Air Quality Technical Report

for the

Mt. Signal Solar Power Project
Calexico I Solar Power Project
Calexico II Solar Power Project

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1.0 Introduction

This Air Quality Technical Report addresses potential air quality and climate change impacts associated with the construction and operation of three solar power projects in Imperial County, California: the Mt. Signal Solar Power Project, the Calexico I Solar Power Project, and the Calexico II Solar Power Project. The objective of the project is to utilize Imperial County's abundance of available solar energy (sunlight) to generate renewable energy, consistent with the County General Plan renewable energy objectives. The Project Applicant and the County identified the following objectives for the project:

- Construct and operate a solar energy facility capable of producing up to 800 (or 1,000) megawatts of electricity, which would help meet the increasing demand for clean, renewable electrical power.
- Construct and operate a solar power facility with minimal impacts to the environment.
- Operate a facility at a location that ranks amongst the highest in solar resource potential in the nation.
- Interconnect with electrical transmission infrastructure either planned or being constructed by other nearby projects, interconnect to the California Independent System Operator (CAISO) controlled transmission network, and maximize opportunities for the sharing or use of existing utility transmission corridor(s).
- Encourage economic investment and diversify the economic base for Imperial County.
- Operate a renewable energy facility that does not produce noise, emit any greenhouse gases, and minimizes water use.
- Help reduce reliance on foreign sources of fuel.
- Supply on-peak power to the electrical grid in California.
- Help California meet its statutory and regulatory goal of increasing renewable power generation, including greenhouse gas reduction goals of Assembly Bill (AB) 32 (California Global Warming Solutions Act of 2006).

The project would employ the use of photo-voltaic (PV) power systems to convert solar energy into electricity using non-reflective technology. The project facilities would consist of solar PV

panels, inverter modules, pad mounted transformer(s), and optional, on-site substation(s). Up to five Operations and Maintenance (O&M) buildings are contemplated. Each O&M building would include its own emergency power, fire suppression, potable water system and septic system. Additional auxiliary facilities would include lighting, grounding, backup uninterruptable power supply (UPS) systems and diesel power generators, fire and hazardous materials safety systems, security systems, chemical safety systems, and emergency response facilities.

At build-out, the proposed project would facilitate the generation of up to 800 (or 1,000) MW of alternative current (AC) on a daily basis. Annually, the project would generate up to 1,920,000 (or 2,400,000) MW. The project facilities would provide maximum electrical output during the daytime hours, which corresponds with peak energy demands associated with air conditioning use during the summer months. This peak period closely corresponds with the time period to where the peak solar energy and solar insolation values are the highest for the Project Study Area.

The solar generating portion of the Project Study Area is located on privately owned, undeveloped agricultural land encompassing 4,228-acres approximately six miles west of Calexico, California in southern Imperial County (County). The U.S./Mexico border is located immediately south of the Project Study Area. The Project Study Area includes all or portions of Sections 17, 18, 19, 20 Township 17 south, Range 14 east and Sections 13, 14, 15, 16, and 17 Township 17 south, Range 13 east San Bernardino baseline and meridian. The geographic center of the Project Study Area roughly corresponds with 32.671 latitude, -16.600 longitude. Figure 3.0-1 illustrates the areas comprising the Project Study Area.

The Project is comprised of five separate conditional use permit (CUP) applications on file with the County, which together define the Project Study Area. The five CUP applications or individual site locations within the Project Study Area consist of the following:

- Mount Signal Solar Farm 1 (MSSF1)
- Calexico Solar Farm 1, Phase A (CSF1(A))
- Calexico Solar Farm 1, Phase B (CSF1(B))

- Calexico Solar Farm 2, Phase A (CSF2(A))
- Calexico Solar Farm 2, Phase B (CSF2(B))

In addition, the Project Study Area includes a linear corridor that could house off-site transmission facilities (OTF), if required. Each individual site location comprising the Project Study Area is further described below.

1.1 Mount Signal Solar Farm 1 (MSSF1)

The MSSF1 site consists of ten parcels totaling approximately 1,431-acres within the central and western portions of the Study Area. The MSSF1 site location is generally located between State Route (SR) 98 to the north and the US-Mexico border to the south, and between Pulliam Road to the west and Weed Road to the east. Primary access to MSSF1 is via SR-98 and Ferrell Road. In total, the MSSF1 site location would facilitate the placement of up to 1.6 million PV panels that would be capable of generating up to 200 MW AC.

The MSSF1 site would also include a new Operations and Maintenance Building (O&M) building and parking area at the intersection of Ferrell Road and SR 98. The O&M building would not exceed an area of approximately 320 square feet. The parking area would comprise an area of less than 0.25 acres. The O&M building would consist of a steel framed structure with metal siding and roof panels and painted to match the surrounding landscape (e.g. desert sand). The O&M building would include a small office, storage space, an electrical/array control room, restroom, and water treatment facility.

1.2 Calexico Solar Farm 1, Phase A (CSF1(A))

The CSF1(A) site consists of four parcels totaling 719-acres within the central portions of the Project Study Area. CSF1(A) is generally bounded by SR 98 to the north, Anza Road to the south, and between Brockman Road to the west and a private road to the east (east of Rockwood Road). Primary access to CSF1(A) occurs via SR-98, Brockman Road, and Rockwood Road. In total, the CSF1(A) site location would facilitate the placement of up to 1.6 million PV panels that would be capable of generating up to 200 MW AC. Similar to the MSSF1 site description,

individual PV panels would either be installed on a fixed-tilt or tracker mounting system and would stand approximately 15-feet high. The PV panels would be installed on a galvanized steel or aluminum mounting framework and arranged in continuous rows of up to approximately 500-feet in length and grouped to form solar array grids.

If required, an on-site substation would be located at the southwestern corner of the intersection of Yuha Cutoff and Brockman Road. The substation would be constructed similar to that described for the MSSF1 site location. The CSF1(A) site would also include an O&M building.

1.3 Calexico Solar Farm 1, Phase B (CSF1(B))

The CSF1(B) site location consists of five parcels totaling 613-acres within the southwestern portion of the Project Study Area. CSF1(B) is generally located between State Route (SR) 98 to the north and the US-Mexico border to the south, and between Pulliam Road to the west and a private road to the east (east of Rockwood Road). Primary access to the CASF1(B) is obtained via SR-98 and Anza Road. In total, the CSF1(B) site location would facilitate the placement of up to 1.6 million PV panels that would be capable of generating up to 200 MW AC. Similar to the MSSF1 site description, individual PV panels would either be installed on a fixed-tilt or tracker mounting system and would stand approximately 15-feet high. The PV panels would be installed on a galvanized steel or aluminum mounting framework and arranged in continuous rows of up to approximately 500-feet in length and grouped together to form solar array grids.

If required, an on-site substation would be located at the southwestern corner of the intersection of Brockman Road and a private road. The substation would be constructed similar to that described for the MSSF1 site location. The CSF1(B) site would also include an O&M building.

1.4 Calexico Solar Farm 2, Phase A (CSF2(A))

The CSF2(A) site location consists of five parcels totaling 940-acres within the eastern portion of the Project Study Area. CSF2(A) is generally located between SR 98 to the north and the US-Mexico border to the south, and between Hammers Road to the east and a private road to the west (west of Weed Road). Bowman airstrip, a small private airstrip used to support crop dusting

operations in the area, transects the northwestern portion of CSF2(A). In total, the CSF2(A) site location would facilitate the placement of up to 1.6 million PV panels that would be capable of generating up to 200 MW AC. Similar to the MSSF1 site description, individual PV panels would either be installed on a fixed-tilt or tracker mounting system and would stand approximately 15-feet high. The PV panels would be installed on a galvanized steel or aluminum mounting framework and arranged in continuous rows of up to approximately 500-feet in length and arrays would be grouped together to form solar array grids.

If required, an on-site substation would be located at the southeastern corner of two private roads (1/2 mile west of Weed Road and ½ mile south of SR-98). The substation would be constructed similar to that described for the MSSF1 site location. The CSF2(A) site would also include an O&M building.

1.5 Calexico Solar Farm 2, Phase B (CSF2(B))

The CSF2(B) site location consists of five parcels totaling 525-acres within the eastern portion of the Project Study Area. CSF2(B) is generally located between Kubler Road to the north and SR-98 to the south, and between Ferrell Road to the east and a private road to the west (west of Corda Road). In total, the CSF2(B) site location would facilitate the placement of up to 1.6 million PV panels that would be capable of generating up to 200 MW AC. Similar to the MSSF1 site description, individual PV panels would either be installed on a fixed-tilt or tracker mounting system and would stand approximately 15-feet high. The PV panels would be installed on a galvanized steel or aluminum mounting framework and arranged in continuous rows of up to approximately 500-feet in length and arrays would be grouped together to form solar array grids.

If required, an on-site substation would be located at the northwestern corner of the intersection of Kubler Road and SR-98. The substation would be constructed similar to that described for the MSSF1 site location. The CSF2(B) site would also include an O&M building.

1.6 Auxiliary Facilities

In addition to the solar farms, the project will include auxiliary facilities, including site security and fencing, lighting, access roads, fire protection systems, and water supply for panel washing.

1.7 Off-site Transmission Facilities (OTF)

The project would connect to existing electrical transmission infrastructure to enable for the export and sale of electricity via the California Independent System Operator (ISO) grid. This connection would be accomplished through the construction of a new 230 kilovolt (kV) transmission line that would bisect the Project Study Area from east to west along a private road just south of SR 98. The transmission corridor would extend from a point near the intersection of Anza Road and a private road, just east of Ferrell Road, west to the intersection of Pulliam Road and a private access road, just south of SR 98. These transmission facilities would then interconnect to the east-west transmission facilities currently being constructed as part of the recently approved Imperial Solar Energy Center South Project. The proposed interconnection point is located at the intersection of Pulliam Road and a private access road located approximately a half mile south of SR 98.

A portion of the transmission facilities associated with the Imperial Solar Energy Center South Project is being constructed within BLM lands, the construction and operation of which, were addressed in BLM EA 2010-64/2011-0007. Transmission facilities currently being constructed in conjunction with the Solar Energy Center South Project would then connect with new transmission facilities proposed on Bureau of Land Management (BLM) lands from the westerly terminus of the Imperial Solar Energy Center South Project transmission line (located within BLM lands) north to the existing Imperial Valley Substation.

Interconnection for the project to the ISO would occur at the Imperial Valley Substation, located approximately 7 miles northwest of the Project Study Area, via a 230 kV transmission structure shared with one or more solar projects in the project vicinity and/or constructed as part of the proposed project. The project would interconnect with one of several transmission facilities currently planned and approved to the west of the Project Study Area. All electrical power

generated by the project would be transferred to off-site transmission infrastructure via a shared transmission facility constructed during the implementation of MSSF1. The proposed ROW for the electrical transmission line corridor would be 120-feet wide.

Three types of steel lattice transmission towers and two types of steel monopoles would be used for the proposed transmission infrastructure, depending on function. The three types of steel lattice towers are suspension, deflection, and dead-end. The two types of steel monopoles are suspension and deflection. Suspension towers (or monopoles) are used where cables are strung in a straight line from one tower to an adjacent one. Deflection towers (or monopoles) are used where transmission lines turn gradual angles and dead-end lattice towers are used where transmission lines turn large angles or where a transmission line is brought into an electric substation. Suspension, deflection and dead-end towers are about 140 feet high, while both deflection and suspension monopoles are about 100 feet high.

The towers would be anchored to concrete foundations at each of the four corners at the base of the tower. The tower base dimensions would range from approximately 30 feet by 30 feet for suspension towers to 40 feet by 40 feet for the deflection and dead-end towers. At the top, the suspension towers would be approximately 6.6 feet square, the deflection towers would be approximately 7.5 feet square and the dead-end towers would be approximately 13 square feet. Conductors (or wires) would be supported by single or double insulators. The minimum ground clearance of the conductor would be 36 feet. The average horizontal distance between circuits would range from 25 to 35 feet depending on the structure.

This report presents an assessment of potential air quality impacts associated with the proposed projects. The evaluation addresses existing conditions and discusses the potential for air quality impacts from the projects.

2.0 Existing Conditions

2.1 Resource Overview

Criteria Pollutants. Air quality is defined by ambient air concentrations of specific pollutants determined by the United States Environmental Protection Agency (USEPA) to be of concern with respect to the health and welfare of the general public. Seven major pollutants of concern, called "criteria pollutants," are carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), ozone (O_3), suspended particulate matter less than or equal to 10 microns in diameter (PM_{10}), fine particulate matter less than or equal to 2.5 microns in diameter ($PM_{2.5}$), and lead (Pb). The USEPA has established National Ambient Air Quality Standards (NAAQS) for these pollutants. Areas that violate a federal air quality standard are designated as non-attainment areas.

Ambient air quality refers to the atmospheric concentration of a specific compound (amount of pollutants in a specified volume of air) that occurs at a particular geographic location. The ambient air quality levels measured at a particular location are determined by the interactions of emissions, meteorology, and chemistry. Emission considerations include the types, amounts, and locations of pollutants emitted into the atmosphere. Meteorological considerations include wind and precipitation patterns affecting the distribution, dilution, and removal of pollutant emissions. Chemical reactions can transform pollutant emissions into other chemical substances. Ambient air quality data are generally reported as a mass per unit volume (e.g., micrograms per cubic meter of air) or as a volume fraction (e.g., parts per million [ppm] by volume).

Pollutant emissions typically refer to the amount of pollutants or pollutant precursors introduced into the atmosphere by a source or group of sources. Pollutant emissions contribute to the ambient air concentrations of criteria pollutants, either by directly affecting the pollutant concentrations measured in the ambient air or by interacting in the atmosphere to form criteria pollutants. Primary pollutants, such as CO, SO_2, Pb, and some particulates, are emitted directly into the atmosphere from emission sources.

Secondary pollutants, such as O_3, NO_2, and some particulates, are formed through atmospheric chemical reactions that are influenced by meteorology, ultraviolet light, and other atmospheric processes. PM_{10} and $PM_{2.5}$ are generated as primary pollutants by various mechanical processes (for example, abrasion, erosion, mixing, or atomization) or combustion processes. However, PM_{10} and $PM_{2.5}$ can also be formed as secondary pollutants through chemical reactions or by gaseous pollutants condensing into fine aerosols. In general, emissions that are considered "precursors" to secondary pollutants in the atmosphere (such as reactive organic gases [ROG] and oxides of nitrogen [NOx], which are considered precursors for O_3), are the pollutants for which emissions are evaluated to control the level of O_3 in the ambient air.

Existing air quality at a given location can be described by the concentrations of various pollutants in the atmosphere. Pollutants are defined as two general types: (1) "criteria" pollutants and (2) toxic compounds. Criteria pollutants have national and/or state ambient air quality standards. The USEPA establishes the NAAQS, while the California Air Resources Board (ARB) establishes the state standards, termed the California Ambient Air Quality Standards (CAAQS). The NAAQS represent maximum acceptable concentrations that generally may not be exceeded more than once per year, except the annual standards, which may never be exceeded. The CAAQS represent maximum acceptable pollutant concentrations that are not to be equaled or exceeded.

Toxic Air Contaminants. Toxic air contaminants (TACs) are substances that have the potential to be emitted into the ambient air that have been determined to present some level of acute or chronic health risk (cancer or non-cancer) to the general public. These pollutants may be emitted in trace amounts from various types of sources, including combustion sources.

Greenhouse Gas Emissions. Greenhouse gases (GHGs) are gases that trap heat in the atmosphere. These emissions occur from natural processes as well as human activities. The accumulation of GHGs in the atmosphere regulates the earth's temperature. Scientific evidence indicates a trend of increasing global temperature over the past century, which a number of scientists attribute to an increase in GHG emissions from human activities. The climate change

associated with this global warming is predicted to produce negative economic and social consequences across the globe.

Recent observed changes due to global warming include shrinking glaciers, thawing permafrost, a lengthened growing season, and shifts in plant and animal ranges (Intergovernmental Panel on Climate Change 2007). Generally accepted predictions of long-term environmental impacts due to global warming include sea level rise, changing weather patterns with increases in the severity of storms and droughts, changes to local and regional ecosystems including the potential loss of species, and a significant reduction in winter snow pack.

The most common GHGs emitted from natural processes and human activities include carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). Examples of GHGs created and emitted primarily through human activities include fluorinated gases (hydrofluorocarbons and perfluorocarbons) and sulfur hexafluoride. Each GHG is assigned a global warming potential. The global warming potential is the ability of a gas or aerosol to trap heat in the atmosphere. The global warming potential rating system is standardized to CO_2, which has a value of one. For example, CH_4 has a global warming potential of 21, which means that it has a global warming effect 21 times greater than CO_2 on an equal-mass basis. Total GHG emissions from a source are often reported as a CO_2 equivalent (CO_2e). The CO_2e is calculated by multiplying the emission of each GHG by its global warming potential and adding the results together to produce a single, combined emission rate representing all GHGs. On a national scale, federal agencies are addressing emissions of GHGs by reductions mandated in federal laws and Executive Orders, most recently, Executive Order 13423 Strengthening Federal Environmental, Energy, and Transportation Management (January 24, 2007) was enacted. Several states have promulgated laws as a means to reduce statewide levels of GHG emissions. In particular, the California Global Warming Solutions Act of 2006 directs the State of California to reduce statewide GHG emissions to 1990 levels by the year 2020.

The potential effects of proposed GHG emissions are by nature global, and have cumulative impacts. As individual sources, GHG emissions are not large enough to have an appreciable

effect on climate change. Therefore, the impact of proposed GHG emissions to climate change is discussed in the context of cumulative impacts.

2.2 Regulatory Framework

The Federal Clean Air Act (CAA) and its subsequent amendments establish air quality regulations and the NAAQS and delegate the enforcement of these standards to the states. In California, the ARB is responsible for enforcing air pollution regulations. The ARB has in turn delegated the responsibility of regulating stationary emission sources to regional air agencies. In Imperial County, the Imperial County Air Pollution Control District (ICAPCD) has this responsibility. The CAA establishes air quality planning processes and requires areas in nonattainment of a NAAQS to develop a State Implementation Plan (SIP) that details how the state will attain the standard within mandated time frames. The requirements and compliance dates for attainment are based on the severity of the nonattainment classification of the area. The national and state ambient air quality standards are shown in Table 1. In California, the ARB is responsible for enforcing both the federal and state air pollution standards.

Areas that do not meet the NAAQS or CAAQS for a given criteria pollutant are designated as "nonattainment areas" by the USEPA and/or the ARB. Further classifications are given to nonattainment areas to identify the severity and number of violations experienced, and the year in which attainment is anticipated based on implementation of attainment plans. The Imperial County is designated a moderate nonattainment area for the 8-hour O_3 NAAQS, and a nonattainment area for the NAAQS for $PM_{2.5}$. The Imperial Valley portion of Imperial County is designated a serious nonattainment area for the NAAQS for PM_{10}. Imperial County is also considered a nonattainment area for the CAAQS for O_3, $PM_{2.5}$, and PM_{10}. The area is considered unclassified or attainment for all other NAAQS and CAAQS for the other criteria pollutants.

Table 1 National and California Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards	NATIONAL STANDARDS [a]	
			Primary [b,c]	Secondary [b,d]
Ozone (O_3)	8-hour	0.070 ppm (137 µg/m^3)	0.075 ppm (147 µg/m^3)	Same as primary
	1-hour	0.09 ppm (180 µg/m^3)	—	—
Carbon monoxide (CO)	8-hour	9.0 ppm (10 mg/m^3)	9 ppm (10 mg/m^3)	—
	1-hour	20 ppm (23 mg/m^3)	35 ppm (40 mg/m^3)	—
Nitrogen dioxide (NO_2)	Annual	0.030 ppm (56 µg/m^3)	0.053 ppm (100 µg/m^3)	Same as primary
	1-hour	0.18 ppm (338 µg/m^3)	—	—
Sulfur dioxide (SO_2)	Annual	—	0.030 ppm (80 µg/m^3)	—
	24-hour	0.04 ppm (105 µg/m^3)	0.14 ppm (365 µg/m^3)	—
	3-hour	—	—	0.5 ppm (1,300 µg/m^3)
	1-hour	0.25 ppm (655 µg/m^3)	—	—
PM_{10}	Annual 24-hour	20 µg/m^3 50 µg/m^3	— 150 µg/m^3	— Same as primary
$PM_{2.5}$	Annual 24-hour	12 µg/m^3 —	15.0 µg/m^3 35 µg/m^3	
Lead	Rolling 3-month period	—	0.15 µg/m^3	Same as primary
	Calendar Quarter 30-day average	— 1.5 µg/m^3	1.5 µg/m^3 —	Same as primary —
Hydrogen Sulfide	1-hour	0.03 ppm (42 µg/m^3)	—	—

Notes:

(a) Standards other than the 1-hour ozone, 24-hour PM_{10}, 24-hour $PM_{2.5}$, and those based on annual averages are not to be exceeded more than once a year. The 8-hour ozone national standard has replaced the 1-hour ozone national standard.

(b) Concentrations are expressed first in units in which they were promulgated. Equivalent units given in parenthesis.

(c) Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health. Each state must attain the primary standards no later than 3 years after that state's implementation plan is approved by the USEPA.

(d) Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

The following summarizes the air quality rules and regulations that apply to the projects.

Federal Regulations. The CAA applies to all air emission sources and to all areas within the United States. Regulations adopted under the CAA that would apply to the projects would include the NAAQS, as well as other requirements that have been adopted as part of the ICAPCD's federally approved plans and programs.

As indicated in Federal Register Volume 75, No. 11, Page 2938, the USEPA is considering lowering the 8-hour O_3 standard from 0.075 ppm, which is its current level, to a lower level within the range of 0.060 and 0.070 ppm. The lower level is proposed to provide increased protection for children and other "at risk" populations against O_3 health effects.

Recent actions by the U.S. EPA have allowed for the regulation of greenhouse gases (GHGs). On April 17, 2009, U.S. EPA issued its proposed endangerment finding for GHG emissions. On December 7, 2009, the U.S. EPA Administrator signed and finalized two distinct findings regarding greenhouse gases under section 202(a) of the Clean Air Act:

> Endangerment Finding: The Administrator finds that the current and projected concentrations of the six key well-mixed greenhouse gases--carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6)--in the atmosphere threaten the public health and welfare of current and future generations.
>
> Cause or Contribute Finding: The Administrator finds that the combined emissions of these well-mixed greenhouse gases from new motor vehicles and new motor vehicle engines contribute to the greenhouse gas pollution which threatens public health and welfare.

These findings do not themselves impose any requirements on industry or other entities. However, this action was a prerequisite to finalizing the U.S. EPA's proposed greenhouse gas emission standards for light-duty vehicles, which were jointly proposed by U.S. EPA and the

Department of Transportation's National Highway Safety Administration on September 15, 2009 and adopted on April 1, 2010. As finalized in April 2010, the emissions standards rule for vehicles will improve average fuel economy standards to 35.5 miles per gallon by 2016. In addition, the rule will require model year 2016 vehicles to meet an estimated combined average emission level of 250 grams of carbon dioxide per mile.

On March 10, 2009, in response to the FY2008 Consolidated Appropriations Act (H.R. 2764; Public Law 110–161), the U.S. EPA proposed a rule that requires mandatory reporting of greenhouse gas (GHG) emissions from large sources in the United States. On September 22, 2009, the Final Mandatory Reporting of Greenhouse Gases Rule was signed, and was published in the Federal Register on October 30, 2009. The rule became effective on December 29, 2009. The rule will collect accurate and comprehensive emissions data to inform future policy decisions.

The U.S. EPA is requiring suppliers of fossil fuels or industrial greenhouse gases, manufacturers of vehicles and engines, and facilities that emit 25,000 metric tons or more per year of GHG emissions to submit annual reports to U.S. EPA. The gases covered by the proposed rule are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFC), perfluorocarbons (PFC), sulfur hexafluoride (SF_6), and other fluorinated gases, including nitrogen trifluoride (NF_3) and hydrofluorinated ethers (HFE).

State Regulations. The ARB has oversight over air quality in the state of California. Regulation of individual stationary sources has been delegated to local air pollution control agencies. The ARB is responsible for developing programs designed to reduce emissions from non-stationary sources, including motor vehicles and off-road equipment.

The ARB and the California Office of Environmental Health Hazard Assessment (OEHHA) are also responsible for developing regulations governing TACs. TACs include air pollutants that can cause serious illnesses or increased mortality, even in low concentrations. The ARB and OEHHA identify specific air pollutants as TACs, develop health thresholds for exposure to

TACs, and develop guidelines for conducting health risk assessments for sources of TAC emissions.

The state of California enacted some of the first legislation in the United States to regulate GHGs. The following subsections describe regulations and standards that have been adopted by the state of California to address GHG emissions.

Assembly Bill 32, the California Global Warming Solutions Act of 2006. In September 2006, Governor Schwarzenegger signed AB 32 into law. AB 32 directs the ARB to do the following:

- Make publicly available a list of discrete early action GHG emission reduction measures that can be implemented prior to the adoption of the statewide GHG limit and the measures required to achieve compliance with the statewide limit.
- Make publicly available a GHG inventory for the year 1990 and determine target levels for 2020.
- On or before January 1, 2010, adopt regulations to implement the early action GHG emission reduction measures.
- On or before January 1, 2011, adopt quantifiable, verifiable, and enforceable emission reduction measures by regulation that will achieve the statewide GHG emissions limit by 2020, to become operative on January 1, 2012, at the latest. The emission reduction measures may include direct emission reduction measures, alternative compliance mechanisms, and potential monetary and non-monetary incentives that reduce GHG emissions from any sources or categories of sources that ARB finds necessary to achieve the statewide GHG emissions limit.
- Monitor compliance with and enforce any emission reduction measure adopted pursuant to AB 32.

AB 32 required that, by January 1, 2008, the ARB determine what the statewide GHG emissions level was in 1990, and approve a statewide GHG emissions limit that is equivalent to that level, to be achieved by 2020. The ARB adopted its Scoping Plan in December 2008, which provided estimates of the 1990 GHG emissions level and identified sectors for the reduction of GHG

emissions. The ARB has estimated that the 1990 GHG emissions level was 427 MMT net CO_2e (ARB 2007b). The ARB estimates that a reduction of 173 MMT net CO_2e emissions below business-as-usual would be required by 2020 to meet the 1990 levels (ARB 2007b). This amounts to roughly a 30 percent reduction from projected business-as-usual levels in 2020 (ARB 2008a).

Senate Bill 97. Senate Bill (SB) 97, enacted in 2007, amends the CEQA statute to clearly establish that GHG emissions and the effects of GHG emissions are appropriate subjects for CEQA analysis. SB 97 directed the Governor's Office of Planning and Research (OPR) to develop draft CEQA guidelines "for the mitigation of greenhouse gas emissions or the effects of greenhouse gas emissions" by July 1, 2009, and directed the California Natural Resources Agency (CNRA) to certify and adopt the CEQA guidelines by January 1, 2010.

OPR published a technical advisory on CEQA and climate change on June 19, 2008. The guidance did not include a suggested threshold, but stated that the OPR had asked the ARB to "recommend a method for setting thresholds which will encourage consistency and uniformity in the CEQA analysis of greenhouse gas emissions throughout the state." The OPR technical advisory does recommend that CEQA analyses include the following components:

- Identification of greenhouse gas emissions;
- Determination of significance; and
- Mitigation of impacts, as needed and as feasible.

On December 31, 2009, the CNRA adopted the proposed amendments to the State CEQA Guidelines. These amendments became effective on March 18, 2010.

Executive Order S-3-05. Executive Order S-3-05, signed by Governor Schwarzenegger on June 1, 2005, calls for a reduction in GHG emissions to 1990 levels by 2020 and for an 80 percent reduction in GHG emissions below 1990 levels by 2050. Executive Order S-3-05 also calls for the California EPA (CalEPA) to prepare biennial science reports on the potential impact of continued GCC on certain sectors of the California economy. The first of these reports, "Our Changing Climate: Assessing Risks to California", and its supporting document "Scenarios of

Climate Change in California: An Overview" were published by the California Climate Change Center in 2006.

Executive Order S-21-09. Executive Order S-21-09 was enacted by the Governor on September 15, 2009. Executive Order S-21-09 requires that the ARB, under its AB 32 authority, adopt a regulation by July 31, 2010 that sets a 33 percent renewable energy target. Under Executive Order S-21-09, the ARB will work with the Public Utilities Commission and California Energy Commission to encourage the creation and use of renewable energy sources, and will regulate all California utilities. The ARB will also consult with the Independent System Operator and other load balancing authorities on the impacts on reliability, renewable integration requirements, and interactions with wholesale power markets in carrying out the provisions of the Executive Order. The order requires the ARB to establish highest priority for those resources that provide the greatest environmental benefits with the least environmental costs and impacts on public health.

California Code of Regulations Title 24. Although not originally intended to reduce greenhouse gas emissions, Title 24 of the California Code of Regulations, Part 6: California's Energy Efficiency Standards for Residential and Nonresidential Buildings, were first established in 1978 in response to a legislative mandate to reduce California's energy consumption. The standards are updated periodically to allow for the consideration and possible incorporation of new energy efficiency technologies and methods. Energy efficient buildings require less electricity, natural gas, and other fuels. Electricity production from fossil fuels and on-site fuel combustion (typically for water heating) results in greenhouse gas emissions. Therefore, increased energy efficiency results in decreased greenhouse gas emissions.

The GHG emission inventory was based on Title 24 standards as of October 2005; however, Title 24 has been updated as of 2008 and standards are currently being phased in.

Senate Bill 1078, Senate Bill 107, and Executive Order S-14-08. SB 1078 initially set a target of 20% of energy to be sold from renewable sources by the year 2017. The schedule for implementation of the RPS was accelerated in 2006 with the Governor's signing of SB 107, which accelerated the 20% RPS goal from 2017 to 2010. On November 17, 2008, the Governor

signed Executive Order S-14-08, which requires all retail sellers of electricity to serve 33 percent of their load with renewable energy by 2020. The Governor signed Executive Order S-21-09 on September 15, 2009, which directs ARB to implement a regulation consistent with the 2020 33% renewable energy target by July 31, 2010.

State Standards Addressing Vehicular Emissions. California Assembly Bill 1493 (Pavley) enacted on July 22, 2002, required the ARB to develop and adopt regulations that reduce greenhouse gases emitted by passenger vehicles and light duty trucks. Regulations adopted by ARB would apply to 2009 and later model year vehicles. ARB estimated that the regulation would reduce climate change emissions from light duty passenger vehicle fleet by an estimated 18% in 2020 and by 27% in 2030 (AEP 2007). Once implemented, emissions from new light-duty vehicles are expected to be reduced in San Diego County by up to 21 percent by 2020[1].

The ARB has adopted amendments to the Pavley regulations that reduce GHG emissions in new passenger vehicles from 2009 through 2016. The amendments, approved by the ARB Board on September 24, 2009, are part of California's commitment toward a nation-wide program to reduce new passenger vehicle GHGs from 2012 through 2016, and prepare California to harmonize its rules with the federal rules for passenger vehicles.

Executive Order S-01-07. Executive Order S-01-07 was enacted by the Governor on January 18, 2007, and mandates that: 1) a statewide goal be established to reduce the carbon intensity of California's transportation fuels by at least 10 percent by 2020; and 2) a Low Carbon Fuel Standard ("LCFS") for transportation fuels be established for California. On April 23, 2009, the ARB adopted regulations to implement the LCFS.

Senate Bill 375. SB 375 finds that GHG from autos and light trucks can be substantially reduced by new vehicle technology, but even so "it will be necessary to achieve significant additional greenhouse gas reductions from changed land use patterns and improved transportation. Without improved land use and transportation policy, California will not be able to achieve the goals of AB 32." Therefore, SB 375 requires that regions with metropolitan planning organizations adopt

[1] SDCGHGI, An Analysis of Regional Emissions and Strategies to Achieve AB 32 Targets, On-Road Transportation Report. Sean Tanaka, Tanaka Research and Consulting, September 2008, Page 7.

sustainable communities strategies, as part of their regional transportation plans, which are designed to achieve certain goals for the reduction of GHG emissions from mobile sources.

SB 375 also includes CEQA streamlining provisions for "transit priority projects" that are consistent with an adopted sustainable communities strategy. As defined in SB 375, a "transit priority project" shall: (1) contain at least 50 percent residential use, based on total building square footage and, if the project contains between 26 and 50 percent nonresidential uses, a floor area ratio of not less than 0.75; (2) provide a maximum net density of at least 20 dwelling units per acre; and (3) be within 0.5 mile of a major transit stop or high quality transit corridor

Local Regulations. As discussed in Section 2.1, the projects are located in the jurisdiction of the ICAPCD. The ICAPCD is responsible for regulating stationary sources of air emissions in Imperial County. Stationary sources that have the potential to emit air pollutants into the ambient air are subject to the Rules and Regulations adopted by the ICAPCD.

The following ICAPCD rules are applicable to the project.

Rule 403 – General Limitations on the Discharge of Air Contaminants. Rule 403 sets forth limitations on emissions of pollutants, including particulate matter, from individual sources.

Rule 407 – Nuisance. Rule 407 prohibits a person from discharging from any source whatsoever such quantities of air contaminants or other material which cause injury, detriment, nuisance or annoyance to any considerable number of persons or to the public, or which endanger the comfort, repose, health or safety of any such persons or the public, or which cause, or have a natural tendency to cause, injury or damage to business or property.

Regulation VIII – Fugitive Dust Rules. Regulation VIII sets forth rules regarding the control of fugitive dust, including fugitive dust from construction activities. The regulation requires implementation of fugitive dust control measures to reduce emissions from earthmoving, unpaved roads, handling of bulk materials, and control of track-out/carry-out dust from active construction sites.

2.3 Regional Climate

Data from the Western Regional Climate Center (WRCC 2010) indicate that temperature and precipitation were measured at Calexico from June 1904 through the present. The annual mean temperature for Calexico is 71.1 degrees F, and the mean annual precipitation is 2.69 inches. Monthly average temperatures and precipitation for the area are summarized in Table 2.

Table 2
Monthly Average Temperatures and Precipitation
Calexico Meteorological Station

Month	Monthly Average Temperatures, °F			Precipitation, inches
	Maximum	Minimum	Mean	Mean
January	67.2	39.0	53.2	0.42
February	72.9	44.1	58.4	0.35
March	78.6	48.2	63.4	0.22
April	85.4	53.4	69.4	0.07
May	91.9	59.4	75.7	0.03
June	101.4	67.5	84.4	0.01
July	103.9	75.8	89.8	0.19
August	103.3	74.8	89.0	0.10
September	98.4	67.8	83.1	0.41
October	87.6	56.1	71.8	0.24
November	76.6	46.0	61.3	0.21
December	67.2	39.1	53.2	0.42
Annual	86.2	55.9	71.1	2.69

Source: www.wrcc.dri.edu

The climate in Imperial Valley is categorized as a desert climate, with dry, hot summers and mild winters. Figure 1 presents a wind rose for Calexico showing the prevailing winds.

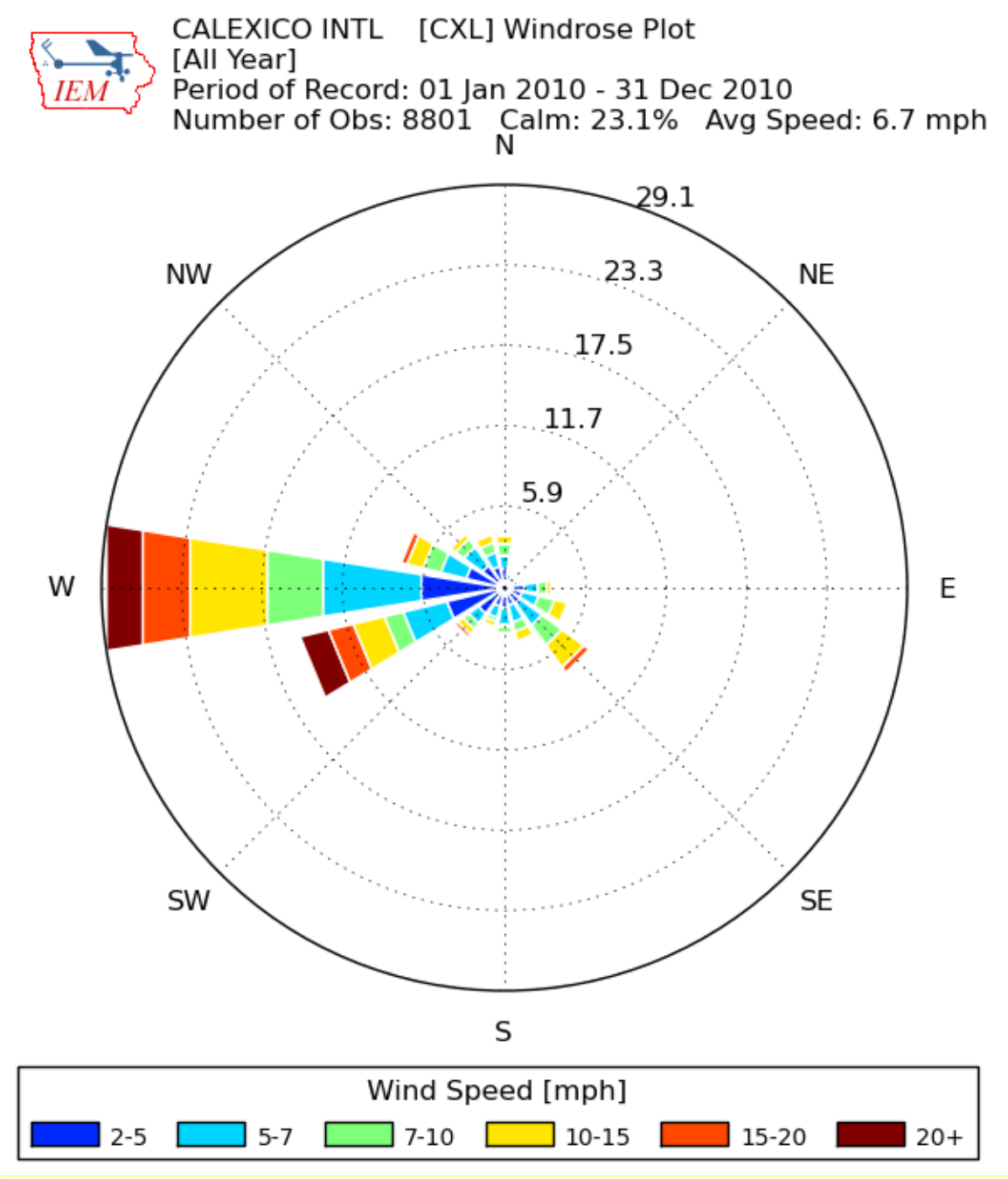

Figure 1. Calexico Wind Rose

2.4 Existing Air Quality

The ARB and the ICAPCD operate a series of ambient air quality monitoring stations throughout Imperial County. The closest monitoring site to the project locations is located on Ethel Street in

Calexico. The Calexico monitoring station measures O_3, PM_{10}, $PM_{2.5}$, CO, NO_2, and SO_2. Table 3 provides a summary of background air quality representative of the Project region.

Table 3
Representative Air Quality Data for the Project Area (2006-2010)

Air Quality Indicator	2006	2007	2008	2009	2010
Ozone (O_3)[1]					
Peak 1-hour value (ppm)	0.111	0.112	0.128	0.104	0.102
Days above state standard (0.09 ppm)	2	10	8	5	4
Peak 8-hour value (ppm)	0.087	0.094	0.093	0.083	0.082
Days above state standard (0.070 ppm)	3	20	17	9	6
Days above federal standard (0.075 ppm)[1,3]	2	9	7	4	2
Particulate matter less than or equal to 10 microns in diameter (PM_{10})					
Peak 24-hour value ($\mu g/m^3$)	164	282	110.5	358	77
Days above state standard (50 $\mu g/m^3$)	24	36	31	4	2
Days above federal standard (150 $\mu g/m^3$)	1	1	0	3	0
Annual Average value (ppm)	56.1	65.5	54.1	65.8	38.4
Particulate matter less than or equal to 2.5 microns in diameter ($PM_{2.5}$)[2]					
Peak 24-hour value ($\mu g/m^3$)	68.8	66.7	37.1	45.0	50.9
Days above federal standard (35 $\mu g/m^3$)	5	3	1	4	2
Annual Average value (ppm)	12.4	12.9	*	18.7	12.7
Carbon Monoxide					
Peak 8-hour value ($\mu g/m^3$)	9.76	7.53	6.34	7.46	4.46
Days above federal standard (9 ppm)	1	0	0	0	0
Nitrogen Dioxide (NO_2)[4]					
Peak 1-hour value (ppm)	0.101	0.107	0.146	0.102	0.080
Days above state standard (0.18 ppm)	0	0	0	0	0
Annual Average value (ppm)	0.014	0.014	0.014	0.014	0.014
Sulfur Dioxide (SO_2)					
Peak 24-hour value (ppm)	0.041	0.004	0.007	0.004	0.004
Days above state standard (0.04 ppm)	0	0	0	0	0
Days above federal standard (0.14 ppm)	0	0	0	0	0
Annual Average value (ppm)	0.001	0.000	0.000	0.000	0.000

Notes: [1] The federal O_3 standard was revised downward in 2008 to 0.075 ppm.
[2] The federal $PM_{2.5}$ standard was revised downward in 2007 to 35 $\mu g/m^3$.
[3] The federal eight-hour ozone standard was previously defined as 0.08 ppm (1 significant digit). Measurements were rounded up or down to determine compliance with the standard; therefore a measurement of 0.084 ppm is rounded to 0.08 ppm. The 8-hour ozone ambient air quality standards are met at an ambient air quality monitoring site when the average of the annual fourth-highest daily maximum 8-hour average ozone concentration is less than or equal to the standard.
[4] The federal 1-hour NO_2 standard was adopted in 2010. Prior years were not evaluated based on the new standard.
ppm = parts per million; $\mu g/m^3$ = micrograms per cubic meter; * = not available
Source: http://www.arb.ca.gov/adam/php_files/aqdphp/topfourdisplay.php

3.0 Thresholds of Significance

The CEQA thresholds of significance for air quality are derived from Appendix G of the state CEQA guidelines. These thresholds indicate that a project could have potentially significant impacts if it could:

a. Conflict with or obstruct implementation of the applicable air quality plan
b. Violate any air quality standard or contribute substantially to an existing or projected air quality violation
c. Result in cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including release emissions which exceed quantitative thresholds for ozone precursors);
d. Expose sensitive receptors to substantial pollutant concentrations; or
e. Create objectionable odors affecting a substantial number of people.

The ICAPCD has adopted its own CEQA guidelines (ICAPCD 2007) and has established significance thresholds based on the state CEQA thresholds. The ICAPCD has identified two tiers of emission thresholds to evaluate whether operational impacts from a project have the potential for a significant air quality impact, and to address whether a project must implement additional feasible mitigation measures to reduce emissions to the extent possible.

Table 4 presents the emission thresholds that are identified by the ICAPCD. Projects with emissions below Tier 1 would not have a significant impact on the air quality. Project with emissions above Tier 1 but below Tier 2 would be required to implement all applicable standard mitigation measures. Projects with emissions above Tier 2 would be required to implement all applicable standard mitigation measures, plus all feasible discretionary mitigation measures as listed in the ICAPCD's guidance. These thresholds apply to operational emissions.

Table 4 ICAPCD Thresholds of Significance for Project Operations		
Criteria Pollutant	**Tier 1**	**Tier 2**
NOx and ROG	Less than 55 lbs/day	55 lbs/day and greater
PM_{10} and SOx	Less than 150 lbs/day	150 lbs/day and greater
CO	Less than 550 lbs/day	550 lbs/day and greater
Level of Significance	Less than Significant	Significant Impact
Level of Analysis	Initial Study	Comprehensive AQ Report
Environmental Document	Negative Declaration	Mitigated ND or EIR

For construction projects, the ICAPCD Handbook indicates that the significance threshold for NOx is 100 lbs/day, and for ROG is 75 lbs/day. As discussed in the ICAPCD's guidance document, the approach to evaluating construction emissions should be qualitative rather than quantitative. In any case, regardless of the size of the project, the standard mitigation measures for construction equipment and fugitive PM_{10} must be implemented at all construction sites. The implementation of discretionary mitigation measures, as listed in Section 7.1 of the ICAPCD's Handbook, apply to those construction sites which are 5 acres or more for non-residential developments or 10 acres or more in size for residential developments. The mitigation measures found in Section 7.1 are intended to be a menu of feasible mitigation measures and are not intended to be an all inclusive comprehensive list of all mitigation measures.

The impacts associated with the project were evaluated for significance based on these significance criteria.

4.0 Impacts

The proposed project's air quality impacts are mainly attributable to the construction of the projects, including mobilization; clearing, grading, and trenching; construction of the framework foundations and frameworks; installation of the panels and system wiring; installation of the inverters and transformers; and cabling and connection to the switching station. Operational impacts will include inspection and maintenance operations, which will include washing of the solar panels.

4.1 Construction

Emissions of pollutants such as fugitive dust and heavy equipment exhaust that are generated during construction are generally highest near the construction site. Emissions associated with construction would include the following:

- Emissions of fugitive dust from surface disturbance activities
- Emissions of combustion pollutants from heavy construction equipment
- Emissions of combustion pollutants from worker vehicles
- Emissions of combustion pollutants from heavy-duty vehicles transporting construction materials and equipment to the site

Construction activities are proposed to start in mid-2012 and last for up to 3 years. For this purposes of analysis, this EIR assumes that construction activities associated within one or more facility site components, including off-site transmission infrastructure, could occur simultaneously with the most intense construction activities occurring during mid to late 2012 into 2013. Final construction scheduling would be completed during engineering and contractor bidding, which may result in variations to the planned construction schedule. Typical construction activities involved in the construction of the project include:

- Materials transport
- Site preparation (vegetation removal, and structure demolition, if necessary)
- Earthwork (grading, excavation, backfill)
- Concrete foundations (forming, rebar placement, and concrete delivery and placement) and paving
- Structural steel work (assembly and welding)
- Electrical/instrumentation work
- Architectural and landscaping
- Start up and testing

To characterize and analyze potential construction impacts, maximum crew size, truck trips, and worker trips have been estimated, based on the expected construction activities and evaluating similar projects to construct solar facilities and transmission lines. To support these activities, the main pieces of equipment that may be used at any one time during construction may include the following:

- Rough-terrain forklifts
- Track-type dozers
- Drum-type compactors
- Backhoes
- Racking post ramming machines
- Rough-terrain cranes
- Generators
- Pickup trucks
- ATVs
- Water trucks
- Fuel trucks

The typical crew size for each construction phase would be 10 to 20 people, plus inspectors. In assuming that multiple construction activities could occur simultaneously at multiple project facility sites, up to 150 construction personnel could be present during the most intense construction periods. In addition, daily haul truck trips could average up to 15 daily trips at the height of construction. Work hours would be governed by permits issued by regulatory agencies. Roadways that would be used by construction traffic would be contingent on the location of actual construction at any given time. To the extent feasible, construction activities would occur in the dry months to minimize damage to unpaved roadways used by heavy equipment.

Approximately 10 acres within the Project Study Area would be required to allow for proper PV panel offloading and steel frame assembly. Although an area has not been designated specifically for the lay down yard, it is assumed that it would be located in close proximity to an O&M building.

To calculate emissions associated with construction of the projects, the following assumptions were made:

Construction of MSSF1

1. The MSSF1 Project will be constructed first. As discussed in the Traffic Impact Analysis – Mount Signal Solar Farm (Linscott, Law, and Greenspan 2011a), it was assumed that the construction of the MSSF1 would commence in the second quarter of 2012 and be complete by the end of year 2012.
2. Construction daily trip generation would be estimated at 462 passenger vehicles (Linscott, Law, and Greenspan 2011a).
3. Construction trucks would generate 30 average daily trips (Linscott, Law, and Greenspan 2011a).
4. Heavy equipment requirements were assumed to be the same as similar solar projects.

Construction of CSF1(A) and CSF1(B)

1. The CSF1(A) and CSF1(B) Projects will be constructed second. It was assumed that Phase A and Phase B would be constructed simultaneously. As discussed in the Traffic Impact Analysis – Calexico Solar Farm 1 (Linscott, Law, and Greenspan 2011b), it was assumed that the construction of the CSF1 would commence in 2013 and would be complete by 2014.
2. Construction daily trip generation would be estimated at 462 passenger vehicles (Linscott, Law, and Greenspan 2011b).
3. Construction trucks would generate 30 average daily trips (Linscott, Law, and Greenspan 2011b).
4. Heavy equipment requirements were assumed to be the same as similar solar projects.

Construction of CSF2(A) and CSF2(B)

1. The CSF2(A) and CSF2(B) Projects will be constructed third. It was assumed that Phase A and Phase B would be constructed simultaneously. As discussed in the Traffic Impact

Analysis – Calexico Solar Farm 2 (Linscott, Law, and Greenspan 2011c), it was assumed that the construction of the CSF2 would commence in 2014 and would be complete by the end of 2014.

2. Construction daily trip generation would be estimated at 462 passenger vehicles (Linscott, Law, and Greenspan 2011a).
3. Construction trucks would generate 30 average daily trips (Linscott, Law, and Greenspan 2011a).
4. Heavy equipment requirements were assumed to be the same as similar solar projects.

Construction of Auxiliary Facilities

Emissions associated with construction of auxiliary facilities discussed in Section 1.6 were assumed to occur within the construction timeframe and activity estimated for each individual solar farm. No separate calculations were conducted.

Construction of the Transmission Line

Emissions associated with construction of the transmission line were calculated based on the assumption that the activity and heavy equipment requirements would be similar to other transmission line projects. It was assumed that construction of the transmission line would occur simultaneously with construction of the MSSF1, in the year 2012.

Emissions from heavy equipment used in construction of the projects were estimated based on emission factors for the SCAB from the ARB's OFFROAD2007 Model (ARB 2007a), as published on the SCAQMD's website. Emission factors for 2012, 2013, and 2014 represent the average fleet emissions throughout the SCAB during those construction years, and were considered representative of construction equipment that would be used during construction of the project. Emissions from worker travel and truck traffic were calculated using the ARB's EMFAC2007 Model (ARB 2007b) for on-road vehicles. Emissions of fugitive dust were estimated based on SCAQMD and USEPA emission factors. Unmitigated construction emissions may have the potential to result in a temporary significant impact on the air quality.

As discussed in Section 3.0, all construction projects in Imperial County are required to implement mitigation measures listed in the ICAPCD's CEQA Handbook (ICAPCD 2009). Fugitive dust control measures must be utilized to reduce emissions of particulate matter during construction, and emissions from construction would therefore not conflict with or obstruct implementation of the applicable air quality management plan, and will be mitigated to below a level of significance.

Emissions were estimated based on the construction schedule and equipment requirements for the project provided by the project team. Tables 5a through 5d present a summary of the daily and annual construction emissions for the MSSF1, 230 kV transmission line, CSF1(A) and CSF1(B), and CSF2(A) and CSF2(B), respectively.

Table 5a
Estimated Construction Emissions, MSSF1

Emission Source	ROG	NOx	CO	SOx	PM_{10}	$PM_{2.5}$
Total Construction Emissions, lbs/day						
Heavy Construction Equipment	367.15	732.21	442.42	34.77	25.83	22.99
On-Road Vehicles	69.16	378.48	595.76	1.07	16.40	16.23
Fugitive Dust	-	-	-	-	29.68	7.41
TOTAL	**436.31**	**1110.70**	**1038.18**	**35.84**	**71.91**	**46.63**
Significance Thresholds	75	100	550	150	150	150
Above Significance Thresholds?	*Yes*	*Yes*	*Yes*	*No*	*No*	*No*
Total Construction Emissions, tons/year						
Heavy Construction Equipment	33.04	65.90	39.82	3.13	2.32	2.07
On-Road Vehicles	5.52	10.24	57.07	0.07	0.64	0.64
Fugitive Dust	-	-	-	-	18.87	3.69
TOTAL	**38.57**	**76.14**	**96.89**	**3.20**	**21.84**	**6.39**

Table 5b Estimated Construction Emissions, Transmission Line						
Emission Source	**ROG**	**NOx**	**CO**	**SOx**	**PM_{10}**	**$PM_{2.5}$**
Total Construction Emissions, lbs/day						
Heavy Construction Equipment	109.51	391.06	212.25	11.17	12.33	10.98
On-Road Vehicles	60.27	266.72	525.96	0.89	12.38	12.25
Helicopters	9.67	39.65	39.65	9.34	14.85	14.70
Fugitive Dust	-	-	-	-	40.70	8.42
TOTAL	**179.46**	**697.43**	**777.86**	**21.40**	**80.26**	**46.35**
Significance Thresholds	75	100	550	150	150	150
Above Significance Thresholds?	*Yes*	*Yes*	*Yes*	*No*	*Yes*	*No*
Total Construction Emissions, tons/year						
Heavy Construction Equipment	6.95	25.20	13.66	0.71	0.79	0.70
On-Road Vehicles	5.42	11.00	53.22	0.07	0.67	0.67
Helicopters	3.78	6.48	6.48	1.35	1.99	1.97
Fugitive Dust	-	-	-	-	12.25	2.66
TOTAL	**16.16**	**42.68**	**73.35**	**2.12**	**15.71**	**6.00**

Table 5c Estimated Construction Emissions, CSF1						
Emission Source	**ROG**	**NOx**	**CO**	**SOx**	**PM_{10}**	**$PM_{2.5}$**
Total Construction Emissions, lbs/day						
Heavy Construction Equipment	355.29	732.21	442.42	31.41	25.83	22.99
On-Road Vehicles	66.36	339.99	567.15	1.01	15.18	15.03
Fugitive Dust	-	-	-	-	29.68	7.41
TOTAL	**421.65**	**1072.20**	**1009.57**	**32.42**	**70.69**	**45.43**
Significance Thresholds	75	100	550	150	150	150
Above Significance Thresholds?	*Yes*	*Yes*	*Yes*	*No*	*No*	*No*
Total Construction Emissions, tons/year						
Heavy Construction Equipment	31.98	65.90	39.82	2.83	2.32	2.07
On-Road Vehicles	5.39	9.46	54.43	0.07	0.61	0.61
Fugitive Dust	-	-	-	-	18.87	3.69
TOTAL	**37.36**	**75.36**	**94.25**	**2.89**	**21.81**	**6.36**

Table 5d Estimated Construction Emissions, CSF2						
Emission Source	**ROG**	**NOx**	**CO**	**SOx**	**PM_{10}**	**$PM_{2.5}$**
Total Construction Emissions, lbs/day						
Heavy Construction Equipment	345.49	732.21	**442.42**	28.26	25.83	22.99
On-Road Vehicles	63.18	304.85	**539.30**	0.96	13.85	13.71
Fugitive Dust	-	-	-	-	29.68	7.41
TOTAL	**408.66**	**1037.07**	**981.71**	**29.23**	**69.35**	**44.10**
Significance Thresholds	75	100	550	150	150	150
Above Significance Thresholds?	*Yes*	*Yes*	*Yes*	*No*	*No*	*No*
Total Construction Emissions, tons/year						
Heavy Construction Equipment	31.09	65.90	39.82	2.54	2.32	2.07
On-Road Vehicles	5.20	8.76	51.88	0.06	0.58	0.58
Fugitive Dust	-	-	-	-	18.87	3.69
TOTAL	**36.30**	**74.65**	**91.70**	**2.61**	**21.78**	**6.33**

As shown in Tables 5a through 5d, emissions of ROG, NOx, and CO would be above the ICAPCD's operational significance thresholds for all projects. As discussed in Section 3.0, the significance thresholds are mainly applicable to operational impacts rather than construction impacts, and are presented in this analysis for information purposes.

As discussed above, it was assumed that both the MSSF1 and the transmission line could be constructed in 2012. Table 6 presents a summary of the maximum emissions, assuming these two projects would be constructed simultaneously.

Table 6 Maximum Simultaneous Construction Emissions						
Emission Source	**ROG**	**NOx**	**CO**	**SOx**	**PM_{10}**	**$PM_{2.5}$**
Total Construction Emissions, lbs/day						
MSSF1	436.31	1110.70	1038.18	35.84	42.23[1]	39.22[1]
Transmission Line	179.46	697.43	777.86	21.40	80.26	46.35
TOTAL	**615.77**	**1808.13**	**1816.04**	**57.24**	**122.49**	**85.57**
Significance Thresholds	75	100	550	150	150	150
Above Significance Thresholds?	*Yes*	*Yes*	*Yes*	*No*	*No*	*No*
Total Construction Emissions, tons/year						
MSSF1	38.57	76.14	96.89	3.20	21.84	6.39
Transmission Line	16.16	42.68	73.35	2.12	15.71	6.00
TOTAL	**54.73**	**118.82**	**170.24**	**5.32**	**37.55**	**12.39**

[1]Assume heavy equipment use only; maximum fugitive dust emissions from dust-generating activities for transmission line.

As shown in Table 6, emissions of ROG, NOx, and CO would be above the ICAPCD's operational significance thresholds for 2012, assuming the MSSF1 and the transmission line are constructed in the same year. As discussed in Section 3.0, the significance thresholds are mainly applicable to operational impacts rather than construction impacts, and are presented in this analysis for information purposes.

As discussed in the ICAPCD CEQA Handbook, all construction projects within Imperial County must comply with the requirements of ICAPCD Regulation VIII for the control of fugitive dust. In addition, the Handbook lists additional mitigation measures that may be warranted as feasible to control emissions of fugitive dust and combustion exhaust. The requirements are as follows:

REGULATION VIII - FUGITIVE DUST CONTROL MEASURES (Most recently adopted) – All construction sites, regardless of size, must comply with the requirements contained within Regulation VIII. Although compliance with Regulation VIII does not constitute mitigation under the reductions attributed to environmental impacts its main purpose is to reduce the amount of PM_{10} entrained into the atmosphere as a result of anthropogenic (man-made) fugitive dust sources. Therefore, under all preliminary modeling a presumption is made that all projects are in compliance with Regulation VIII.

Standard Mitigation Measures for Fugitive PM_{10} Control

a. All disturbed areas, including Bulk Material storage which is not being actively utilized, shall be effectively stabilized and visible emissions shall be limited to no greater than 20% opacity for dust emissions by using water, chemical stabilizers, dust suppressants, tarps or other suitable material such as vegetative ground cover.
b. All on site and off site unpaved roads will be effectively stabilized and visible emissions shall be limited to no greater than 20% opacity for dust emissions by paving, chemical stabilizers, dust suppressants and/or watering.
c. All unpaved traffic areas one (1) acre or more with 75 or more average vehicle trips per day will be effectively stabilized and visible emission shall be limited to no greater than 20% opacity for dust emissions by paving, chemical stabilizers, dust suppressants and/or watering.

d. The transport of Bulk Materials shall be completely covered unless six inches of freeboard space from the top of the container is maintained with no spillage and loss of Bulk Material. In addition, the cargo compartment of all Haul Trucks is to be cleaned and/or washed at delivery site after removal of Bulk Material.
e. All Track-Out or Carry-Out will be cleaned at the end of each workday or immediately when mud or dirt extends a cumulative distance of 50 linear feet or more onto a paved road within an Urban area.
f. Movement of Bulk Material handling or transfer shall be stabilized prior to handling or at points of transfer with application of sufficient water, chemical stabilizers or by sheltering or enclosing the operation and transfer line.
g. The construction of any new Unpaved Road is prohibited within any area with a population of 500 or more unless the road meets the definition of a Temporary Unpaved Road. Any temporary unpaved road shall be effectively stabilized and visible emissions shall be limited to no greater than 20% opacity for dust emission by paving, chemical stabilizers, dust suppressants and/or watering.

In order to provide a greater degree of PM_{10} reductions, above that required by Regulation VIII, the ICAPCD recommends the following:

Discretionary Mitigation Measures for Fugitive PM_{10} Control

a. Water exposed soil with adequate frequency for continued moist soil.
b. Replace ground cover in disturbed areas as quickly as possible
c. Automatic sprinkler system installed on all soil piles
d. Vehicle speed for all construction vehicles shall not exceed 15 mph on any unpaved surface at the construction site.
e. Develop a trip reduction plan to achieve a 1.5 AVR for construction employees
f. Implement a shuttle service to and from retail services and food establishments during lunch hours

Standard Mitigation Measures for Construction Combustion Equipment

a. Use of alternative fueled or catalyst equipped diesel construction equipment, including all off-road and portable diesel powered equipment.
b. Minimize idling time either by shutting equipment off when not in use or reducing the time of idling to 5 minutes as a maximum.
c. Limit, to the extent feasible, the hours of operation of heavy duty equipment and/or the amount of equipment in use
d. Replace fossil fueled equipment with electrically driven equivalents (provided they are not run via a portable generator set)

To help provide a greater degree of reduction of PM emissions from construction combustion equipment the ICAPCD recommends the following enhanced measures.

Enhanced Mitigation Measures for Construction Equipment

a. Curtail construction during periods of high ambient pollutant concentrations; this may include ceasing of construction activity during the peak hour of vehicular traffic on adjacent roadways
b. Implement activity management (e.g. rescheduling activities to reduce short-term impacts)

Implementation of the above-listed fugitive dust control measures was assumed to control PM_{10} emissions by 85%.

Furthermore, under the requirements for industrial projects as discussed in the ICAPCD's CEQA Guidelines, projects with emissions exceeding the threshold must provide off-site mitigation under guidance policy #5, which provides an evaluation of off-site mitigation from mobile source emissions generated from the source. This project would be required to pay fees in accordance with guidance policy #5. These fees are similar to fees required under ICAPCD Rule 310. The requirement addresses emissions of PM_{10} and NOx, as these pollutants are nonattainment pollutants within the Imperial County Air Basin.

With implementation of fugitive dust control measures, emissions of PM_{10} are below the

ICAPCD's significance threshold during all construction phases. Emissions of NOx would exceed the ICAPCD's significance threshold for construction of the MSSF1, simultaneous construction of the MSSF1 and the transmission line, construction of the CSF1, and construction of the CSF2. The exceedance is anticipated to occur for 180 days for construction of each of the solar farms.

This analysis provides a preliminary evaluation of emissions associated with construction of the MSSF1, substation and transmission line, CSF1, and CSF2. For all projects that cannot mitigate to less than the regional significance levels, they are required to abide by Section 7.4 of the ICAPCD Guidelines regarding off-site mitigation. Off-site mitigation measures are designed to offset emissions from residential and commercial projects that cannot be fully mitigated with on-site measures. All project proponents have the option of either providing off-site mitigation or paying an in-lieu mitigation fee as described ICAPCD Policy Number 5 (ICAPCD 2009d). The applicable fee in Policy Number 5 is derived from utilizing the last three year Carl Moyer grant program average cost effectiveness for Imperial County multiplied by the amount of tons needed to be offset. The proposed Project will be required to implement the following mitigation:

MM-1 The operator shall pay to the ICAPCD prior to beginning operation a fee to be determined based on the formula provided in ICAPCD Policy Number 5.

The impacts would therefore be fully mitigated to below a level of significance. Detailed emission calculations will be provided to the ICAPCD upon selection of the construction contractor, such that an accurate estimate of fees to be paid can be made prior to commencement of construction.

Operational Emissions

Operational emissions would include inspection and maintenance activities. The project would be staffed with up to 30 full time employees to maintain the project facilities seven days a week during normal daylight hours. Typically, up to 15 staff would work during the day shift (sunrise to sunset), and the remainder during the night shifts and weekend. To ensure optimal PV output,

the solar panels would be maintained 24-hours a day/seven days a week. Each of the individual site components would be staffed by up to 4 employees during the day. Equipment and supply deliveries would typically occur during the week and, on average, could entail up to 2 daily truck trips.

According to the traffic analyses that were prepared for the projects, it is anticipated that each project would generate operational trips as follows:

- MSSF1 would generate a maximum of 40 ADT
- CSF1(A) and CSF1(B) would generate a maximum of 80 ADT
- CSF2(A) and CSF2(B) would generate a maximum of 80 ADT

The total operational daily trip generation rate is therefore estimated at 200 ADT.

Emissions would include travel on unpaved roads for solar panel washing and maintenance, as well as commuting emissions from workers. Emissions were calculated in the same manner as for construction emissions for vehicles and fugitive dust. Estimated operational emissions are presented in Table 7.

Table 7
Operational Emissions

Emission Source	ROG	NOx	CO	SOx	PM_{10}	$PM_{2.5}$
Total Construction Emissions, lbs/day						
Vehicles	12.97	19.40	137.85	0.14	1.31	1.30
Fugitive Dust	-	-	-	-	4.93	1.56
TOTAL	**12.97**	**19.40**	**137.85**	**0.14**	**6.25**	**2.86**
Significance Thresholds	55	55	550	150	150	150
Above Significance Thresholds?	*No*	*No*	*No*	*No*	*No*	*No*
Total Construction Emissions, tons/year						
Vehicles	1.34	1.60	14.31	0.02	0.13	0.13
Fugitive Dust	-	-	-	-	0.68	0.21
TOTAL	**1.34**	**1.60**	**14.31**	**0.02**	**0.81**	**0.34**

As shown in Table 7, operational emissions would be below the ICAPCD's significance thresholds. Impacts to air quality during operations would be less than significant.

4.3 Toxic Air Contaminant Emissions

Construction activities would result in emissions of diesel particulate matter from heavy construction equipment used on site and truck traffic to and from the site, as well as minor amounts of TAC emissions from motor vehicles (such as benzene, 1,3-butadiene, toluene, and xylenes). Health effects attributable to exposure to diesel particulate matter are long-term effects based on chronic (i.e., long-term) exposure to emissions. Health effects are generally evaluated based on a lifetime (70 years) of exposure. Due to the short-term nature of construction at the site, no adverse health effects would be anticipated from short-term diesel particulate emissions. Motor vehicle emissions would not be concentrated in any one area but would be dispersed along travel routes and would not be anticipated to pose a significant health risk to receptors.

4.4 Odors

Project construction could result in minor amounts of odor compounds associated with diesel heavy equipment exhaust; however, because the construction equipment would be operating at various locations throughout the construction site, and because any operations near existing receptors would be temporary, impacts associated with odors during construction are not considered significant. Solar facilities are not generally considered to be a source of odors.

5.0 Global Climate Change

Global Climate Change (GCC) refers to changes in average climatic conditions on Earth as a whole, including temperature, wind patterns, precipitation and storms. Global temperatures are moderated by naturally occurring atmospheric gases, including water vapor, carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O), which are known as greenhouse gases (GHGs). These gases allow solar radiation (sunlight) into the Earth's atmosphere, but prevent radiative heat from escaping, thus warming the Earth's atmosphere. Gases that trap heat in the atmosphere are often called greenhouse gases, analogous to a greenhouse. GHGs are emitted by both natural processes and human activities. The accumulation of GHGs in the atmosphere regulates the

Earth's temperature. Emissions from human activities, such as burning fossil fuels for electricity production and vehicle use, have elevated the concentration of these gases in the atmosphere.

The State of California has been at the forefront of developing solutions to address GCC. GCC refers to any significant change in measures of climate, such as average temperature, precipitation, or wind patterns over a period of time. GCC may result from natural factors, natural processes, and/or human activities that change the composition of the atmosphere and alter the surface and features of land.

The United Nations Intergovernmental Panel on Climate Change (IPCC) constructed several emission trajectories of GHGs needed to stabilize global temperatures and climate change impacts. The IPCC concluded that a stabilization of GHGs at 400 to 450 ppm CO_2 equivalent concentration is required to keep global mean warming below 3.6º Fahrenheit (2º Celsius), which is assumed to be necessary to avoid dangerous climate change (Association of Environmental Professionals 2007).

State law defines greenhouse gases as any of the following compounds: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulfur hexafluoride (SF_6) (California Health and Safety Code Section 38505(g).) CO_2, followed by CH_4 and N_2O, are the most common GHGs that result from human activity.

The State of California GHG Inventory performed by the California Air Resources Board (ARB), compiled statewide anthropogenic GHG emissions and sinks. It includes estimates for CO_2, CH_4, N_2O, SF_6, HFCs, and PFCs. The current inventory covers the years 1990 to 2008, and is summarized in Table 8. Data sources used to calculate this GHG inventory include California and federal agencies, international organizations, and industry associations. The calculation methodologies are consistent with guidance from the IPCC. The 1990 emissions level is the sum total of sources and sinks from all sectors and categories in the inventory. The inventory is divided into seven broad sectors and categories in the inventory. These sectors include: Agriculture; Commercial; Electricity Generation; Forestry; Industrial; Residential; and Transportation.

Table 8 State of California GHG Emissions by Sector				
Sector	**Total 1990 Emissions ($MMTCO_2e$)**	**Percent of Total 1990 Emissions**	**Total 2008 Emissions ($MMTCO_2e$)**	**Percent of Total 2008 Emissions**
Agriculture	23.4	5%	28.06	6%
Commercial	14.4	3%	14.68	3%
Electricity Generation	110.6	26%	116.35	25%
Forestry (excluding sinks)	0.2	<1%	0.19	<1%
Industrial	103.0	24%	92.66	20%
Residential	29.7	7%	28.45	6%
Transportation	150.7	35%	174.99	37%
Recycling and Waste			6.71	1%
High GWP Gases			15.65	3%
Forestry Sinks	(6.7)		(3.98)	

When accounting for GHGs, all types of GHG emissions are expressed in terms of CO_2 equivalents (CO_2e) and are typically quantified in metric tons (MT) or millions of metric tons (MMT).

GHGs have varying global warming potential (GWP). The GWP is the potential of a gas or aerosol to trap heat in the atmosphere; it is the "cumulative radiative forcing effect of a gas over a specified time horizon resulting from the emission of a unit mass of gas relative to a reference gas" (USEPA 2006). The reference gas for GWP is CO_2; therefore, CO_2 has a GWP of 1. The other main greenhouse gases that have been attributed to human activity include CH_4, which has a GWP of 21, and N_2O, which has a GWP of 310. Table 9 presents the GWP and atmospheric lifetimes of common GHGs.

Table 9 Global Warming Potentials and Atmospheric Lifetimes of GHGs			
GHG	**Formula**	**100-Year Global Warming Potential**	**Atmospheric Lifetime (Years)**
Carbon Dioxide	CO_2	1	Variable
Methane	CH_4	21	12 ± 3
Nitrous Oxide	N_2O	310	120
Sulfur Hexafluoride	SF_6	23,900	3,200

Human-caused sources of CO_2 include combustion of fossil fuels (coal, oil, natural gas, gasoline and wood). Data from ice cores indicate that CO_2 concentrations remained steady prior to the current period for approximately 10,000 years. Concentrations of CO_2 have increased in the atmosphere since the industrial revolution.

CH_4 is the main component of natural gas and also arises naturally from anaerobic decay of organic matter. Human-caused sources of natural gas include landfills, fermentation of manure and cattle farming. Human-caused sources of N_2O include combustion of fossil fuels and industrial processes such as nylon production and production of nitric acid.

Other GHGs are present in trace amounts in the atmosphere and are generated from various industrial or other uses.

5.1 Potential Climate Change Impacts to Project

The Climate Scenarios Report (CCCC 2006), uses a range of emissions scenarios developed by the IPCC to project a series of potential warming ranges (i.e., temperature increases) that may occur in California during the 21st century. Three warming ranges were identified: Lower warming range (3.0 to 5.5 degrees Fahrenheit (ºF)); medium warming range (5.5 to 8.0 ºF); and higher warming range (8.0 to 10.5 ºF). The Climate Scenarios report then presents an analysis of the future projected climate changes in California under each warming range scenario.

According to the report, substantial temperature increases would result in a variety of impacts to the people, economy, and environment of California. These impacts would result from a projected increase in extreme conditions, with the severity of the impacts depending upon actual future emissions of GHGs and associated warming. These impacts are described below.

Public Health. Higher temperatures are expected to increase the frequency, duration, and intensity of conditions conducive to air pollution formation. For example, days with weather conducive to O_3 formation are projected to increase by 25 to 35 percent under the lower warming range and 75 to 85 percent under the medium warming range. In addition, if global background O_3 levels increase as is predicted in some scenarios, it may become impossible to meet local air quality standards. An increase in wildfires could also occur, and the corresponding increase in the release of pollutants including $PM_{2.5}$ could further compromise air quality. The Climate Scenarios report indicates that large wildfires could become up to 55 percent more frequent of GHG emissions are not significantly reduced.

Potential health effects from global climate change may arise from temperature increases, climate-sensitive diseases, extreme events, and air quality. There may be direct temperature effects through increases in average temperature leading to more extreme heat waves and less extreme cold spells. Those living in warmer climates are likely to experience more stress and heat-related problems (e.g., heat rash and heat stroke). In addition, climate sensitive diseases (such as malaria, dengue fever, yellow fever, and encephalitis) may increase, such as those spread by mosquitoes and other disease-carrying insects.

Climate change could affect the project area in that it is located in the desert area of California, where warmer climates may lead to more of the problems identified above related to heat, should increases in average temperature in the project area occur.

Water Resources. A vast network of reservoirs and aqueducts capture and transport water throughout the State from northern California rivers and the Colorado River. The current distribution system relies on Sierra Nevada mountain snowpack to supply water during the dry spring and summer months. Rising temperatures, potentially compounded by decreases in

precipitation, could severely reduce spring snowpack, increasing the risk of summer water shortages. In addition, if temperatures continue to rise more precipitation would fall as rain instead of snow, further reducing the Sierra Nevada spring snowpack by as much as 70 to 90 percent. The State's water resources are also at risk from rising sea levels. An influx of seawater would degrade California's estuaries, wetlands, and groundwater aquifers.

This global climate change impact is not likely to have a direct effect on the operation of the projects.

Agriculture. Increased GHG and associated increases in temperature are expected to cause widespread changes to the agricultural industry, reducing the quantity and quality of agricultural products statewide. Significant reductions in available water supply to support agriculture would also impact production. Crop growth and development will change as will the intensity and frequency of pests and diseases. This effect of global climate change would not be anticipated to affect the project site directly because there are no agricultural uses present.

Ecosystems/Habitats. Continued global warming will likely shift the ranges of existing invasive plants and weeds, thus alternating competition patterns with native plants. Range expansion is expected in many species while range contractions are less likely in rapidly evolving species with significant populations already established. Continued global warming is also likely to increase the populations of and types of pests. Continued global warming would also affect natural ecosystems and biological habitats throughout the State. This effect of global climate change could affect current ecosystems/habitats at the project site.

Wildland Fires. Global warming is expected to increase the risk of wildfire and alter the distribution and character of natural vegetation. If temperatures rise into the medium warming range, the risk of large wildfires in California could increase by as much as 55 percent, which is almost twice the increase expected if temperatures stay in the lower warming range. However, since wildfire risk is determined by a combination of factors including precipitation, winds, temperature, and landscape and vegetation conditions, future risks will not be uniform throughout the State. Should global climate change in the southern California region lead to

increased risk of wildfires, this impact could directly affect the project site in that the potential for wildfire at the project location would increase.

Rising Sea Levels. Rising sea levels, more intense coastal storms, and warmer water temperatures will increasing threaten the State's coastal regions. Under the high warming scenario, sea level is anticipated to rise 22 to 35 inches by 2100. A sea level risk of this magnitude would inundate coastal areas with salt water, accelerate coastal erosion, threaten levees and inland water systems, and disrupt wetlands and natural habitats. Because the project site is located in the high desert area at approximately 2,900 feet above sea level, it is not anticipated that rising sea levels would have a direct affect on the project.

5.2 Impacts

The effects of project-specific GHG emissions are cumulative, and therefore GCC impacts are addressed as a cumulative, rather than a direct, impact. The guidance for determining significance of impacts has been developed from the requirements of AB 32. The guideline addresses the potential cumulative impacts that a project's GHG emissions could have on GCC. Based on Appendix G of the CEQA Guidelines, the following criteria are used to evaluate whether a project would result in a significant impact for GCC impacts:

Would the project:

- Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?
- Conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases?

As discussed in Section 15064.4 of the CEQA Regulations, the determination of the significance of greenhouse gas emissions calls for a careful judgment by the lead agency consistent with the provisions in section 15064. A lead agency should make a good-faith effort, based to the extent possible on scientific and factual data, to describe, calculate or estimate the amount of

greenhouse gas emissions resulting from a project. A lead agency shall have discretion to determine, in the context of a particular project, whether to:

(1) Use a model or methodology to quantify greenhouse gas emissions resulting from a project, and which model or methodology to use. The lead agency has discretion to select the model or methodology it considers most appropriate provided it supports its decision with substantial evidence. The lead agency should explain the limitations of the particular model or methodology selected for use; and/or

(2) Rely on a qualitative analysis or performance based standards.

A lead agency should consider the following factors, among others, when assessing the significance of impacts from greenhouse gas emissions on the environment:

(1) The extent to which the project may increase or reduce greenhouse gas emissions as compared to the existing environmental setting;

(2) Whether the project emissions exceed a threshold of significance that the lead agency determines applies to the project.

(3) The extent to which the project complies with regulations or requirements adopted to implement a statewide, regional, or local plan for the reduction or mitigation of greenhouse gas emissions. Such requirements must be adopted by the relevant public agency through a public review process and must reduce or mitigate the project's incremental contribution of greenhouse gas emissions. If there is substantial evidence that the possible effects of a particular project are still cumulatively considerable notwithstanding compliance with the adopted regulations or requirements, an EIR must be prepared for the project.

Different agencies and studies estimate different goals for reduction of emissions to achieve 1990 levels by the year 2020, as set forth in AB 32. Some agencies have estimated a reduction of 28 percent to 29 percent, based on the ARB's analysis that statewide 2020 business as usual GHG emissions would be 596 $MMTCO_2e$, with 1990 emissions of 427 $MMTCO_2e$, for a reduction of 28.35% (ARB 2010).

Projects that meet the criteria for conducting a climate change analysis are required to conduct a GHG inventory and disclose GHG emissions associated with project implementation and operation under "business as usual" conditions. "Business as usual" is defined as the emissions that would have occurred in the absence of reductions mandated under AB 32.

The main source of greenhouse gas emissions associated with the projects would be combustion of fossil fuels during construction of the project. Emissions of GHG were calculated using the same approach as emissions for overall construction emissions discussed in Section 4.1. Estimated emissions of construction greenhouse gases are summarized in Table 10. Emission calculations are provided in Appendix A.

Table 10
Construction Greenhouse Gas Emissions

Emissions, metric tons/year	**CO_2**
MSSF1	16,597
CSF1(A) and CSF1(B)	16,618
CSF2(A) and CSF2(B)	16,588
Transmission Line	11,788
Total	**61,591**

Emissions associated with construction would be temporary, likely to occur in only one three-year period. Emissions associated with operations are estimated to be 1,305 metric tons per year of CO_2e.

Because the Project would generate additional solar power, it would serve meet the state of California's goals for the Renewable Portfolio Standard, which has been identified by the state as a means of meeting the goals of AB 32 to reduce emissions to 1990 levels by the year 2020. The project is therefore consistent with the goals of AB 32, and would not result in a significant impact to global climate change.

6.0 Cumulative Impacts

In analyzing cumulative impacts from a proposed project, the analysis must specifically evaluate a project's contribution to the cumulative increase in pollutants for which the project area is listed as "non-attainment" for the federal or state AAQS. In the event direct impacts from a project are less than significant, a project may still have a cumulatively considerable impact on air quality if the emissions from the project, in combination with the emissions from other proposed, or reasonably foreseeable future projects are in excess of screening levels identified above, and the project's contribution accounts for more than an insignificant proportion of the cumulative total emissions.

As discussed in Section 2.0, Imperial County is considered a moderate nonattainment area for the 8-hour O_3 NAAQS and a nonattainment area for the NAAQS for $PM_{2.5}$. The area is also designated as a serious nonattainment area for the NAAQS for PM_{10}. Imperial County is considered a nonattainment area for the CAAQS for O_3, $PM_{2.5}$, and PM_{10}.

The project's emissions of O_3 precursors and particulate matter are mainly attributable to temporary construction activities. These activities would cease after approximately three years. The project will be required to implement the following mitigation measure:

MM-1 The operator shall pay to the ICAPCD prior to beginning operation a fee to be determined based on the formula provided in ICAPCD Policy Number 5.

Because the project would fully offset its emissions of nonattainment pollutants through guidance policy #5, in accordance with the ICAPCD CEQA Guidelines, impacts would be mitigated to less than significant. Also, because the project would provide renewable energy to the state, the project would serve the goal of reducing emissions within the region.

7.0 Conclusions and Recommendations

In summary, the proposed project would result in emissions of air pollutants for both the construction phase and operational phase of the project. The air quality impact analysis

evaluated the potential for adverse impacts to the ambient air quality due to construction and operational emissions. Construction emissions would include emissions associated with fugitive dust, heavy construction equipment and construction workers commuting to and from the site. The emissions associated with construction would be above the ICAPCD's significance thresholds under CEQA; therefore, emissions would be offset as required under guidance policy #5. In accordance with the requirements of the ICAPCD CEQA Handbook, mitigation measures to control emissions of fugitive dust and equipment exhaust will be employed to reduce impacts to the extent feasible. Impacts would be mitigated to below a level of significance.

Project operational emissions would be minor and would only be associated with inspection and maintenance activities. These activities would involve on-road vehicle travel from employee vehicles and deliveries, and emissions associated with inspection and maintenance operations, including washing of the solar panels. Operational emissions would be less than significant.

The project would provide renewable energy to the state of California and would therefore serve the purpose of assisting the state in meetings its goals for renewable energy as set forth in AB 32. The project would therefore not conflict with the goals of AB 32 in reducing emissions of GHG, and would result in a less than significant impact on global climate.

8.0 References

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Appendix A

Emission Calculations

Table A-1. Air Emissions Calculations Summary, MSSF1

Construction Phase Emissions, MSSF1

Offroad Tiers 2 emission factors (EFs) are applied to NOx, PM, and CO. Load factors (LFs) are used in conjunction with Tiers 2 EFs.
2012 SCAB EFs (OFFROAD2007 model) are applied to CO2, ROG, SOX. LFs already incorporated in OFFROAD model.
Onroad model (EMFAC) assumes 1990-2012 composite fleet across light, medium, and heavy duty vehicle classes.
Helicopter emissions are calculated using EDMS 5.1 and CCAR reccomended emission factors.
Onroad/offroad equipment mix and schedules, including helicopter classes and usage,as provided by construction contractor (Sargent & Lundy LLC).

Maximum Daily Emissions of Proposed Project		NOX lbs/day	ROG lbs/day	PM10 lbs/day	PM2.5 lbs/day	CO lbs/day	SOX lbs/day	CO2 lbs/day
Imperial County	Offroad Vehicles and Equipment	732.21	367.15	25.83	22.99	442.42	34.77	134042.03
	Onroad Vehicles	378.48	69.16	16.40	16.23	595.76	1.07	101819.40
	Fugitive Dust	---	---	29.68	7.41	---	---	---
	Total for Imperial County *	**1110.70**	**436.31**	**71.91**	**46.63**	**1038.18**	**35.84**	**235861.43**

Overall Emissions of MSSF1	NOX (ton)	ROG (ton)	PM10 (ton)	PM2.5 (ton)	CO (ton)	SOX (ton)	CO2 (ton)
Offroad Vehicles and Equipment	65.90	33.04	2.32	2.07	39.82	3.13	12,063.8
Onroad Vehicles	10.24	5.52	0.64	0.64	57.07	0.07	6,231.2
Fugitive Dust			18.87	3.69			
Total Emissions for Project Duration	**76.14**	**38.57**	**21.84**	**6.39**	**96.89**	**3.20**	**18,295.0**

Table A-2. 2012 SCAB Fleet Average Emission Factors (OFFROAD2007)

These emission factors are applied to CO2, ROG, SOX only. Load factors are already incorporated.

Equipment	MaxHP	NOX (lbs/hr)	ROG (lbs/hr)	PM (lbs/hr)	CO (lbs/hr)	SOX (lbs/hr)	CO2 (lbs/hr)
Aerial Lifts	15	0.0102	0.0528	0.0642	0.0001	0.0030	8.7
	25	0.0175	0.0517	0.0957	0.0001	0.0055	11.0
	50	0.0650	0.1822	0.1916	0.0003	0.0169	19.6
	120	0.0607	0.2451	0.4012	0.0004	0.0324	38.1
	500	0.1276	0.4941	1.6553	0.0021	0.0491	213
	750	0.2379	0.8930	3.0795	0.0039	0.0903	385
Aerial Lifts Composite		0.0576	0.1976	0.3249	0.0004	0.0219	34.7
Air Compressors	15	0.0129	0.0494	0.0768	0.0001	0.0052	7.2
	25	0.0286	0.0779	0.1337	0.0002	0.0087	14.4
	50	0.1010	0.2646	0.2310	0.0003	0.0239	22.3
	120	0.0891	0.3287	0.5333	0.0006	0.0492	47.0
	175	0.1135	0.5074	0.8954	0.0010	0.0512	88.5
	250	0.1066	0.3052	1.2194	0.0015	0.0379	131
	500	0.1709	0.5726	1.9077	0.0023	0.0623	232
	750	0.2681	0.8849	3.0371	0.0036	0.0980	358
	1000	0.4533	1.5617	5.4098	0.0049	0.1589	486
Air Compressors Composite		0.0984	0.3445	0.6494	0.0007	0.0469	63.6
Bore/Drill Rigs	15	0.0120	0.0632	0.0754	0.0002	0.0029	10.3
	25	0.0194	0.0658	0.1233	0.0002	0.0054	16.0
	50	0.0351	0.2335	0.2768	0.0004	0.0149	31.0
	120	0.0514	0.4724	0.5026	0.0009	0.0328	77.1
	175	0.0750	0.7538	0.7479	0.0016	0.0366	141
	250	0.0838	0.3435	0.8722	0.0021	0.0268	188
	500	0.1354	0.5526	1.3152	0.0031	0.0437	311
	750	0.2685	1.0916	2.6320	0.0062	0.0865	615
	1000	0.4491	1.6773	6.6123	0.0093	0.1699	928
Bore/Drill Rigs Composite		0.0854	0.5068	0.9013	0.0017	0.0367	165
Cement and Mortar Mixers	15	0.0075	0.0386	0.0475	0.0001	0.0023	6.3
	25	0.0293	0.0852	0.1548	0.0002	0.0091	17.6
Cement and Mortar Mixers Composite		0.0093	0.0425	0.0564	0.0001	0.0029	7.2
Concrete/Industrial Saws	25	0.0199	0.0678	0.1261	0.0002	0.0050	16.5
	50	0.1047	0.3015	0.2972	0.0004	0.0268	30.2
	120	0.1155	0.4880	0.7625	0.0009	0.0639	74.1
	175	0.1685	0.8723	1.4507	0.0018	0.0767	160
Concrete/Industrial Saws Composite		0.1090	0.4148	0.5910	0.0007	0.0491	58.5
Cranes	50	0.1101	0.2979	0.2478	0.0003	0.0258	23.2
	120	0.0982	0.3650	0.5844	0.0006	0.0533	50.1
	175	0.1089	0.4838	0.8259	0.0009	0.0479	80.3
	250	0.1103	0.3103	1.0712	0.0013	0.0388	112
	500	0.1635	0.5691	1.5327	0.0018	0.0571	180
	750	0.2767	0.9554	2.6486	0.0030	0.0974	303
	9999	0.9905	3.5715	10.9484	0.0098	0.3384	971
Cranes Composite		0.1425	0.4946	1.2753	0.0014	0.0553	129
Crawler Tractors	50	0.1262	0.3333	0.2713	0.0003	0.0289	24.9
	120	0.1374	0.4906	0.8120	0.0008	0.0729	65.8
	175	0.1758	0.7491	1.3245	0.0014	0.0765	121
	250	0.1854	0.5225	1.7044	0.0019	0.0667	166
	500	0.2659	1.0217	2.3914	0.0025	0.0942	259
	750	0.4784	1.8248	4.3817	0.0047	0.1705	465
	1000	0.7229	2.8959	7.7626	0.0066	0.2503	658
Crawler Tractors Composite		0.1671	0.6051	1.2309	0.0013	0.0752	114
Crushing/Proc. Equipment	50	0.1927	0.5215	0.4545	0.0006	0.0462	44.0
	120	0.1525	0.5829	0.9172	0.0010	0.0851	83.1
	175	0.2088	0.9654	1.6343	0.0019	0.0946	167
	250	0.1953	0.5592	2.1896	0.0028	0.0682	245
	500	0.2733	0.8961	2.9457	0.0037	0.0972	374
	750	0.4361	1.3892	4.8387	0.0059	0.1560	589
	9999	1.2112	4.0327	14.2648	0.0131	0.4203	1,308
Crushing/Proc. Equipment Composite		0.1872	0.6911	1.2633	0.0015	0.0819	132
Dumpers/Tenders	25	0.0100	0.0324	0.0614	0.0001	0.0031	7.6
Dumpers/Tenders Composite		0.0100	0.0324	0.0614	0.0001	0.0031	7.6
Excavators	25	0.0198	0.0677	0.1253	0.0002	0.0048	16.4
	50	0.0912	0.2933	0.2568	0.0003	0.0237	25.0
	120	0.1183	0.5220	0.7300	0.0009	0.0657	73.6
	175	0.1288	0.6678	0.9613	0.0013	0.0569	112
	250	0.1301	0.3630	1.2438	0.0018	0.0415	159
	500	0.1805	0.5493	1.6112	0.0023	0.0574	234
	750	0.3013	0.9096	2.7605	0.0039	0.0969	387
Excavators Composite		0.1300	0.5401	0.9817	0.0013	0.0536	120

Table A-2. 2012 SCAB Fleet Average Emission Factors (OFFROAD2007)

These emission factors are applied to CO2, ROG, SOX only. Load factors are already incorporated.

Equipment	MaxHP	NOX (lbs/hr)	ROG (lbs/hr)	PM (lbs/hr)	CO (lbs/hr)	SOX (lbs/hr)	CO2 (lbs/hr)
Forklifts	50	0.0514	0.1682	0.1488	0.0002	0.0136	14.7
	120	0.0489	0.2195	0.3017	0.0004	0.0277	31.2
	175	0.0624	0.3304	0.4664	0.0006	0.0278	56.1
	250	0.0595	0.1638	0.5872	0.0009	0.0187	77.1
	500	0.0806	0.2241	0.7257	0.0011	0.0252	111
Forklifts Composite		0.0585	0.2257	0.4330	0.0006	0.0231	54.4
Generator Sets	15	0.0157	0.0698	0.1063	0.0002	0.0061	10.2
	25	0.0276	0.0951	0.1632	0.0002	0.0096	17.6
	50	0.0959	0.2734	0.2966	0.0004	0.0255	30.6
	120	0.1206	0.4956	0.8099	0.0009	0.0640	77.9
	175	0.1460	0.7413	1.3131	0.0016	0.0644	142
	250	0.1372	0.4502	1.8047	0.0024	0.0508	213
	500	0.1952	0.7617	2.5896	0.0033	0.0756	337
	750	0.3257	1.2296	4.3019	0.0055	0.1241	544
	9999	0.8673	3.0642	10.8871	0.0105	0.3104	1,049
Generator Sets Composite		0.0832	0.3121	0.5779	0.0007	0.0351	61.0
Graders	50	0.1182	0.3365	0.2882	0.0004	0.0286	27.5
	120	0.1348	0.5355	0.8223	0.0009	0.0740	75.0
	175	0.1554	0.7363	1.1931	0.0014	0.0688	124
	250	0.1575	0.4508	1.5344	0.0019	0.0547	172
	500	0.1947	0.6639	1.8193	0.0023	0.0671	229
	750	0.4147	1.4022	3.9602	0.0049	0.1439	486
Graders Composite		0.1533	0.6129	1.2503	0.0015	0.0649	133
Off-Highway Tractors	120	0.2224	0.7269	1.2964	0.0011	0.1143	93.7
	175	0.2135	0.8404	1.6085	0.0015	0.0923	130
	250	0.1718	0.4896	1.5282	0.0015	0.0644	130
	750	0.6814	3.0883	6.1417	0.0057	0.2515	568
	1000	1.0246	4.8137	10.5080	0.0082	0.3620	814
Off-Highway Tractors Composite		0.2170	0.7878	1.7969	0.0017	0.0871	151
Off-Highway Trucks	175	0.1533	0.7593	1.1072	0.0014	0.0666	125
	250	0.1469	0.3944	1.3513	0.0019	0.0461	167
	500	0.2263	0.6661	1.9463	0.0027	0.0705	272
	750	0.3695	1.0792	3.2612	0.0044	0.1164	442
	1000	0.5790	1.7854	6.4025	0.0063	0.1933	625
Off-Highway Trucks Composite		0.2241	0.6635	2.0158	0.0027	0.0715	260
Other Construction Equipmen	15	0.0118	0.0617	0.0737	0.0002	0.0028	10.1
	25	0.0160	0.0544	0.1019	0.0002	0.0044	13.2
	50	0.0842	0.2740	0.2707	0.0004	0.0228	28.0
	120	0.1104	0.5320	0.7540	0.0009	0.0633	80.9
	175	0.1008	0.5880	0.8599	0.0012	0.0467	107
	500	0.1517	0.5426	1.6573	0.0025	0.0545	254
Other Construction Equipment Composite		0.0925	0.3847	0.8599	0.0013	0.0366	123
Other General Industrial Equip	15	0.0066	0.0391	0.0466	0.0001	0.0018	6.4
	25	0.0185	0.0632	0.1170	0.0002	0.0045	15.3
	50	0.1085	0.2856	0.2332	0.0003	0.0253	21.7
	120	0.1274	0.4542	0.7277	0.0007	0.0703	62.0
	175	0.1349	0.5757	1.0001	0.0011	0.0599	95.9
	250	0.1235	0.3281	1.2983	0.0015	0.0417	136
	500	0.2232	0.6772	2.2367	0.0026	0.0758	265
	750	0.3707	1.1162	3.8016	0.0044	0.1273	437
	1000	0.5621	1.8453	6.4018	0.0056	0.1947	560
Other General Industrial Equipmen Composite		0.1635	0.5362	1.4520	0.0016	0.0632	152
Other Material Handling Equip	50	0.1506	0.3950	0.3243	0.0004	0.0352	30.3
	120	0.1239	0.4423	0.7103	0.0007	0.0684	60.7
	175	0.1703	0.7292	1.2706	0.0014	0.0759	122
	250	0.1305	0.3496	1.3863	0.0016	0.0443	145
	500	0.1590	0.4876	1.6124	0.0019	0.0545	192
	9999	0.7467	2.4395	8.4619	0.0073	0.2565	741
Other Material Handling Equipment Composite		0.1566	0.5108	1.4125	0.0015	0.0613	141
Pavers	25	0.0255	0.0811	0.1531	0.0002	0.0080	18.7
	50	0.1451	0.3680	0.3038	0.0004	0.0327	28.0
	120	0.1467	0.5107	0.8788	0.0008	0.0776	69.2
	175	0.1864	0.7833	1.4495	0.0014	0.0819	128
	250	0.2182	0.6365	2.0698	0.0022	0.0818	194
	500	0.2383	0.9957	2.2418	0.0023	0.0883	233
Pavers Composite		0.1596	0.5445	0.8980	0.0009	0.0642	77.9
Paving Equipment	25	0.0153	0.0520	0.0974	0.0002	0.0042	12.6
	50	0.1239	0.3124	0.2591	0.0003	0.0279	23.9
	120	0.1150	0.3997	0.6897	0.0006	0.0610	54.5

Table A-2. 2012 SCAB Fleet Average Emission Factors (OFFROAD2007)

These emission factors are applied to CO2, ROG, SOX only. Load factors are already incorporated.

Equipment	MaxHP	NOX (lbs/hr)	ROG (lbs/hr)	PM (lbs/hr)	CO (lbs/hr)	SOX (lbs/hr)	CO2 (lbs/hr)
	175	0.1455	0.6114	1.1384	0.0011	0.0640	101
	250	0.1349	0.3946	1.2976	0.0014	0.0507	122
Paving Equipment Composite		0.1204	0.4365	0.8114	0.0008	0.0570	68.9

Table A-2. 2012 SCAB Fleet Average Emission Factors (OFFROAD2007)

These emission factors are applied to CO2, ROG, SOX only. Load factors are already incorporated.

Equipment	MaxHP	NOX (lbs/hr)	ROG (lbs/hr)	PM (lbs/hr)	CO (lbs/hr)	SOX (lbs/hr)	CO2 (lbs/hr)
Plate Compactors	15	0.0050	0.0263	0.0314	0.0001	0.0013	4.3
Plate Compactors Composite		0.0050	0.0263	0.0314	0.0001	0.0013	4.3
Pressure Washers	15	0.0075	0.0334	0.0509	0.0001	0.0029	4.9
	25	0.0112	0.0385	0.0662	0.0001	0.0039	7.1
	50	0.0349	0.1074	0.1339	0.0002	0.0102	14.3
	120	0.0332	0.1458	0.2385	0.0003	0.0172	24.1
Pressure Washers Composite		0.0173	0.0635	0.0921	0.0001	0.0063	9.4
Pumps	15	0.0133	0.0508	0.0790	0.0001	0.0054	7.4
	25	0.0386	0.1051	0.1803	0.0002	0.0117	19.5
	50	0.1155	0.3229	0.3362	0.0004	0.0299	34.3
	120	0.1250	0.5036	0.8226	0.0009	0.0669	77.9
	175	0.1498	0.7431	1.3164	0.0016	0.0664	140
	250	0.1357	0.4345	1.7375	0.0023	0.0501	201
	500	0.2089	0.8032	2.6861	0.0034	0.0803	345
	750	0.3557	1.3279	4.5700	0.0057	0.1350	571
	9999	1.1456	4.0641	14.2305	0.0136	0.4081	1,355
Pumps Composite		0.0813	0.2983	0.4999	0.0006	0.0351	49.6
Rollers	15	0.0074	0.0386	0.0461	0.0001	0.0018	6.3
	25	0.0162	0.0549	0.1029	0.0002	0.0045	13.3
	50	0.1105	0.2994	0.2677	0.0003	0.0263	26.0
	120	0.1054	0.4098	0.6619	0.0007	0.0574	59.0
	175	0.1320	0.6220	1.0725	0.0012	0.0591	108
	250	0.1347	0.4083	1.4103	0.0017	0.0498	153
	500	0.1755	0.6752	1.8093	0.0022	0.0652	219
Rollers Composite		0.1038	0.4107	0.6936	0.0008	0.0488	67.1
Rough Terrain Forklifts	50	0.1315	0.3910	0.3455	0.0004	0.0330	33.9
	120	0.1038	0.4364	0.6425	0.0007	0.0585	62.4
	175	0.1444	0.7268	1.1204	0.0014	0.0652	125
	250	0.1353	0.3896	1.4082	0.0019	0.0458	171
	500	0.1894	0.5985	1.8577	0.0025	0.0642	257
Rough Terrain Forklifts Composite		0.1093	0.4680	0.6995	0.0008	0.0587	70.3
Rubber Tired Dozers	175	0.2209	0.8528	1.6304	0.0015	0.0945	129
	250	0.2545	0.7124	2.1985	0.0021	0.0942	183
	500	0.3345	1.5220	2.8822	0.0026	0.1210	265
	750	0.5042	2.2809	4.4100	0.0040	0.1832	399
	1000	0.7807	3.6654	7.7816	0.0060	0.2729	592
Rubber Tired Dozers Composite		0.3114	1.2491	2.6866	0.0025	0.1137	239
Rubber Tired Loaders	25	0.0205	0.0697	0.1295	0.0002	0.0052	16.9
	50	0.1315	0.3756	0.3242	0.0004	0.0319	31.1
	120	0.1045	0.4187	0.6404	0.0007	0.0576	58.9
	175	0.1312	0.6288	1.0135	0.0012	0.0583	106
	250	0.1330	0.3838	1.3129	0.0017	0.0462	149
	500	0.1961	0.6755	1.8555	0.0023	0.0677	237
	750	0.4044	1.3812	3.9115	0.0049	0.1408	486
	1000	0.5480	1.9543	6.3337	0.0060	0.1909	594
Rubber Tired Loaders Composite		0.1272	0.4855	1.0034	0.0012	0.0558	109
Scrapers	120	0.1990	0.7011	1.1749	0.0011	0.1054	93.9
	175	0.2172	0.9158	1.6429	0.0017	0.0945	148
	250	0.2367	0.6699	2.1849	0.0024	0.0859	209
	500	0.3333	1.3000	3.0162	0.0032	0.1190	321
	750	0.5779	2.2380	5.3231	0.0056	0.2075	555
Scrapers Composite		0.2916	1.0984	2.5680	0.0027	0.1087	262
Signal Boards	15	0.0072	0.0377	0.0450	0.0001	0.0017	6.2
	50	0.1270	0.3587	0.3564	0.0005	0.0324	36.2
	120	0.1284	0.5269	0.8360	0.0009	0.0703	80.2
	175	0.1661	0.8370	1.4268	0.0017	0.0750	155
	250	0.1746	0.5516	2.1599	0.0029	0.0639	255
Signal Boards Composite		0.0203	0.0940	0.1470	0.0002	0.0083	16.7
Skid Steer Loaders	25	0.0211	0.0635	0.1189	0.0002	0.0067	13.8
	50	0.0596	0.2332	0.2402	0.0003	0.0180	25.5
	120	0.0482	0.2769	0.3536	0.0005	0.0286	42.8
Skid Steer Loaders Composite		0.0534	0.2360	0.2686	0.0004	0.0207	30.3
Surfacing Equipment	50	0.0513	0.1441	0.1411	0.0002	0.0128	14.1
	120	0.1040	0.4251	0.6895	0.0007	0.0557	63.8
	175	0.0950	0.4745	0.8195	0.0010	0.0422	85.8
	250	0.1095	0.3526	1.1993	0.0015	0.0413	135
	500	0.1631	0.6813	1.7819	0.0022	0.0622	221
	750	0.2601	1.0660	2.8642	0.0035	0.0986	347
Surfacing Equipment Composite		0.1362	0.5467	1.3678	0.0017	0.0512	166

Table A-2. 2012 SCAB Fleet Average Emission Factors (OFFROAD2007)

These emission factors are applied to CO2, ROG, SOX only. Load factors are already incorporated.

Equipment	MaxHP	NOX (lbs/hr)	ROG (lbs/hr)	PM (lbs/hr)	CO (lbs/hr)	SOX (lbs/hr)	CO2 (lbs/hr)
Sweepers/Scrubbers	15	0.0124	0.0729	0.0870	0.0002	0.0034	11.9
	25	0.0237	0.0808	0.1501	0.0002	0.0060	19.6
	50	0.1195	0.3565	0.3179	0.0004	0.0302	31.6
	120	0.1233	0.5204	0.7534	0.0009	0.0706	75.0
	175	0.1575	0.8008	1.2212	0.0016	0.0717	139
	250	0.1205	0.3447	1.3019	0.0018	0.0402	162
Sweepers/Scrubbers Composite		0.1278	0.5215	0.7403	0.0009	0.0576	78.5
Tractors/Loaders/Backhoes	25	0.0199	0.0662	0.1250	0.0002	0.0061	15.9
	50	0.1006	0.3305	0.3030	0.0004	0.0267	30.3
	120	0.0760	0.3557	0.4910	0.0006	0.0432	51.7
	175	0.1058	0.5866	0.8294	0.0011	0.0478	101
	250	0.1264	0.3755	1.2813	0.0019	0.0415	172
	500	0.2386	0.7714	2.2621	0.0039	0.0784	345
	750	0.3611	1.1563	3.5105	0.0058	0.1199	517
Tractors/Loaders/Backhoes Composite		0.0862	0.3824	0.5816	0.0008	0.0435	66.8
Trenchers	15	0.0099	0.0517	0.0617	0.0001	0.0024	8.5
	25	0.0398	0.1355	0.2519	0.0004	0.0101	32.9
	50	0.1656	0.4176	0.3536	0.0004	0.0374	32.9
	120	0.1354	0.4732	0.8257	0.0008	0.0709	64.9
	175	0.2050	0.8694	1.6306	0.0016	0.0901	144
	250	0.2483	0.7418	2.3854	0.0025	0.0951	223
	500	0.3135	1.4011	3.0220	0.0031	0.1190	311
	750	0.5949	2.6307	5.8034	0.0059	0.2259	587
Trenchers Composite		0.1507	0.4749	0.6995	0.0007	0.0582	58.7
Welders	15	0.0111	0.0425	0.0660	0.0001	0.0045	6.2
	25	0.0224	0.0609	0.1044	0.0001	0.0068	11.3
	50	0.1071	0.2854	0.2637	0.0003	0.0260	26.0
	120	0.0708	0.2687	0.4376	0.0005	0.0387	39.5
	175	0.1183	0.5475	0.9688	0.0011	0.0531	98.2
	250	0.0909	0.2704	1.0791	0.0013	0.0329	119
	500	0.1154	0.4072	1.3538	0.0016	0.0431	168
Welders Composite		0.0703	0.2150	0.2702	0.0003	0.0243	25.6

Table A-3. Offroad Emissions Calculation - Using SCAB Emission Factors - MSSF1

2012 SCAB emission factors (EFs) corresponding to OFFROAD2007 model are applied to CO2, ROG, and SOX.
Tier 2 and 3 EFs are applied to NOx, PM, and CO. Calculation details are provided in *Offroad Tier 2* and *Offroad Tier 3* worksheets.
Load factors are used in conjunction with Tier 2and 3 EFs.

Offroad Equipment Project Total

ROG lbs/day	SOx lbs/day	CO2 lbs/day	ROG (tons)	SOX (tons)	CO2 (tons)
367.15	34.77	134042.03	33.04	3.13	12,063.78

Mount Signal Solar Farm 1
Site Preparation
7 months

Primary Equipment Description	Offroad Equip Category	HP Estimate	Primary Equip Quantity	Activity Schedule Estimate (Days)	Duration of Use (Hours/ Day)	Total Hours of Utilization 150,840	HP Used for OFFROAD	2012 SCAB ROG (lbs/hr)	2012 SCAB SOX (lbs/hr)	2012 SCAB CO2 (lbs/hr)	2012 SCAB ROG lbs/day	2012 SCAB SOx lbs/day	2012 SCAB CO2 lbs/day	2012 SCAB ROG (tons)	2012 SCAB SOX (tons)	2012 SCAB CO2 (tons)
10,000 lb Rough Terrain Fork Lift	Rough Terrain Forklift	200	7	180	4	5040	250	0.3896	0.0458	170.7965						
Track Type Dozer	Grader	350	7	180	2	2520	500	0.6639	0.0671	229.4843	9.2941	0.9388	3212.7797	0.8365	0.0845	289.1502
Drum Type Compactor	Paving Equipment	250	7	180	2	2520	250	0.3946	0.0507	122.2913	5.5251	0.7095	1712.0776	0.4973	0.0639	154.0870
Backhoe	Tractor/loader/backhoe	200	14	180	4	10080	250	0.3755	0.0415	171.7370	21.0279	2.3266	9617.2722	1.8925	0.2094	865.5545
Racking Post Ramming Machine	Other Construction Equipment	200	48	180	8	69120	500	0.5426	0.0545	254.2385	208.3660	20.9340	97627.5650	18.7529	1.8841	8786.4809
80 Ton Rough Terrain Cranes	Off-highway Truck	400	6	180	2	2160	500	0.6661	0.0705	272.3339	7.9931	0.8465	3268.0066	0.7194	0.0762	294.1206
Generator	Generator Sets	30	28	180	8	40320	50	0.2734	0.0255	30.6230	61.2469	5.7050	6859.5490	5.5122	0.5134	617.3594
Pickup Truck	Off-highway Truck	250	16	180	4	11520	250	0.3944	0.0461	166.5454	25.2428	2.9473	10658.9033	2.2719	0.2653	959.3013
ATV	ATVs	50	16	180	4	11520	50	0.4077	0.0013	1.3532	26.0918	0.0864	86.6040	2.3483	0.0078	7.7944
4000 Gallon Water Truck	Off-highway Truck	250	2	180	1	360	250	0.3944	0.0461	166.5454	0.7888	0.0921	333.0907	0.0710	0.0083	29.9782
Fuel Truck	Off-highway Truck	300	4	180	1	720	500	0.3944	0.0461	166.5454	1.5777	0.1842	666.1815	0.1420	0.0166	59.9563

Table A-4. Offroad Emissions Calculations - Using Tier 2 Emission Factors - MSSF1

Tier 2 emission factors (EFs) are applied to NOx, PM, and CO. Load Factors (LFs) are used in conjunction with Tier 2 EFs.
2012 SCAB EFs (OFFROAD2007) are applied to CO2, ROG, and SOX. Calculation detail is provided in *Offroad SCAB* worksheet.

Offroad Equipment Project

NOX lbs/day	PM lbs/day	CO lbs/day	NOX (tons)	PM (tons)
732.21	25.83	442.42	65.90	2.32

Mount Signal Solar Farm 1

7 months

Primary Equipment Description	Offroad Equip Category	HP Estimate	Primary Equip Quantity	Activity Schedule Estimate (Days)	Duration of Use (Hours/ Day)	Total Hours of Utilization 150,840	Load Factor for Tier 2	HP Used for OFFROAD	TIER 2 NOX (lbs/hr)	TIER 2 PM (lbs/hr)	TIER 2 CO (lbs/hr)	TIER 2 NOX lbs/day	TIER 2 PM lbs/day	TIER 2 CO lbs/day	TIER 2 CO (tons)	TIER 2 PM (tons)
10,000 lb Rough Terrain Fork Lift	Rough Terrain Forklift	200	7	180	4	5040	0.6	250	1.2963	0.0397	0.6878	36.30	1.11	19.26	3.2667	0.1000
Track Type Dozer	Grader	350	7	180	2	2520	0.61	500	2.2593	0.0706	1.2238	31.63	0.99	17.13	2.8467	0.0890
Drum Type Compactor	Paving Equipment	250	7	180	2	2520	0.53	250	1.4313	0.0438	0.7595	20.04	0.61	10.63	1.8035	0.0552
Backhoe	Tractor/loader/backhoe	200	14	180	4	10080	0.55	250	1.1883	0.0364	0.6305	66.54	2.04	35.31	5.9889	0.1833
Racking Post Ramming Machine	Other Construction Equipment	200	48	180	8	69120	0.5	500	1.0802	0.0331	0.5732	414.81	12.70	220.11	37.3333	1.1429
80 Ton Rough Terrain Cranes	Off-highway Truck	400	6	180	2	2160	0.57	500	2.4127	0.0754	1.3069	28.95	0.90	15.68	2.6057	0.0814
Generator	Generator Sets	30	28	180	8	40320	0.74	50	0.2741	0.0220	0.2007	61.39	4.93	44.95	5.5253	0.4440
Pickup Truck	Off-highway Truck	250	16	180	4	11520	0.57	250	1.5394	0.0471	0.8168	98.52	3.02	52.28	8.8667	0.2714
ATV	ATVs	50	16	180	4	11520	0.5	50	0.0001	0.0049	0.6371	0.01	0.32	40.78	0.0007	0.0285
4000 Gallon Water Truck	Off-highway Truck	250	2	180	1	360	0.57	250	1.5394	0.0471	0.8168	3.08	0.09	1.63	0.2771	0.0085
Fuel Truck	Fuel Truck	300	4	180	1	720	0.57	500	1.8095	0.0565	0.9802	7.24	0.23	3.92	0.6514	0.0204

Total

CO (tons)
39.82

TIER 2 CO (tons)
1.7333
1.5419
0.9569
3.1778
19.8095
1.4114
4.0453
4.7048
3.6699
0.1470
0.3529

Table A-5. ARB and USEPA Off-Road Compression-Ignition (Diesel) Engine Standards (NMHC+NOx/CO/PM in g/bhp-hr). When ARB and USEPA standards differ, the standards shown here represent the more stringent of the two.

Maximum horsepower	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015+
<11	See Table 2 footnote (a)					7.8 / 6.0 / 0.75					5.6 / 6.0 / 0.6			5.6 / 6.0 / 0.30[a]							
11≤hp<25						7.1 / 4.9 / 0.60					5.6 / 4.9 / 0.60			5.6 / 4.9 / 0.30							
25≤hp<50	-					7.1 /4.1 / 0.60				5.6 / 4.1 / 0.45				5.6 / 4.1 / 0.22					3.5 / 4.1 / 0.02		
50≤hp< 75						- / 6.9 / - / -[b]				5.6 / 3.7 / 0.30				3.5 / 3.7 / 0.22[c]					3.5 / 3.7 / 0.02[c]		
75≤hp<100														3.5 / 3.7 / 0.30			0.14 / 2.5 / 3.7 / 0.015[b,d]				0.14 / 0.30 / 3.7 / 0.015[b]
100≤hp<175									4.9 / 3.7 / 0.22				3.0 / 3.7 / 0.22								
175≤hp<300									4.9 / 2.6 / 0.15			3.0 / 2.6 / 0.15[e]					0.14 / 1.5 / 2.6 / 0.015[b,d]				0.14 / 0.30 / 2.2 / 0.015[b]
300≤hp<600	-		1.0 / 6.9 / 8.5 / 0.40[b]					4.8 / 2.6 / 0.15													
600≤hp≤750																					
Mobile Machines > 750hp			-			1.0 / 6.9 / 8.5 / 0.40[b]					4.8 / 2.6 / 0.15						0.30 / 2.6 / 2.6 / 0.07[b]				0.14 / 2.6 / 2.6 / 0.03[b]
750hp<GEN ≤1200hp																					0.14 / 0.50 / 2.6 / 0.02[b]
GEN>1200 hp																	0.30 / 0.50 / 2.6 / 0.07[b]				

a) The PM standard for hand-start, air cooled, direct injection engines below 11 hp may be delayed until 2010 and be set at 0.45 g/bhp-hr.
b) Standards given are NMHC/NOx/CO/PM in g/bhp-hr.
c) Engine families in this power category may alternately meet Tier 3 PM standards (0.30 g/bhp-hr) from 2008-2011 in exchange for introducing final PM standards in 2012.
d) The implementation schedule shown is the three-year alternate NOx approach. Other schedules are available.
e) Certain manufacturers have agreed to comply with these standards by 2005.

: Tier 1 : Tier 2 : Tier 3 : Tier 4 Interim / Final

	TIER 2 Emission Factors						TIER 3 Emission Factors						% reduction from TIER 2 to TIER 3		
	NOx		CO		PM		NOx		CO		PM		NOx	CO	PM
Maximum horsepower	g/bhp-hr	lb/bhp-hr	g/bhp-hr	lb/bhp-hr	g/bhp-hr	lb/bhp-hr	g/bhp-hr	lb/bhp-hr	g/bhp-hr	lb/bhp-hr	g/bhp-hr	lb/bhp-hr			
<11	5.6	0.0123457	6	0.0132275	0.6	0.0013228	5.6	0.0123457	6	0.0132275	0.6	0.0013228	0.00%	0.00%	0.00%
11≤hp<25	5.6	0.0123457	4.9	0.0108025	0.6	0.0013228	5.6	0.0123457	4.9	0.0108025	0.6	0.0013228	0.00%	0.00%	0.00%
25≤hp<50	5.6	0.0123457	4.1	0.0090388	0.45	0.0009921	5.6	0.0123457	4.1	0.0090388	0.45	0.0009921	0.00%	0.00%	0.00%
50≤hp< 75	5.6	0.0123457	3.7	0.008157	0.3	0.0006614	5.6	0.0123457	3.7	0.008157	0.3	0.0006614	0.00%	0.00%	0.00%
75≤hp<100	5.6	0.0123457	3.7	0.008157	0.3	0.0006614	3.5	0.007716	3.7	0.008157	0.3	0.0006614	37.50%	0.00%	0.00%
100≤hp<175	4.9	0.0108025	3.7	0.008157	0.22	0.000485	3	0.0066138	3.7	0.008157	0.22	0.000485	38.78%	0.00%	0.00%
175≤hp<300	4.9	0.0108025	2.6	0.0057319	0.15	0.0003307	3	0.0066138	2.6	0.0057319	0.15	0.0003307	38.78%	0.00%	0.00%
300≤hp<600	4.8	0.010582	2.6	0.0057319	0.15	0.0003307	3	0.0066138	2.6	0.0057319	0.15	0.0003307	37.50%	0.00%	0.00%
600≤hp≤750	4.8	0.010582	2.6	0.0057319	0.15	0.0003307	3	0.0066138	2.6	0.0057319	0.15	0.0003307	37.50%	0.00%	0.00%
Mobile Machines > 750hp	4.8	0.010582	2.6	0.0057319	0.15	0.0003307	4.8	0.010582	2.6	0.0057319	0.15	0.0003307	0.00%	0.00%	0.00%
	4.8	0.010582	2.6	0.0057319	0.15	0.0003307	4.8	0.010582	2.6	0.0057319	0.15	0.0003307	0.00%	0.00%	0.00%
750hp<GEN ≤1200hp	4.8	0.010582	2.6	0.0057319	0.15	0.0003307	4.8	0.010582	2.6	0.0057319	0.15	0.0003307	0.00%	0.00%	0.00%
GEN>1200 hp	4.8	0.010582	2.6	0.0057319	0.15	0.0003307	4.8	0.010582	2.6	0.0057319	0.15	0.0003307	0.00%	0.00%	0.00%

: Tier 2

: Tier 3

Table A-6. PSR Offroad Load Factors - MSSF1

Used in conjunction with Tier 2-3 emission factors.

Source: mailout MSC99-32, http://www.arb.ca.gov/msei/onroad/downloads/pubs/mo9932.zip (4/2/2009)

Category	Equipment	HP	P/N	Activity (hrs/yr)	Load
Agricultural	Agricultural Mowers	120	P	363	0.43
	Agricultural Tractors	50	P	475	0.70
		120	P	475	0.70
		175	P	475	0.70
		250	N	475	0.70
		500	N	475	0.70
	Balers	50	P	95	0.58
		120	P	95	0.58
	Combines	120	P	150	0.70
		175	P	150	0.70
		250	N	150	0.70
		500	N	150	0.70
	Hydro Power Units	50	P	790	0.48
		120	P	790	0.48
	Irrigation Pumps	50	P	749	0.65
		120	P	749	0.65
		175	P	749	0.65
		250	N	749	0.65
		500	N	749	0.65
	Other Agricultural Equipment	50	P	381	0.51
		120	P	381	0.51
		175	P	381	0.51
		250	N	381	0.51
		500	N	381	0.51
	Sprayers	50	P	90	0.50
		120	P	90	0.50
		175	P	90	0.50
		250	N	90	0.50
		500	N	90	0.50
	Swathers	120	P	110	0.55
		175	P	110	0.55
	Tillers >5 HP	250	N	172	0.78
		500	N	172	0.78
Commercial	Air Compressors	50	P	815	0.48
		120	P	815	0.48
		175	P	815	0.48
		250	N	815	0.48
		500	N	815	0.48
		750	N	815	0.48
		9999	N	815	0.48
	Generator Sets	50	N	338	0.74
		120	N	338	0.74
		175	N	338	0.74
		250	N	338	0.74
		500	N	338	0.74
		750	N	338	0.74
		9999	N	338	0.74
	Pressure Washers	50	P	145	0.30
		120	P	145	0.30
	Pumps	50	P	403	0.74
		120	P	403	0.74

Table A-6. PSR Offroad Load Factors - MSSF1

Used in conjunction with Tier 2-3 emission factors.

Source: mailout MSC99-32, http://www.arb.ca.gov/msei/onroad/downloads/pubs/mo9932.zip (4/2/2009)

Category	Equipment	HP	P/N	Activity (hrs/yr)	Load
		175	P	403	0.74
		250	N	403	0.74
		500	N	403	0.74
		9999	N	403	0.74
	Welders	50	P	643	0.45
		120	P	643	0.45
		175	P	643	0.45
Construction	Bore/Drill Rigs	50	P	726	0.75
		120	P	726	0.75
		175	P	726	0.75
		250	N	726	0.75
		500	N	726	0.75
		750	N	726	0.75
		9999	N	726	0.75
	Concrete/Industrial Saws	50	P	580	0.73
		120	P	580	0.73
		175	P	580	0.73
	Cranes	50	P	1464	0.43
		120	P	1464	0.43
		175	P	1464	0.43
		250	N	1464	0.43
		500	N	1464	0.43
		750	N	1464	0.43
	Crawler Tractors	50	P	936	0.64
		120	P	936	0.64
		175	P	936	0.64
		250	N	936	0.64
		500	N	936	0.64
		750	N	936	0.64
		9999	N	936	0.64
	Crushing/Proc. Equipment	50	P	955	0.78
		120	P	955	0.78
		175	P	955	0.78
		250	N	955	0.78
		500	N	955	0.78
		750	N	955	0.78
		9999	N	955	0.78
	Excavators	50	P	1162	0.57
		120	P	1162	0.57
		175	P	1162	0.57
		250	N	1162	0.57
		500	N	1162	0.57
		750	N	1162	0.57
	Graders	50	P	965	0.61
		120	P	965	0.61
		175	P	965	0.61
		250	N	965	0.61
		500	N	965	0.61
		750	N	965	0.61
	Off-Highway Tractors	120	P	855	0.65
		175	P	855	0.65

Table A-6. PSR Offroad Load Factors - MSSF1

Used in conjunction with Tier 2-3 emission factors.

Source: mailout MSC99-32, http://www.arb.ca.gov/msei/onroad/downloads/pubs/mo9932.zip (4/2/2009)

Category	Equipment	HP	P/N	Activity (hrs/yr)	Load
		250	N	855	0.65
		750	N	855	0.65
		9999	N	855	0.65
	Off-Highway Trucks	175	P	1641	0.57
		250	N	1641	0.57
		500	N	1641	0.57
		750	N	1641	0.57
		9999	N	1641	0.57
	Other Construction Equipment	50	P	606	0.62
		120	P	606	0.62
		175	P	606	0.62
		500	N	606	0.62
	Pavers	50	P	828	0.62
		120	P	828	0.62
		175	P	828	0.62
		250	N	828	0.62
		500	N	828	0.62
	Paving Equipment	50	P	622	0.53
		120	P	622	0.53
		175	P	622	0.53
		250	N	622	0.53
	Rollers	50	P	748	0.56
		120	P	748	0.56
		175	P	748	0.56
		250	N	748	0.56
		500	N	748	0.56
	Rough Terrain Forklifts	50	P	1198	0.60
		120	P	1198	0.60
		175	P	1198	0.60
		250	N	1198	0.60
		500	N	1198	0.60
	Rubber Tired Dozers	175	P	899	0.59
		250	N	899	0.59
		500	N	899	0.59
		750	N	899	0.59
		9999	N	899	0.59
	Rubber Tired Loaders	50	P	1346	0.54
		120	P	1346	0.54
		175	P	1346	0.54
		250	N	1346	0.54
		500	N	1346	0.54
		750	N	1346	0.54
		9999	N	1346	0.54
	Scrapers	120	P	1090	0.72
		175	P	1090	0.72
		250	N	1090	0.72
		500	N	1090	0.72
		750	N	1090	0.72
	Signal Boards	50	P	535	0.78
		120	P	535	0.78
		175	P	535	0.78

Table A-6. PSR Offroad Load Factors - MSSF1

Used in conjunction with Tier 2-3 emission factors.

Source: mailout MSC99-32, http://www.arb.ca.gov/msei/onroad/downloads/pubs/mo9932.zip (4/2/2009)

Category	Equipment	HP	P/N	Activity (hrs/yr)	Load
		250	N	535	0.78
	Skid Steer Loaders	50	P	811	0.55
		120	P	811	0.55
	Surfacing Equipment	50	P	561	0.45
		120	P	561	0.45
		175	P	561	0.45
		250	N	561	0.45
		500	N	561	0.45
		750	N	561	0.45
	Tractors/Loaders/Backhoes	50	P	1135	0.55
		120	P	1135	0.55
		175	P	1135	0.55
		250	N	1135	0.55
	Trenchers	50	P	620	0.75
		120	P	620	0.75
		175	P	620	0.75
		250	N	620	0.75
		500	N	620	0.75
		750	N	620	0.75
Dredging	Compressor (Dredging)	50	P	815	0.48
		120	P	815	0.48
	Crane	750	N	1464	0.43
	Deck/door engine	250	N	142	0.80
	Dredger	175	P	878	0.51
		250	N	878	0.51
		750	N	878	0.51
	Generator (Dredging)	50	P	1011	0.74
		120	P	1011	0.74
		175	P	1011	0.74
		250	N	1011	0.74
		500	N	1011	0.74
		750	N	1011	0.74
		9999	N	1011	0.74
	Hoist/swing/winch	50	P	878	0.51
		120	P	878	0.51
		175	P	878	0.51
		250	N	878	0.51
		500	N	878	0.51
		750	N	878	0.51
		9999	N	878	0.51
	Other (Dredging)	120	P	878	0.51
		175	P	878	0.51
		250	N	878	0.51
		500	N	878	0.51
	Pump (Dredging)	175	P	403	0.74
		250	N	403	0.74
		500	N	403	0.74
		9999	N	403	0.74
Drilling	Compressors (Workover)	120	P	1231	0.60
		175	P	1231	0.60
		250	N	1231	0.60

Table A-6. PSR Offroad Load Factors - MSSF1

Used in conjunction with Tier 2-3 emission factors.

Source: mailout MSC99-32, http://www.arb.ca.gov/msei/onroad/downloads/pubs/mo9932.zip (4/2/2009)

Category	Equipment	HP	P/N	Activity (hrs/yr)	Load
		750	N	1231	0.60
	Generator (Drilling)	120	P	1231	0.60
		175	P	1231	0.60
		250	N	1231	0.60
		750	N	1231	0.60
	Generator (Workover)	120	P	1231	0.60
		175	P	1231	0.60
		250	N	1231	0.60
		750	N	1231	0.60
		9999	N	1231	0.60
	Lift (Drilling)	250	N	1231	0.60
		750	N	1231	0.60
	Other Drilling Equipment	120	P	1231	0.60
		175	P	1231	0.60
		250	N	1231	0.60
		750	N	1231	0.60
		9999	N	1231	0.60
	Other Workover Equipment	120	P	1231	0.60
		175	P	1231	0.60
		250	N	1231	0.60
		750	N	1231	0.60
		9999	N	1231	0.60
	Pump (Drilling)	120	P	1231	0.60
		175	P	1231	0.60
		250	N	1231	0.60
		750	N	1231	0.60
		9999	N	1231	0.60
	Pump (Workover)	120	P	1231	0.60
		175	P	1231	0.60
		250	N	1231	0.60
		750	N	1231	0.60
		9999	N	1231	0.60
	Snubbing	120	P	1231	0.60
	Swivel	120	P	1231	0.60
		175	P	1231	0.60
		250	N	1231	0.60
		750	N	1231	0.60
Ground Support Equipment	A/C Tug Narrow Body	250	N	606.1839847	0.80
	A/C Tug Wide Body	500	N	759.2692308	0.80
	Air Conditioner	175	N	808.1666667	0.75
	Air Start Unit	500	N	332.9655172	0.90
	Baggage Tug	120	N	1623.8	0.55
	Belt Loader	120	N	1037.643678	0.50
	Bobtail	120	N	1867.428571	0.55
	Cargo Loader	120	N	901.7941176	0.50
	Cargo Tractors	120	N	101	0.54
	Catering Truck	250	N	1600	0.52
	Forklift	175	P	731.5	0.30
	Fuel Truck	250	N	3489.166667	0.25
	Generator	175	N	1629.714286	0.78
	Ground Power Unit	175	N	968.4296875	0.75

Table A-6. PSR Offroad Load Factors - MSSF1

Used in conjunction with Tier 2-3 emission factors.

Source: mailout MSC99-32, http://www.arb.ca.gov/msei/onroad/downloads/pubs/mo9932.zip (4/2/2009)

Category	Equipment	HP	P/N	Activity (hrs/yr)	Load
	Hydrant Truck	175	N	224.25	0.70
	Lav Truck	175	N	1306.5	0.25
	Lift	120	N	917.3636364	0.50
	Other	175	N	1645.590909	0.50
	Passenger Stand	120	N	70	0.59
	Service Truck	175	N	1930.75	0.20
	Sweeper	120	N	12	0.51
Industrial	Aerial Lifts	50	P	384	0.46
		120	P	384	0.46
		500	N	384	0.46
		750	N	384	0.46
	Forklifts	50	P	1800	0.30
		120	P	1800	0.30
		175	P	1800	0.30
		250	N	1800	0.30
		500	N	1800	0.30
	Other General Industrial Equipment	50	N	878	0.51
		120	N	878	0.51
		175	N	878	0.51
		250	N	878	0.51
		500	N	878	0.51
		750	N	878	0.51
		9999	N	878	0.51
	Other Material Handling Equipment	50	N	421	0.59
		120	N	421	0.59
		175	N	421	0.59
		250	N	421	0.59
		500	N	421	0.59
	Sweepers/Scrubbers	50	N	1220	0.68
		120	N	1220	0.68
		175	N	1220	0.68
		250	N	1220	0.68
Lawn and Garden	Chippers/Stump Grinders	120	P	465	0.73
		175	P	465	0.73
		250	N	465	0.73
		500	N	465	0.73
		750	N	465	0.73
	Leaf Blowers/Vacuums	120	N	120	0.40
		250	N	120	0.40
	Snowblowers	175	P	400	0.65
		250	N	400	0.65
		500	N	400	0.65
Logging	Fellers/Bunchers	120	P	1276	0.71
		175	P	1276	0.71
		250	N	1276	0.71
		500	N	1276	0.71
		750	N	1276	0.71
	Shredders	175	P	120	0.40
	Skidders	120	P	1442	0.74
		175	P	1442	0.74
		250	N	1442	0.74

Table A-6. PSR Offroad Load Factors - MSSF1

Used in conjunction with Tier 2-3 emission factors.

Source: mailout MSC99-32, http://www.arb.ca.gov/msei/onroad/downloads/pubs/mo9932.zip (4/2/2009)

Category	Equipment	HP	P/N	Activity (hrs/yr)	Load
		500	N	1442	0.74
Military Tactical Support	A/C unit	120	P	300	0.60
		250	N	300	0.60
		500	N	300	0.60
	Aircraft Support	120	P	300	0.60
		175	P	300	0.60
	Cart	120	P	300	0.60
		175	P	300	0.60
		250	N	300	0.60
	Communications	50	P	300	0.60
		120	P	300	0.60
	Compressor (Military)	50	P	300	0.60
		120	P	300	0.60
		175	P	300	0.60
		250	N	300	0.60
		500	N	300	0.60
	Crane	120	P	300	0.60
		175	P	300	0.60
		250	N	300	0.60
	Deicer	120	P	300	0.60
	Generator (Military)	50	P	300	0.60
		120	P	300	0.60
		175	P	300	0.60
		250	N	300	0.60
		500	N	300	0.60
	Hydraulic unit	120	P	300	0.60
	Lift (Military)	120	P	300	0.60
	Light	50	P	300	0.60
	Other tactical support equipment	50	P	300	0.60
		120	P	300	0.60
		175	P	300	0.60
		250	N	300	0.60
		500	N	300	0.60
		750	N	300	0.60
	Pressure Washer	175	P	300	0.60
	Pump (Military)	50	P	300	0.60
		120	P	300	0.60
	Start Cart	120	P	300	0.60
		500	N	300	0.60
	Test Stand	120	P	300	0.60
		175	P	300	0.60
		250	N	300	0.60
		500	N	300	0.60
	Welder	50	P	300	0.60
		120	P	300	0.60
Misc. Portable Equipment	Misc Portable Equipment	120	P	484	0.56
		175	P	484	0.56
		250	N	484	0.56
		500	N	484	0.56
		750	N	484	0.56
		9999	N	484	0.56

Table A-6. PSR Offroad Load Factors - MSSF1

Used in conjunction with Tier 2-3 emission factors.

Source: mailout MSC99-32, http://www.arb.ca.gov/msei/onroad/downloads/pubs/mo9932.zip (4/2/2009)

Category	Equipment	HP	P/N	Activity (hrs/yr)	Load
Transport Refrigeration	Transport Refrigeration Unit	50	N	1341	0.28
		120	P	1341	0.28

Table A-7. Onroad Emissions Calculation - MSSF1

Emission factors generated by EMFAC assuming 1990-2012 composite fleet of light, medium, and heavy duty vehicles.

Light Duty Autos and Trucks

Overall Personnel to Work Sites Worker Commute Trips *	Workers	Months	Veh/Day	RT/day (mi)	Miles/Day	Total Miles	NOX (lb/1000mi)	ROG (lb/1000mi)	PM (lb/1000mi)	CO (lb/1000mi)	SOX (lb/1000mi)	CO2 (lb/1000mi)
							Composite Emissions for Fleet of Vehicles					
Maximum Labor Force	462	12	462	60	27,720	7,318,080	1.0060	0.8466	0.0797	9.0189	0.0100	906.3745
Typical Labor Force	375	10	375	60	22,500	4,950,000	1.0060	0.8466	0.0797	9.0189	0.0100	906.3745
* Estimated rideshare factor	1			SubTot Personnel (mi)		12,268,080						

Max Daily 30

Operational Emissions - Light Duty	RT/day (mi)	Vehicle Days	Total Miles	NOX (lb/1000mi)	ROG (lb/1000mi)	PM (lb/1000mi)	CO (lb/1000mi)	SOX (lb/1000mi)	CO2 (lb/1000mi)
SubTot Crew and QA/QC Mobilize (mi)	60	1,610	96,600	1.0060	0.8466	0.0797	9.0189	0.0100	906.3745

TOTAL Light Duty Autos and Trucks (vmt) 12,364,680

Medium to Heavy Duty Trucks Max Daily 30

Operational Emissions - Medium Duty	RT/day (mi)	Vehicle Days	Total Miles	NOX (lb/1000mi)	ROG (lb/1000mi)	PM (lb/1000mi)	CO (lb/1000mi)	SOX (lb/1000mi)	CO2 (lb/1000mi)
				Composite Emissions for Fleet of Vehicles					
Splicing/testing vans, dump trucks under 200hp	60	100	6,000	3.0655	0.7143	0.1190	7.4405	0.0000	1666.6667
Miscellaneous hardware deliveries	60	100	6000	3.0655	0.7143	0.1190	7.4405	0.0000	1666.6667

TOTAL Medium Duty Trucks (vmt) 12,000

Heavy-Heavy Duty Trucks Max Daily 30

Operational Emissions - Heavy Duty	RT/day (mi)	Vehicle Days	Total Miles	NOX (lb/1000mi)	ROG (lb/1000mi)	PM (lb/1000mi)	CO (lb/1000mi)	SOX (lb/1000mi)	CO2 (lb/1000mi)
				Composite Emissions for Fleet of Vehicles					
Local material deliveries and waste removal	60	1,995	119,700	26.9330	1.9271	1.0106	8.5311	0.0470	4159.8120
Port to marshalling yards material deliveries	150	1,050	157,500	26.9330	1.9271	1.0106	8.5311	0.0470	4159.8120
Equipment deliveries	60	0	0	26.9330	1.9271	1.0106	8.5311	0.0470	4159.8120
Water transportation	60	20	1,200	26.9330	1.9271	1.0106	8.5311	0.0470	4159.8120
Fuel transportation	60	310	18,600	26.9330	1.9271	1.0106	8.5311	0.0470	4159.8120

TOTAL Heavy-Heavy Duty Trucks (vmt) 297,000

Table A-7. Onroad Emissions Calculation - MSSF1

Emission factors generated by EMFAC assuming 1990-2012 composite fleet of light, medium, and heavy duty vehicles.

Overall Onroad Emissions

NOX lbs/day	ROG lbs/day	PM lbs/day	CO lbs/day	SOX lbs/day	CO2 lbs/day	NOX (ton)	ROG (ton)	PM (ton)	CO (ton)	SOX (ton)	CO2 (ton)
378.48	69.16	16.40	595.76	1.07	101,819.40	10.24	5.52	0.64	57.07	0.07	6,231.25

Light Duty Autos and Trucks

Overall Personnel to Work Sites / Worker Commute Trips *	Workers	Months	Veh/Day	RT/day (mi)	Miles/Day	Total Miles	NOX lbs/day	ROG lbs/day	PM lbs/day	CO lbs/day	SOX lbs/day	CO2 lbs/day	NOX (ton)	ROG (ton)	PM (ton)	CO (ton)	SOX (ton)	CO2 (ton)
Maximum Labor Force	462	12	462	60	27,720	7,318,080	27.89	23.47	2.21	250.00	0.28	25124.70	3.6809	3.0978	0.2916	33.0006	0.0364	3316.4606
Typical Labor Force	375	10	375	60	22,500	4,950,000	22.63	19.05	1.79	202.93	0.22	20393.43	2.4898	2.0954	0.1972	22.3218	0.0247	2243.2769
* Estimated rideshare factor	1				SubTot Personnel (mi)	12,268,080												

Total Emissions for Vehicles

Max Daily 30

Operational Emissions - Light Duty	RT/day (mi)	Vehicle Days	Total Miles	NOX lbs/day	ROG lbs/day	PM lbs/day	CO lbs/day	SOX lbs/day	CO2 lbs/day	NOX (ton)	ROG (ton)	PM (ton)	CO (ton)	SOX (ton)	CO2 (ton)
SubTot Crew and QA/QC Mobilize (mi)	60	1,610	96,600	1.81	1.52	0.14	16.23	0.02	1631.47	0.0486	0.0409	0.0038	0.4356	0.0005	43.7779

TOTAL Light Duty Autos and Trucks (vmt) 12,364,680

Medium to Heavy Duty Trucks Max Daily 30

Total Emissions for Vehicles

Operational Emissions - Medium Duty	RT/day (mi)	Vehicle Days	Total Miles	NOX lbs/day	ROG lbs/day	PM lbs/day	CO lbs/day	SOX lbs/day	CO2 lbs/day	NOX (ton)	ROG (ton)	PM (ton)	CO (ton)	SOX (ton)	CO2 (ton)
Splicing/testing vans, dump trucks under 200hp	60	100	6,000	5.52	1.29	0.21	13.39	0.00	3000.00	0.0092	0.0021	0.0004	0.0223	0.0000	5.0000
Miscellaneous hardware deliveries	60	100	6000	5.52	1.29	0.21	13.39	0.00	3000.00	0.0092	0.0021	0.0004	0.0223	0.0000	5.0000

TOTAL Medium Duty Trucks (vmt) 12,000

Heavy-Heavy Duty Trucks Max Daily 30

Total Emissions for Vehicles

Operational Emissions - Heavy Duty	RT/day (mi)	Vehicle Days	Total Miles	NOX lbs/day	ROG lbs/day	PM lbs/day	CO lbs/day	SOX lbs/day	CO2 lbs/day	NOX (ton)	ROG (ton)	PM (ton)	CO (ton)	SOX (ton)	CO2 (ton)
Local material deliveries and waste removal	60	1,995	119,700	48.48	3.47	1.82	15.36	0.08	7487.66	1.6119	0.1153	0.0605	0.5106	0.0028	248.9647
Port to marshalling yards material deliveries	150	1,050	157,500	121.20	8.67	4.55	38.39	0.21	18719.15	2.1210	0.1518	0.0796	0.6718	0.0037	327.5852
Equipment deliveries	60	0	0	48.48	3.47	1.82	15.36	0.08	7487.66	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water transportation	60	20	1,200	48.48	3.47	1.82	15.36	0.08	7487.66	0.0162	0.0012	0.0006	0.0051	0.0000	2.4959
Fuel transportation	60	310	18,600	48.48	3.47	1.82	15.36	0.08	7487.66	0.2505	0.0179	0.0094	0.0793	0.0004	38.6863

TOTAL Heavy-Heavy Duty Trucks (vmt) 297,000

Table A-8. Onroad Vehicle Mix and Schedules - MSSF1

Source: Equipment mix and schedules from similar projects

Total Vehicle Workdays		
Light	Medium	Heavy
1,610.00	100.00	2,325.00

Site Preparation

1 month

Primary Equipment Description	HP Estimate	Primary Equip Quantity	Activity Schedule Estimate (Days)	Duration of Use (Hours/ Day)	Total Hours of Utilization	Onroad Vehicle Category	Light Duty Fractional Total Vehicle Workdays	Medium Duty Fractional Total Vehicle Workdays	Heavy Duty Fractional Total Vehicle Workdays
					2,460				
1/2 Ton Pick-up Truck, 4X4	200	6	30	4	720	light	60.0		
Mechanic Truck	300	2	30	8	480	heavy			40.0
Fuel Truck	300	2	30	8	480	heavy			40.0
40' Flat Bed Truck & Trailer	350	2	30	10	600	heavy			50.0
Dump Truck (Trash)	350	1	30	6	180	heavy			15.0

Grading and Earthwork

3 months

Primary Equipment Description	HP Estimate	Primary Equip Quantity	Activity Schedule Estimate (Days)	Duration of Use (Hours/ Day)	Total Hours of Utilization	Onroad Vehicle Category	Light Duty Fractional Total Vehicle Workdays	Medium Duty Fractional Total Vehicle Workdays	Heavy Duty Fractional Total Vehicle Workdays
					9,000				
1/2 Ton Pick-up Truck, 4X4	200	6	90	4	2160	light	180.0		
Mechanic Truck	300	2	90	8	1440	heavy			120.0
Fuel Truck	300	2	90	8	1440	heavy			120.0
40' Flat Bed Truck & Trailer	350	2	90	10	1800	heavy			150.0
Dump Truck	350	4	90	6	2160	heavy			180.0

Table A-8. Onroad Vehicle Mix and Schedules - MSSF1

Source: Equipment mix and schedules from similar projects

Total Vehicle Workdays		
Light	Medium	Heavy
1,610.00	100.00	2,325.00

Concrete Foundations

3 months

Primary Equipment Description	HP Estimate	Primary Equip Quantity	Activity Schedule Estimate (Days)	Duration of Use (Hours/ Day)	Total Hours of Utilization	Onroad Vehicle Category	Light Duty Fractional Total Vehicle Workdays	Medium Duty Fractional Total Vehicle Workdays	Heavy Duty Fractional Total Vehicle Workdays
					10,800				
1/2 Ton Pick-up Truck, 4X4	200	6	90	4	2160	light	180.0		
Mechanic Truck	300	2	90	8	1440	heavy			120.0
Fuel Truck	300	2	90	8	1440	heavy			120.0
10 cu.yd. Concrete Mixer Trucks	425	8	90	8	5760	heavy			480.0

Structural Steel Work

4 months

Primary Equipment Description	HP Estimate	Primary Equip Quantity	Activity Schedule Estimate (Days)	Duration of Use (Hours/ Day)	Total Hours of Utilization	Onroad Vehicle Category	Light Duty Fractional Total Vehicle Workdays	Medium Duty Fractional Total Vehicle Workdays	Heavy Duty Fractional Total Vehicle Workdays
					18,960				
1/2 Ton Pick-up Truck, 4X4	200	8	120	4	3840	light	320.0		
1 Ton Crew Cab 4X4	300	1	120	2	240	light	20.0		
30 Ton Boom Truck	300	1	120	2	240	heavy			20.0
1 Ton Crew Cab Flat Bed, 4X4	300	9	120	4	4320	light	360.0		
40' Flat Bed Truck & Trailer	350	2	120	10	2400	heavy			200.0
3/4 Ton Pick-up Truck, 4X4	300	4	120	4	1920	light	160.0		
1 Ton Crew Cab Flat Bed, 4X4	300	2	120	4	960	light	80.0		
Wire Trucks & Trailers	350	6	120	6	4320	heavy			360.0
Dump Truck (Trash)	350	1	120	6	720	heavy			60.0

Table A-8. Onroad Vehicle Mix and Schedules - MSSF1

Source: Equipment mix and schedules from similar projects

Total Vehicle Workdays		
Light	Medium	Heavy
1,610.00	100.00	2,325.00

Electrical/Instrumentation Work

2 months

Primary Equipment Description	HP Estimate	Primary Equip Quantity	Activity Schedule Estimate (Days)	Duration of Use (Hours/ Day)	Total Hours of Utilization	Onroad Vehicle Category	Light Duty Fractional Total Vehicle Workdays	Medium Duty Fractional Total Vehicle Workdays	Heavy Duty Fractional Total Vehicle Workdays
					3,180				
Foreman Truck	180	1	60	4	240	light	20.0		
Mechanic Truck	250	1	60	10	600	heavy			50.0
5-Ton Flatbed Truck	180	5	60	5	1500	heavy			125.0
Pickup Trucks	180	4	60	2	480	light	40.0		
Crew Trucks	180	2	60	2	240	light	20.0		
Support Trucks	180	1	60	2	120	light	10.0		

Architectural and Landscape

2 months

Primary Equipment Description	HP Estimate	Primary Equip Quantity	Activity Schedule Estimate (Days)	Duration of Use (Hours/ Day)	Total Hours of Utilization	Onroad Vehicle Category	Light Duty Fractional Total Vehicle Workdays	Medium Duty Fractional Total Vehicle Workdays	Heavy Duty Fractional Total Vehicle Workdays
					3,180				
1/2 Ton Pick-up Truck, 4X4	200	6	60	2	720	light	60.0		
Fuel Truck	300	2	60	3	360	heavy			30.0
Crew Trucks	180	2	60	5	600	light	50.0		
5 CY Dump Trucks	180	2	60	10	1200	medium		100.0	
Mulch Truck	350	1	60	5	300	heavy			25.0

Testing

1 month

Primary Equipment Description	HP Estimate	Primary Equip Quantity	Activity Schedule Estimate (Days)	Duration of Use (Hours/ Day)	Total Hours of Utilization	Onroad Vehicle Category	Light Duty Fractional Total Vehicle Workdays	Medium Duty Fractional Total Vehicle Workdays	Heavy Duty Fractional Total Vehicle Workdays
					840				
1/2 Ton Pick-up Truck, 4X4	200	1	30	8	240	light	20.0		
1/2 Ton Pick-up Truck, 4X4	200	1	30	8	240	light	20.0		
1 Ton Crew Cab 4X4	300	1	30	4	120	light	10.0		
Water Trucks	350	1	30	8	240	heavy			20.0

Estimated Deliveries from Port to Marshalling Yard and Miscellaneous Hardware

Material	No. Deliveries	Origin	SD Co R/T Miles	Imp Co R/T Miles
Transmission Lines				
Steel	500	Long Beach	150	60
Conductors	400	Long Beach	150	60
Misc Hardware	100	Local	60	60
Underground Structures				
Conductors	100	Long Beach	150	0
Substations				
Steel	40	Long Beach	150	0
Equipment	100	Local	60	0
Transformers	10	Long Beach	150	0

Table A-9. Onroad Emission Factors - MSSF1

Source: EMFAC2007 v.2.3, burden reports for Imperial County.

Composite fleet: 1990 - 2012 for light, medium, and heavy duty vehicle classes

1990-2012 Composite Fleet County-Wide

Imperial County Vehicle Class	2012 Fleet (VMT/1000)	NOX (ton/day)	ROG (ton/day)	PM (ton/day)	CO (ton/day)	SOX (ton/day)	CO2 (ton/day)	NOX (lb/1000mi)	ROG (lb/1000mi)	PM (lb/1000mi)	CO (lb/1000mi)	SOX (lb/1000mi)	CO2 (lb/1000mi)
LDA-TOT	2,285	1.10	0.95	0.08	10.66	0.01	940.00	0.963	0.832	0.070	9.330	0.009	822.757
LDT1-TOT	715	0.33	0.36	0.03	3.20	0.00	360.00	0.923	1.007	0.084	8.951	0.000	1006.993
LDT2-TOT	1,016	0.59	0.39	0.05	4.25	0.01	520.00	1.161	0.768	0.098	8.366	0.020	1023.622
MDV-TOT	484	0.23	0.13	0.02	1.63	0.00	340.00	0.950	0.537	0.083	6.736	0.000	1404.959
LHDT1-TOT	79	0.18	0.03	0.00	0.21	0.00	80.00	4.557	0.759	0.000	5.316	0.000	2025.316
LHDT2-TOT	37	0.12	0.03	0.00	0.17	0.00	30.00	6.486	1.622	0.000	9.189	0.000	1621.622
MHDT-TOT	72	0.50	0.05	0.02	0.49	0.00	110.00	13.889	1.389	0.556	13.611	0.000	3055.556
HHDT-TOT	851	11.46	0.82	0.43	3.63	0.02	1770.00	26.933	1.927	1.011	8.531	0.047	4159.812

1990-2011 Composite Fleet County-Wide

Imperial Composite Vehicle Class	2012 Fleet (VMT/1000)	NOX (ton/day)	ROG (ton/day)	PM (ton/day)	CO (ton/day)	SOX (ton/day)	CO2 (ton/day)	NOX (lb/1000mi)	ROG (lb/1000mi)	PM (lb/1000mi)	CO (lb/1000mi)	SOX (lb/1000mi)	CO2 (lb/1000mi)
Light Duty Autos and Trucks Composite	4,016	2.02	1.70	0.16	18.11	0.02	1820.00	1.006	0.847	0.080	9.019	0.010	906.375
Medium to Heavy Trucks Composite	672	1.03	0.24	0.04	2.50	0.00	560.00	3.065	0.714	0.119	7.440	0.000	1666.667
Heavy-Heavy Duty Trucks Composite	851	11.46	0.82	0.43	3.63	0.02	1770.00	26.933	1.927	1.011	8.531	0.047	4159.812

	LDA-TOT	LDT1-TOT	LDT2-TOT	MDV-TOT	LHDT1-TOT	LHDT2-TOT	MHDT-TOT	HHDT-TOT
Vehicles	59030	19254	26041	12646	1834	939	1337	4914
VMT/1000	2285	715	1016	484	79	37	72	851
Trips	375104	120589	164855	80925	49611	22267	42750	27470
Reactive Organic Gas Emissions								
Run Exh	0.32	0.06	0.07	0.03	0.01	0.01	0.02	0.72
Idle Exh	0	0	0	0	0	0	0	0.09
Start Ex	0.28	0.07	0.08	0.04	0.01	0.01	0.02	0.01
Total Ex	0.59	0.13	0.16	0.07	0.02	0.02	0.04	0.82
Diurnal	0.08	0.03	0.03	0.01	0	0	0	0
Hot Soak	0.08	0.04	0.04	0.01	0	0	0	0
Running	0.15	0.15	0.14	0.04	0.01	0.02	0.02	0
Resting	0.04	0.02	0.02	0.01	0	0	0	0
Total	0.95	0.36	0.39	0.13	0.03	0.03	0.05	0.82
Carbon Monoxide Emissions								
Run Exh	7.67	2.34	3.14	1.2	0.07	0.07	0.21	3.1
Idle Exh	0	0	0	0	0.01	0.01	0.01	0.4
Start Ex	2.99	0.85	1.11	0.43	0.13	0.1	0.27	0.12
Total Ex	10.66	3.2	4.25	1.63	0.21	0.17	0.49	3.63
Oxides of Nitrogen Emissions								
Run Exh	0.91	0.26	0.45	0.17	0.1	0.09	0.44	10.38
Idle Exh	0	0	0	0	0	0	0.01	1.06
Start Ex	0.19	0.07	0.14	0.06	0.08	0.04	0.05	0.02
Total Ex	1.1	0.33	0.59	0.23	0.18	0.12	0.5	11.46
Carbon Dioxide Emissions (000)								
Run Exh	0.91	0.35	0.51	0.33	0.07	0.03	0.11	1.71
Idle Exh	0	0	0	0	0	0	0	0.06
Start Ex	0.03	0.01	0.02	0.01	0	0	0	0
Total Ex	0.94	0.36	0.52	0.34	0.08	0.03	0.11	1.77
Total Particulate Emissions								
Run Exh	0.02	0.01	0.02	0.01	0	0	0.01	0.36
Idle Exh	0	0	0	0	0	0	0	0.01
Start Ex	0	0	0	0	0	0	0	0
Total Ex	0.02	0.01	0.03	0.01	0	0	0.01	0.37
TireWear	0.02	0.01	0.01	0	0	0	0	0.03
BrakeWr	0.03	0.01	0.01	0.01	0	0	0	0.03
Total	0.08	0.03	0.05	0.02	0	0	0.02	0.43
Lead	0	0	0	0	0	0	0	0
SOx	0.01	0	0.01	0	0	0	0	0.02
Fuel Consumption (000 gallons)								
Gasoline	98.11	36.58	54.22	35.05	6.58	2.35	1.13	0.62
Diesel	0.04	0.91	0.04	0.04	1.15	0.88	8.86	158.82

< --- > Title : Mt Signal Solar Farm Projects
Version : Emfac2007 V2.3 Nov 1 2006
Run Date : 2011/09/13 19:50:39
Scen Year: 2012 -- All model years in the range 1990 to 2012 selected
Season : Annual
Area : Imperial County
I/M Stat : COO Basic (2005)
Emissions: Tons Per Day

Table A-10. Fugitive Dust Generating Activity Estimates - MSSF1

Proposed Activity Sites and Areas	
(Activity Areas)	**Imperial**
Source: Project Description Table B-3, B-7, B-9.	**Valley**
Site Area	**(acres)**
Total site area	1431.0
Construction Staging Areas and Fly Yards	
Staging Area	20.0
Total Activity Sites and Areas (acres)	1451.0
Duration of Activity (months)	**3**
Total Acre-Months	**4,353**

Proposed Access Roads	**Imperial**
(Grading)	**Valley**
Assume 1% of site would be used for access roads	**(acres)**
Proposed Solar Field Access Roads	14.31

Proposed Structures - Solar Array	**Average**	**Imperial**	
(Excavation, Material Unloading)	**Excavation**	**Valley**	**All Links**
	(cu.yd per #)	**#**	**(cu.yd)**
Each Structure			
Total	1	1600000	1,600,000
			All Links
Avg Rate of Excavation	**(cu.yd/day)**	**(cu.yd)**	**(cu.yd)**
Each Structure	250	1,600,000	1,600,000

Table A-11. Fugitive Dust Emissions by Activity - MSSF1

Source: Emission factors from USEPA AP-42 and South Coast Air Quality Management District, where noted.

								SubTotals of Fugitive Dust Emissions			
								Overall Fugitive Dust Emissions			
						PM10	**PM2.5**			**PM10**	**PM2.5**
						lbs/day	**lbs/day**			**(ton)**	**(ton)**
						29.7	**7.4**	**Overall Proposed Proj.**		**18.9**	**3.7**
Activity Sites and Areas											
Source: "Improvement of Specific Emission Factors (BACM Project No. 1), Final Report", prepared for											
South Coast AQMD by Midwest Research Institute, March 1996											
E = Level 2 Factor = tonPM10/ac-month	0.011	tonPM10/acre-month		22	= activity days/mo					Overall	Overall
f = 0.21 for PM2.5	0.21	PM2.5 fraction (SCAQMD Methodology for PM 2.5, October 2006)		Activity Areas	Activity Areas	PM10	PM2.5		Activity Areas	PM10	PM2.5
Control Effectiveness (watering) =	85.0%	Emission Factors		(acre-mo)	(ac-day)	(lb/day)	(lb/day)		(acre-mo)	(ton)	(ton)
		3.3000	lbPM10 (per acre activity-per mo)	4,353	198	29.68	---		4,353	7.2	---
		0.6930	lbPM2.5 (per acre activity-per mo)	4,353	198	---	6.23		4,353	---	1.5
Access Roads											
Source: "Improvement of Specific Emission Factors (BACM Project No. 1), Final Report", prepared for											Overall
South Coast AQMD by Midwest Research Institute, March 1996											PM2.5
E = Level 2 Factor = tonPM10/ac-month	0.011	tonPM10/acre-month		22	= activity days/mo					Overall	(ton)
f = 0.21 for PM2.5	0.21	PM2.5 fraction (SCAQMD Methodology for PM 2.5, October 2006)		Activity Areas	Activity Areas	PM10	PM2.5		Activity Areas	PM10	---
Control Effectiveness (watering) =	85.0%	Emission Factors		(acre-mo)	(ac-day)	(lb/day)	(lb/day)		(acre-mo)	(ton)	
		3.3000	lbPM10 (per acre activity-per mo)	14	1	0.10	---		14	0.0	---
		0.6930	lbPM2.5 (per acre activity-per mo)	14	1	---	0.02		14	---	0.0
										Overall	Overall
Grading (Bulldozing of Overburden)				Doz/Grad/Scrap		PM10	PM2.5	Doz/Grad/Scrap		PM10	PM2.5
Source: USEPA AP-42, Table 11.9-1, 10/98		Emission Factors		(hr/day)		(lb/day)	(lb/day)	(hr)		(ton)	(ton)
E = 0.75 * (s^1.5) / (M^1.4) = lbPM10/hr		0.573	lbPM10 (per hr bulldozer or grader)	24		13.76	---	2,520		0.7	---
E = 0.105 * 5.7 * (s^1.2) / (M^1.3) = lbPM2.5/hr		0.309	lbPM2.5 (per hr bulldozer or grader)	24		---	7.41	2,520		---	0.4
s = silt content =	8.50	percent (average for construction sites, USEPA AP-42 Table 13.2.2-1)									
M = moisture content =	12.00	percent (SCAQMD CEQA Handbook Table A9-9-G-1, with watering)									
										Overall	Overall
Excavation / Trenching (Removal of Overburden)				Excavation		PM10	PM2.5	Excavation		PM10	PM2.5
Source: USEPA AP-42, Table 11.9-2 (dragline operations), 10/98		Emission Factors		(yd3/day)		(lb/day)	(lb/day)	(cu.yd)		(ton)	(ton)
E = 0.75 * 0.0021 (d^0.7)/(M^0.3) = lbPM10/yd3		0.0023	lbPM10 (per yd3 excavated)	250		0.58	---	1,600,000		1.845	---
E = 0.017 * 0.0021 (d^1.1)/(M^0.3) = lbPM2.5/yd3		0.0001	lbPM2.5 (per yd3 excavated)	250		---	0.02	1,600,000		---	0.080
d = drop height =	5	ft (estimate)									
M = moisture content =	12.00	percent (SCAQMD CEQA Handbook Table A9-9-G-1, with watering)									
Material Unloading/Loading											
Source: USEPA AP-42, p. 13.2.4-3, 11/06											
E = (k)(0.0032)[(U/5)^1.3]/[(M/2)^1.4] = lb/ton											
U = average wind speed =	15.00	mph (upper bound wind, p.13.2.4-4)									
M = moisture content =	12.00	percent (SCAQMD CEQA Handbook Table A9-9-G-1, with watering)		4	= transfers					Overall	Overall
lb of material / yd3 =	2600.00	for moist soil		Excavation	Unloading	PM10	PM2.5	Excavation	Unloading	PM10	PM2.5
		Emission Factors		(yd3/day)	(yd3/day)	(lb/day)	(lb/day)	(cu.yd)	(cu.yd)	(ton)	(ton)
k = 0.35 for PM10	0.35	for PM10	0.00049 lbPM10 (per yd3 unloaded)	250	1000	0.49	---	1,600,000	6,400,000	1.582	---
k = 0.053 for PM2.5	0.05	for PM2.5	0.00007 lbPM2.5 (per yd3 unloaded)	250	1000	---	0.07	1,600,000	6,400,000	---	0.240

Table A-12. Air Emissions Calculations Summary, CSF1

Construction Phase Emissions, CSF1

Offroad Tiers 2 emission factors (EFs) are applied to NOx, PM, and CO. Load factors (LFs) are used in conjunction with Tiers 2 EFs.
2012 SCAB EFs (OFFROAD2007 model) are applied to CO2, ROG, SOX. LFs already incorporated in OFFROAD model.
Onroad model (EMFAC) assumes 1990-2012 composite fleet across light, medium, and heavy duty vehicle classes.
Helicopter emissions are calculated using EDMS 5.1 and CCAR reccomended emission factors.
Onroad/offroad equipment mix and schedules, including helicopter classes and usage,as provided by construction contractor (Sargent & Lundy LLC).

	Maximum Daily Emissions of Proposed Project	NOX lbs/day	ROG lbs/day	PM10 lbs/day	PM2.5 lbs/day	CO lbs/day	SOX lbs/day	CO2 lbs/day
Imperial County	Offroad Vehicles and Equipment	732.21	355.29	25.83	22.99	442.42	31.41	134042.06
	Onroad Vehicles	339.99	66.36	15.18	15.03	567.15	1.01	102008.77
	Fugitive Dust	---	---	29.68	7.41	---	---	---
	Total for Imperial County *	**1072.20**	**421.65**	**70.69**	**45.43**	**1009.57**	**32.42**	**236050.83**

Overall Emissions of CSF1	NOX (ton)	ROG (ton)	PM10 (ton)	PM2.5 (ton)	CO (ton)	SOX (ton)	CO2 (ton)
Offroad Vehicles and Equipment	65.90	31.98	2.32	2.07	39.82	2.83	12,063.8
Onroad Vehicles	9.46	5.39	0.61	0.61	54.43	0.07	6,254.5
Fugitive Dust			18.87	3.69			
Total Emissions for Project Duration	**75.36**	**37.36**	**21.81**	**6.36**	**94.25**	**2.89**	**18,318.3**

Table A-13. 2013 SCAB Fleet Average Emission Factors (OFFROAD2007)

These emission factors are applied to CO2, ROG, SOX only. Load factors are already incorporated.

Equipment	MaxHP	NOX (lbs/hr)	ROG (lbs/hr)	PM (lbs/hr)	CO (lbs/hr)	SOX (lbs/hr)	CO2 (lbs/hr)
Aerial Lifts	15	0.0101	0.0528	0.0637	0.0001	0.0027	8.7
	25	0.0166	0.0503	0.0937	0.0001	0.0051	11.0
	50	0.0592	0.1757	0.1840	0.0003	0.0156	19.6
	120	0.0558	0.2425	0.3758	0.0004	0.0299	38.1
	500	0.1191	0.4671	1.5310	0.0021	0.0448	213
	750	0.2221	0.8443	2.8534	0.0039	0.0825	385
Aerial Lifts Total		0.0529	0.1925	0.3059	0.0004	0.0202	34.7
Air Compressors	15	0.0122	0.0484	0.0732	0.0001	0.0048	7.2
	25	0.0266	0.0744	0.1306	0.0002	0.0081	14.4
	50	0.0921	0.2546	0.2221	0.0003	0.0220	22.3
	120	0.0825	0.3251	0.4991	0.0006	0.0456	47.0
	175	0.1059	0.5054	0.8385	0.0010	0.0472	88.5
	250	0.1007	0.2955	1.1320	0.0015	0.0347	131
	500	0.1626	0.5399	1.7639	0.0023	0.0570	232
	750	0.2547	0.8344	2.8139	0.0036	0.0898	358
	1000	0.4190	1.4213	5.0841	0.0049	0.1474	486
Air Compressors Total		0.0913	0.3376	0.6065	0.0007	0.0434	63.6
Bore/Drill Rigs	15	0.0120	0.0632	0.0754	0.0002	0.0029	10.3
	25	0.0193	0.0658	0.1226	0.0002	0.0049	16.0
	50	0.0289	0.2282	0.2568	0.0004	0.0120	31.0
	120	0.0447	0.4698	0.4583	0.0009	0.0257	77.1
	175	0.0704	0.7538	0.6931	0.0016	0.0302	141
	250	0.0795	0.3429	0.7632	0.0021	0.0221	188
	500	0.1295	0.5517	1.1717	0.0031	0.0361	311
	750	0.2565	1.0899	2.3376	0.0062	0.0715	615
	1000	0.4163	1.6675	5.9553	0.0093	0.1544	928
Bore/Drill Rigs Total		0.0786	0.5044	0.8125	0.0017	0.0302	165
Cement and Mortar Mixers	15	0.0074	0.0386	0.0470	0.0001	0.0021	6.3
	25	0.0270	0.0813	0.1510	0.0002	0.0083	17.6
Cement and Mortar Mixers Total		0.0091	0.0421	0.0556	0.0001	0.0026	7.2
Concrete/Industrial Saws	25	0.0199	0.0678	0.1257	0.0002	0.0049	16.5
	50	0.0955	0.2918	0.2858	0.0004	0.0247	30.2
	120	0.1065	0.4836	0.7154	0.0009	0.0589	74.1
	175	0.1569	0.8701	1.3612	0.0018	0.0706	160
Concrete/Industrial Saws Total		0.1002	0.4088	0.5572	0.0007	0.0452	58.5
Cranes	50	0.1015	0.2892	0.2394	0.0003	0.0239	23.2
	120	0.0919	0.3618	0.5508	0.0006	0.0493	50.1
	175	0.1031	0.4821	0.7769	0.0009	0.0445	80.3
	250	0.1040	0.2948	0.9948	0.0013	0.0351	112
	500	0.1551	0.5292	1.4230	0.0018	0.0518	180
	750	0.2625	0.8887	2.4614	0.0030	0.0885	303
	9999	0.9491	3.3249	10.3665	0.0098	0.3189	971
Cranes Total		0.1348	0.4737	1.1934	0.0014	0.0508	129
Crawler Tractors	50	0.1176	0.3246	0.2627	0.0003	0.0270	24.9
	120	0.1293	0.4858	0.7686	0.0008	0.0677	65.8
	175	0.1674	0.7448	1.2529	0.0014	0.0713	121
	250	0.1764	0.5000	1.5945	0.0019	0.0613	166
	500	0.2542	0.9504	2.2389	0.0025	0.0868	259
	750	0.4574	1.6983	4.1042	0.0047	0.1573	465
	1000	0.6901	2.6950	7.3731	0.0066	0.2361	658
Crawler Tractors Total		0.1584	0.5900	1.1593	0.0013	0.0697	114
Crushing/Proc. Equipment	50	0.1741	0.5009	0.4359	0.0006	0.0422	44.0
	120	0.1402	0.5764	0.8552	0.0010	0.0779	83.1
	175	0.1942	0.9615	1.5237	0.0019	0.0864	167
	250	0.1848	0.5425	2.0202	0.0028	0.0620	245
	500	0.2608	0.8480	2.7097	0.0037	0.0884	374
	750	0.4147	1.3191	4.4498	0.0059	0.1418	589
	9999	1.1270	3.6752	13.3218	0.0131	0.3880	1,308
Crushing/Proc. Equipment Total		0.1733	0.6773	1.1752	0.0015	0.0748	132
Dumpers/Tenders	25	0.0097	0.0320	0.0601	0.0001	0.0029	7.6
Dumpers/Tenders Total		0.0097	0.0320	0.0601	0.0001	0.0029	7.6
Excavators	25	0.0198	0.0677	0.1253	0.0002	0.0047	16.4
	50	0.0816	0.2841	0.2458	0.0003	0.0212	25.0
	120	0.1086	0.5177	0.6791	0.0009	0.0586	73.6
	175	0.1208	0.6668	0.8932	0.0013	0.0512	112
	250	0.1242	0.3541	1.1360	0.0018	0.0372	159
	500	0.1735	0.5271	1.4763	0.0023	0.0516	234
	750	0.2895	0.8731	2.5290	0.0039	0.0871	387
Excavators Total		0.1220	0.5338	0.9071	0.0013	0.0481	120

Table A-13. 2013 SCAB Fleet Average Emission Factors (OFFROAD2007)

These emission factors are applied to CO2, ROG, SOX only. Load factors are already incorporated.

Equipment	MaxHP	NOX (lbs/hr)	ROG (lbs/hr)	PM (lbs/hr)	CO (lbs/hr)	SOX (lbs/hr)	CO2 (lbs/hr)
Forklifts	50	0.0445	0.1623	0.1431	0.0002	0.0121	14.7
	120	0.0438	0.2176	0.2788	0.0004	0.0241	31.2
	175	0.0572	0.3307	0.4261	0.0006	0.0246	56.1
	250	0.0570	0.1614	0.5281	0.0009	0.0168	77.1
	500	0.0781	0.2208	0.6592	0.0011	0.0228	111
Forklifts Total		0.0541	0.2235	0.3950	0.0006	0.0204	54.4
Generator Sets	15	0.0149	0.0684	0.1016	0.0002	0.0058	10.2
	25	0.0266	0.0908	0.1594	0.0002	0.0091	17.6
	50	0.0872	0.2639	0.2847	0.0004	0.0234	30.6
	120	0.1106	0.4905	0.7587	0.0009	0.0590	77.9
	175	0.1347	0.7388	1.2314	0.0016	0.0592	142
	250	0.1277	0.4365	1.6763	0.0024	0.0464	213
	500	0.1818	0.7230	2.3955	0.0033	0.0690	337
	750	0.3035	1.1671	3.9863	0.0055	0.1134	544
	9999	0.7957	2.8065	10.2314	0.0105	0.2844	1,049
Generator Sets Total		0.0767	0.3045	0.5430	0.0007	0.0324	61.0
Graders	50	0.1080	0.3263	0.2772	0.0004	0.0262	27.5
	120	0.1254	0.5310	0.7729	0.0009	0.0676	75.0
	175	0.1467	0.7345	1.1193	0.0014	0.0631	124
	250	0.1492	0.4331	1.4184	0.0019	0.0494	172
	500	0.1855	0.6289	1.6842	0.0023	0.0608	229
	750	0.3952	1.3289	3.6674	0.0049	0.1306	486
Graders Total		0.1446	0.6053	1.1663	0.0015	0.0593	133
Off-Highway Tractors	120	0.2113	0.7191	1.2368	0.0011	0.1078	93.7
	175	0.2045	0.8335	1.5337	0.0015	0.0871	130
	250	0.1641	0.4691	1.4453	0.0015	0.0601	130
	750	0.6538	2.8815	5.8130	0.0057	0.2353	568
	1000	0.9818	4.4978	10.0554	0.0082	0.3436	814
Off-Highway Tractors Total		0.2077	0.7649	1.7062	0.0017	0.0818	151
Off-Highway Trucks	175	0.1441	0.7580	1.0305	0.0014	0.0602	125
	250	0.1400	0.3837	1.2373	0.0019	0.0412	167
	500	0.2170	0.6362	1.7865	0.0027	0.0634	272
	750	0.3542	1.0311	2.9938	0.0044	0.1046	442
	1000	0.5484	1.6691	5.9808	0.0063	0.1796	625
Off-Highway Trucks Total		0.2141	0.6361	1.8543	0.0027	0.0644	260
Other Construction Equipment	15	0.0118	0.0617	0.0737	0.0002	0.0029	10.1
	25	0.0160	0.0544	0.1013	0.0002	0.0041	13.2
	50	0.0753	0.2653	0.2585	0.0004	0.0205	28.0
	120	0.1006	0.5277	0.7025	0.0009	0.0567	80.9
	175	0.0935	0.5873	0.8011	0.0012	0.0420	107
	500	0.1452	0.5234	1.5187	0.0025	0.0491	254
Other Construction Equipment Total		0.0872	0.3765	0.7938	0.0013	0.0330	123
Other General Industrial Equipr	15	0.0066	0.0391	0.0466	0.0001	0.0018	6.4
	25	0.0185	0.0632	0.1170	0.0002	0.0044	15.3
	50	0.0980	0.2738	0.2243	0.0003	0.0232	21.7
	120	0.1177	0.4487	0.6789	0.0007	0.0644	62.0
	175	0.1261	0.5728	0.9333	0.0011	0.0549	95.9
	250	0.1174	0.3177	1.2013	0.0015	0.0380	136
	500	0.2135	0.6384	2.0642	0.0026	0.0693	265
	750	0.3546	1.0522	3.5146	0.0044	0.1165	437
	1000	0.5246	1.6793	6.0067	0.0056	0.1805	560
Other General Industrial Equipmen Total		0.1542	0.5159	1.3484	0.0016	0.0580	152
Other Material Handling Equipr	50	0.1361	0.3789	0.3119	0.0004	0.0323	30.3
	120	0.1144	0.4370	0.6628	0.0007	0.0628	60.7
	175	0.1591	0.7257	1.1860	0.0014	0.0696	122
	250	0.1241	0.3385	1.2829	0.0016	0.0405	145
	500	0.1521	0.4596	1.4883	0.0019	0.0498	192
	9999	0.7021	2.2197	7.9424	0.0073	0.2379	741
Other Material Handling Equipment Total		0.1473	0.4951	1.3132	0.0015	0.0562	141
Pavers	25	0.0247	0.0799	0.1500	0.0002	0.0075	18.7
	50	0.1366	0.3592	0.2948	0.0004	0.0308	28.0
	120	0.1387	0.5057	0.8357	0.0008	0.0729	69.2
	175	0.1777	0.7784	1.3769	0.0014	0.0769	128
	250	0.2072	0.6081	1.9469	0.0022	0.0756	194
	500	0.2275	0.9254	2.1080	0.0023	0.0818	233
Pavers Total		0.1511	0.5357	0.8542	0.0009	0.0603	77.9
Paving Equipment	25	0.0153	0.0520	0.0968	0.0002	0.0039	12.6
	50	0.1166	0.3049	0.2514	0.0003	0.0263	23.9
	120	0.1087	0.3958	0.6561	0.0006	0.0574	54.5

Table A-13. 2013 SCAB Fleet Average Emission Factors (OFFROAD2007)

These emission factors are applied to CO2, ROG, SOX only. Load factors are already incorporated.

Equipment	MaxHP	NOX (lbs/hr)	ROG (lbs/hr)	PM (lbs/hr)	CO (lbs/hr)	SOX (lbs/hr)	CO2 (lbs/hr)
	175	0.1387	0.6079	1.0816	0.0011	0.0602	101
	250	0.1277	0.3763	1.2206	0.0014	0.0467	122
Paving Equipment Total		0.1142	0.4316	0.7709	0.0008	0.0536	68.9

Table A-13. 2013 SCAB Fleet Average Emission Factors (OFFROAD2007)

These emission factors are applied to CO2, ROG, SOX only. Load factors are already incorporated.

Equipment	MaxHP	NOX (lbs/hr)	ROG (lbs/hr)	PM (lbs/hr)	CO (lbs/hr)	SOX (lbs/hr)	CO2 (lbs/hr)
Plate Compactors	15	0.0050	0.0263	0.0314	0.0001	0.0012	4.3
Plate Compactors Total		0.0050	0.0263	0.0314	0.0001	0.0012	4.3
Pressure Washers	15	0.0071	0.0328	0.0487	0.0001	0.0028	4.9
	25	0.0108	0.0368	0.0646	0.0001	0.0037	7.1
	50	0.0315	0.1037	0.1284	0.0002	0.0094	14.3
	120	0.0302	0.1443	0.2235	0.0003	0.0157	24.1
Pressure Washers Total		0.0159	0.0619	0.0878	0.0001	0.0058	9.4
Pumps	15	0.0125	0.0497	0.0752	0.0001	0.0049	7.4
	25	0.0359	0.1004	0.1761	0.0002	0.0109	19.5
	50	0.1052	0.3116	0.3228	0.0004	0.0275	34.3
	120	0.1149	0.4984	0.7706	0.0009	0.0617	77.9
	175	0.1385	0.7405	1.2344	0.0016	0.0611	140
	250	0.1266	0.4210	1.6140	0.0023	0.0457	201
	500	0.1952	0.7595	2.4849	0.0034	0.0734	345
	750	0.3326	1.2556	4.2353	0.0057	0.1235	571
	9999	1.0536	3.7127	13.3750	0.0136	0.3744	1,355
Pumps Total		0.0748	0.2926	0.4705	0.0006	0.0323	49.6
Rollers	15	0.0074	0.0386	0.0461	0.0001	0.0018	6.3
	25	0.0161	0.0549	0.1023	0.0002	0.0041	13.3
	50	0.1025	0.2911	0.2583	0.0003	0.0245	26.0
	120	0.0986	0.4063	0.6253	0.0007	0.0534	59.0
	175	0.1247	0.6199	1.0114	0.0012	0.0550	108
	250	0.1262	0.3887	1.3124	0.0017	0.0451	153
	500	0.1654	0.6313	1.6820	0.0022	0.0593	219
Rollers Total		0.0973	0.4060	0.6546	0.0008	0.0453	67.1
Rough Terrain Forklifts	50	0.1181	0.3778	0.3316	0.0004	0.0300	33.9
	120	0.0955	0.4327	0.5995	0.0007	0.0529	62.4
	175	0.1352	0.7256	1.0448	0.0014	0.0592	125
	250	0.1294	0.3798	1.2955	0.0019	0.0416	171
	500	0.1824	0.5717	1.7096	0.0025	0.0584	257
Rough Terrain Forklifts Total		0.1009	0.4642	0.6526	0.0008	0.0532	70.3
Rubber Tired Dozers	175	0.2119	0.8457	1.5561	0.0015	0.0893	129
	250	0.2435	0.6833	2.0817	0.0021	0.0881	183
	500	0.3211	1.4228	2.7305	0.0026	0.1133	265
	750	0.4843	2.1329	4.1797	0.0040	0.1716	399
	1000	0.7496	3.4322	7.4509	0.0060	0.2591	592
Rubber Tired Dozers Total		0.2986	1.1749	2.5452	0.0025	0.1064	239
Rubber Tired Loaders	25	0.0204	0.0697	0.1292	0.0002	0.0050	16.9
	50	0.1200	0.3641	0.3118	0.0004	0.0292	31.1
	120	0.0971	0.4152	0.6015	0.0007	0.0525	58.9
	175	0.1238	0.6274	0.9501	0.0012	0.0535	106
	250	0.1259	0.3685	1.2125	0.0017	0.0417	149
	500	0.1867	0.6397	1.7158	0.0023	0.0613	237
	750	0.3850	1.3084	3.6184	0.0049	0.1276	486
	1000	0.5190	1.8389	5.9660	0.0060	0.1795	594
Rubber Tired Loaders Total		0.1195	0.4763	0.9346	0.0012	0.0508	109
Scrapers	120	0.1877	0.6943	1.1141	0.0011	0.0983	93.9
	175	0.2070	0.9107	1.5564	0.0017	0.0884	148
	250	0.2252	0.6408	2.0481	0.0024	0.0791	209
	500	0.3186	1.2113	2.8288	0.0032	0.1099	321
	750	0.5525	2.0861	4.9949	0.0056	0.1918	555
Scrapers Total		0.2783	1.0395	2.4118	0.0027	0.1005	262
Signal Boards	15	0.0072	0.0377	0.0450	0.0001	0.0018	6.2
	50	0.1151	0.3456	0.3415	0.0005	0.0296	36.2
	120	0.1176	0.5214	0.7807	0.0009	0.0644	80.2
	175	0.1535	0.8341	1.3333	0.0017	0.0685	155
	250	0.1632	0.5350	1.9963	0.0029	0.0580	255
Signal Boards Total		0.0192	0.0934	0.1399	0.0002	0.0077	16.7
Skid Steer Loaders	25	0.0202	0.0620	0.1166	0.0002	0.0063	13.8
	50	0.0517	0.2263	0.2279	0.0003	0.0157	25.5
	120	0.0429	0.2748	0.3267	0.0005	0.0245	42.8
Skid Steer Loaders Total		0.0468	0.2309	0.2522	0.0004	0.0179	30.3
Surfacing Equipment	50	0.0477	0.1403	0.1359	0.0002	0.0119	14.1
	120	0.0970	0.4215	0.6523	0.0007	0.0517	63.8
	175	0.0894	0.4730	0.7742	0.0010	0.0392	85.8
	250	0.1025	0.3374	1.1177	0.0015	0.0376	135
	500	0.1532	0.6418	1.6597	0.0022	0.0567	221
	750	0.2443	1.0046	2.6697	0.0035	0.0900	347
Surfacing Equipment Total		0.1277	0.5182	1.2760	0.0017	0.0468	166

Table A-13. 2013 SCAB Fleet Average Emission Factors (OFFROAD2007)

These emission factors are applied to CO2, ROG, SOX only. Load factors are already incorporated.

Equipment	MaxHP	NOX (lbs/hr)	ROG (lbs/hr)	PM (lbs/hr)	CO (lbs/hr)	SOX (lbs/hr)	CO2 (lbs/hr)
Sweepers/Scrubbers	15	0.0124	0.0729	0.0870	0.0002	0.0034	11.9
	25	0.0237	0.0808	0.1496	0.0002	0.0058	19.6
	50	0.1048	0.3425	0.3055	0.0004	0.0271	31.6
	120	0.1107	0.5147	0.6989	0.0009	0.0622	75.0
	175	0.1439	0.7997	1.1204	0.0016	0.0637	139
	250	0.1146	0.3382	1.1784	0.0018	0.0362	162
Sweepers/Scrubbers Total		0.1148	0.5145	0.6862	0.0009	0.0510	78.5
Tractors/Loaders/Backhoes	25	0.0195	0.0657	0.1237	0.0002	0.0056	15.9
	50	0.0893	0.3199	0.2893	0.0004	0.0238	30.3
	120	0.0694	0.3529	0.4565	0.0006	0.0383	51.7
	175	0.0988	0.5861	0.7696	0.0011	0.0428	101
	250	0.1204	0.3666	1.1658	0.0019	0.0370	172
	500	0.2290	0.7443	2.0659	0.0039	0.0701	345
	750	0.3462	1.1159	3.2041	0.0058	0.1072	517
Tractors/Loaders/Backhoes Total		0.0792	0.3782	0.5392	0.0008	0.0387	66.8
Trenchers	15	0.0099	0.0517	0.0617	0.0001	0.0024	8.5
	25	0.0397	0.1355	0.2511	0.0004	0.0097	32.9
	50	0.1566	0.4082	0.3432	0.0004	0.0353	32.9
	120	0.1281	0.4684	0.7862	0.0008	0.0669	64.9
	175	0.1955	0.8632	1.5520	0.0016	0.0849	144
	250	0.2354	0.7089	2.2485	0.0025	0.0880	223
	500	0.2985	1.3011	2.8470	0.0031	0.1105	311
	750	0.5663	2.4440	5.4715	0.0059	0.2099	587
Trenchers Total		0.1427	0.4675	0.6684	0.0007	0.0549	58.7
Welders	15	0.0104	0.0416	0.0629	0.0001	0.0041	6.2
	25	0.0208	0.0581	0.1020	0.0001	0.0063	11.3
	50	0.0979	0.2753	0.2535	0.0003	0.0240	26.0
	120	0.0654	0.2659	0.4099	0.0005	0.0358	39.5
	175	0.1101	0.5455	0.9083	0.0011	0.0490	98.2
	250	0.0855	0.2618	1.0026	0.0013	0.0301	119
	500	0.1092	0.3838	1.2526	0.0016	0.0394	168
Welders Total		0.0646	0.2096	0.2564	0.0003	0.0225	25.6

Table A-14. Offroad Emissions Calculation - Using SCAB Emission Factors - CSF1

2012 SCAB emission factors (EFs) corresponding to OFFROAD2007 model are applied to CO2, ROG, and SOX.
Tier 2 and 3 EFs are applied to NOx, PM, and CO. Calculation details are provided in *Offroad Tier 2* and *Offroad Tier 3* worksheets.
Load factors are used in conjunction with Tier 2and 3 EFs.

Offroad Equipment Project Total

ROG lbs/day	SOx lbs/day	CO2 lbs/day	ROG (tons)	SOX (tons)	CO2 (tons)
355.29	31.41	134042.06	31.98	2.83	12,063.79

Mount Signal Solar Farm 1
Site Preparation
7 months

Primary Equipment Description	Offroad Equip Category	HP Estimate	Primary Equip Quantity	Activity Schedule Estimate (Days)	Duration of Use (Hours/ Day)	Total Hours of Utilization 150,840	HP Used for OFFROAD	2012 SCAB ROG (lbs/hr)	2012 SCAB SOX (lbs/hr)	2012 SCAB CO2 (lbs/hr)	2012 SCAB ROG lbs/day	2012 SCAB SOx lbs/day	2012 SCAB CO2 lbs/day	2012 SCAB ROG (tons)	2012 SCAB SOX (tons)	2012 SCAB CO2 (tons)
10,000 lb Rough Terrain Fork Lift	Rough Terrain Forklift	200	7	180	4	5040	250	0.3798	0.0416	170.7966						
Track Type Dozer	Grader	350	7	180	2	2520	500	0.6289	0.0608	229.4844	8.8047	0.8513	3212.7810	0.7924	0.0766	289.1503
Drum Type Compactor	Paving Equipment	250	7	180	2	2520	250	0.3763	0.0467	122.2913	5.2681	0.6540	1712.0782	0.4741	0.0589	154.0870
Backhoe	Tractor/loader/backhoe	200	14	180	4	10080	250	0.3666	0.0370	171.7370	20.5278	2.0719	9617.2727	1.8475	0.1865	865.5545
Racking Post Ramming Machine	Other Construction Equipment	200	48	180	8	69120	500	0.5234	0.0491	254.2385	200.9987	18.8607	97627.5934	18.0899	1.6975	8786.4834
80 Ton Rough Terrain Cranes	Off-highway Truck	400	6	180	2	2160	500	0.6362	0.0634	272.3339	7.6343	0.7602	3268.0063	0.6871	0.0684	294.1206
Generator	Generator Sets	30	28	180	8	40320	50	0.2639	0.0234	30.6230	59.1047	5.2407	6859.5508	5.3194	0.4717	617.3596
Pickup Truck	Off-highway Truck	250	16	180	4	11520	250	0.3837	0.0412	166.5454	24.5544	2.6392	10658.9058	2.2099	0.2375	959.3015
ATV	ATVs	50	16	180	4	11520	50	0.4077	0.0013	1.3532	26.0918	0.0864	86.6040	2.3483	0.0078	7.7944
4000 Gallon Water Truck	Off-highway Truck	250	2	180	1	360	250	0.3837	0.0412	166.5454	0.7673	0.0825	333.0908	0.0691	0.0074	29.9782
Fuel Truck	Off-highway Truck	300	4	180	1	720	500	0.3837	0.0412	166.5454	1.5347	0.1649	666.1816	0.1381	0.0148	59.9563

Table A-15. Offroad Emissions Calculations - Using Tier 2 Emission Factors - CSF1

Tier 2 emission factors (EFs) are applied to NOx, PM, and CO. Load Factors (LFs) are used in conjunction with Tier 2 EFs.
2012 SCAB EFs (OFFROAD2007) are applied to CO2, ROG, and SOX. Calculation detail is provided in *Offroad SCAB* worksheet.

Offroad Equipment Project

NOX lbs/day	PM lbs/day	CO lbs/day	NOX (tons)	PM (tons)
732.21	25.83	442.42	65.90	2.32

Mount Signal Solar Farm 1

7 months

Primary Equipment Description	Offroad Equip Category	HP Estimate	Primary Equip Quantity	Activity Schedule Estimate (Days)	Duration of Use (Hours/ Day)	Total Hours of Utilization 150,840	Load Factor for Tier 2	HP Used for OFFROAD	TIER 2 NOX (lbs/hr)	TIER 2 PM (lbs/hr)	TIER 2 CO (lbs/hr)	TIER 2 NOX lbs/day	TIER 2 PM lbs/day	TIER 2 CO lbs/day	TIER 2 CO (tons)	TIER 2 PM (tons)
10,000 lb Rough Terrain Fork Lift	Rough Terrain Forklift	200	7	180	4	5040	0.6	250	1.2963	0.0397	0.6878	36.30	1.11	19.26	3.2667	0.1000
Track Type Dozer	Grader	350	7	180	2	2520	0.61	500	2.2593	0.0706	1.2238	31.63	0.99	17.13	2.8467	0.0890
Drum Type Compactor	Paving Equipment	250	7	180	2	2520	0.53	250	1.4313	0.0438	0.7595	20.04	0.61	10.63	1.8035	0.0552
Backhoe	Tractor/loader/backhoe	200	14	180	4	10080	0.55	250	1.1883	0.0364	0.6305	66.54	2.04	35.31	5.9889	0.1833
Racking Post Ramming Machine	Other Construction Equipment	200	48	180	8	69120	0.5	500	1.0802	0.0331	0.5732	414.81	12.70	220.11	37.3333	1.1429
80 Ton Rough Terrain Cranes	Off-highway Truck	400	6	180	2	2160	0.57	500	2.4127	0.0754	1.3069	28.95	0.90	15.68	2.6057	0.0814
Generator	Generator Sets	30	28	180	8	40320	0.74	50	0.2741	0.0220	0.2007	61.39	4.93	44.95	5.5253	0.4440
Pickup Truck	Off-highway Truck	250	16	180	4	11520	0.57	250	1.5394	0.0471	0.8168	98.52	3.02	52.28	8.8667	0.2714
ATV	ATVs	50	16	180	4	11520	0.5	50	0.0001	0.0049	0.6371	0.01	0.32	40.78	0.0007	0.0285
4000 Gallon Water Truck	Off-highway Truck	250	2	180	1	360	0.57	250	1.5394	0.0471	0.8168	3.08	0.09	1.63	0.2771	0.0085
Fuel Truck	Fuel Truck	300	4	180	1	720	0.57	500	1.8095	0.0565	0.9802	7.24	0.23	3.92	0.6514	0.0204

Total

CO (tons)
39.82

TIER 2 CO (tons)
1.7333
1.5419
0.9569
3.1778
19.8095
1.4114
4.0453
4.7048
3.6699
0.1470
0.3529

Table A-16. ARB and USEPA Off-Road Compression-Ignition (Diesel) Engine Standards (NMHC+NOx/CO/PM in g/bhp-hr). When ARB and USEPA standards differ, the standards shown here represent the more stringent of the two.

Maximum horsepower	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015+
<11	See Table 2 footnote (a)					7.8 / 6.0 / 0.75					5.6 / 6.0 / 0.6			5.6 / 6.0 / 0.30[a]							
11≤hp<25						7.1 / 4.9 / 0.60					5.6 / 4.9 / 0.60			5.6 / 4.9 / 0.30							
25≤hp<50	-					7.1 /4.1 / 0.60				5.6 / 4.1 / 0.45				5.6 / 4.1 / 0.22					3.5 / 4.1 / 0.02		
50≤hp< 75						- / 6.9 / - / -[b]				5.6 / 3.7 / 0.30				3.5 / 3.7 / 0.22[c]					3.5 / 3.7 / 0.02[c]		
75≤hp<100														3.5 / 3.7 / 0.30			0.14 / 2.5 / 3.7 / 0.015[b,d]				0.14 / 0.30 / 3.7 / 0.015[b]
100≤hp<175									4.9 / 3.7 / 0.22				3.0 / 3.7 / 0.22								
175≤hp<300									4.9 / 2.6 / 0.15												
300≤hp<600	-		1.0 / 6.9 / 8.5 / 0.40[b]					4.8 / 2.6 / 0.15				3.0 / 2.6 / 0.15[e]					0.14 / 1.5 / 2.6 / 0.015[b,d]				0.14 / 0.30 / 2.2 / 0.015[b]
600≤hp≤750																					
Mobile Machines > 750hp	-					1.0 / 6.9 / 8.5 / 0.40[b]						4.8 / 2.6 / 0.15					0.30 / 2.6 / 2.6 / 0.07[b]				0.14 / 2.6 / 2.6 / 0.03[b]
750hp<GEN ≤1200hp																					0.14 / 0.50 / 2.6 / 0.02[b]
GEN>1200 hp																	0.30 / 0.50 / 2.6 / 0.07[b]				

a) The PM standard for hand-start, air cooled, direct injection engines below 11 hp may be delayed until 2010 and be set at 0.45 g/bhp-hr.
b) Standards given are NMHC/NOx/CO/PM in g/bhp-hr.
c) Engine families in this power category may alternately meet Tier 3 PM standards (0.30 g/bhp-hr) from 2008-2011 in exchange for introducing final PM standards in 2012.
d) The implementation schedule shown is the three-year alternate NOx approach. Other schedules are available.
e) Certain manufacturers have agreed to comply with these standards by 2005.

: Tier 1 : Tier 2 : Tier 3 : Tier 4 Interim / Final

	TIER 2 Emission Factors						TIER 3 Emission Factors						% reduction from TIER 2 to TIER 3		
	NOx		CO		PM		NOx		CO		PM		NOx	CO	PM
Maximum horsepower	g/bhp-hr	lb/bhp-hr	g/bhp-hr	lb/bhp-hr	g/bhp-hr	lb/bhp-hr	g/bhp-hr	lb/bhp-hr	g/bhp-hr	lb/bhp-hr	g/bhp-hr	lb/bhp-hr			
<11	5.6	0.0123457	6	0.0132275	0.6	0.0013228	5.6	0.0123457	6	0.0132275	0.6	0.0013228	0.00%	0.00%	0.00%
11≤hp<25	5.6	0.0123457	4.9	0.0108025	0.6	0.0013228	5.6	0.0123457	4.9	0.0108025	0.6	0.0013228	0.00%	0.00%	0.00%
25≤hp<50	5.6	0.0123457	4.1	0.0090388	0.45	0.0009921	5.6	0.0123457	4.1	0.0090388	0.45	0.0009921	0.00%	0.00%	0.00%
50≤hp< 75	5.6	0.0123457	3.7	0.008157	0.3	0.0006614	5.6	0.0123457	3.7	0.008157	0.3	0.0006614	0.00%	0.00%	0.00%
75≤hp<100	5.6	0.0123457	3.7	0.008157	0.3	0.0006614	3.5	0.007716	3.7	0.008157	0.3	0.0006614	37.50%	0.00%	0.00%
100≤hp<175	4.9	0.0108025	3.7	0.008157	0.22	0.000485	3	0.0066138	3.7	0.008157	0.22	0.000485	38.78%	0.00%	0.00%
175≤hp<300	4.9	0.0108025	2.6	0.0057319	0.15	0.0003307	3	0.0066138	2.6	0.0057319	0.15	0.0003307	38.78%	0.00%	0.00%
300≤hp<600	4.8	0.010582	2.6	0.0057319	0.15	0.0003307	3	0.0066138	2.6	0.0057319	0.15	0.0003307	37.50%	0.00%	0.00%
600≤hp≤750	4.8	0.010582	2.6	0.0057319	0.15	0.0003307	3	0.0066138	2.6	0.0057319	0.15	0.0003307	37.50%	0.00%	0.00%
Mobile Machines > 750hp	4.8	0.010582	2.6	0.0057319	0.15	0.0003307	4.8	0.010582	2.6	0.0057319	0.15	0.0003307	0.00%	0.00%	0.00%
	4.8	0.010582	2.6	0.0057319	0.15	0.0003307	4.8	0.010582	2.6	0.0057319	0.15	0.0003307	0.00%	0.00%	0.00%
750hp<GEN ≤1200hp	4.8	0.010582	2.6	0.0057319	0.15	0.0003307	4.8	0.010582	2.6	0.0057319	0.15	0.0003307	0.00%	0.00%	0.00%
GEN>1200 hp	4.8	0.010582	2.6	0.0057319	0.15	0.0003307	4.8	0.010582	2.6	0.0057319	0.15	0.0003307	0.00%	0.00%	0.00%

: Tier 2

: Tier 3

Table A-17. PSR Offroad Load Factors - CSF1

Used in conjunction with Tier 2-3 emission factors.

Source: mailout MSC99-32, http://www.arb.ca.gov/msei/onroad/downloads/pubs/mo9932.zip (4/2/2009)

Category	Equipment	HP	P/N	Activity (hrs/yr)	Load
Agricultural	Agricultural Mowers	120	P	363	0.43
	Agricultural Tractors	50	P	475	0.70
		120	P	475	0.70
		175	P	475	0.70
		250	N	475	0.70
		500	N	475	0.70
	Balers	50	P	95	0.58
		120	P	95	0.58
	Combines	120	P	150	0.70
		175	P	150	0.70
		250	N	150	0.70
		500	N	150	0.70
	Hydro Power Units	50	P	790	0.48
		120	P	790	0.48
	Irrigation Pumps	50	P	749	0.65
		120	P	749	0.65
		175	P	749	0.65
		250	N	749	0.65
		500	N	749	0.65
	Other Agricultural Equipment	50	P	381	0.51
		120	P	381	0.51
		175	P	381	0.51
		250	N	381	0.51
		500	N	381	0.51
	Sprayers	50	P	90	0.50
		120	P	90	0.50
		175	P	90	0.50
		250	N	90	0.50
		500	N	90	0.50
	Swathers	120	P	110	0.55
		175	P	110	0.55
	Tillers >5 HP	250	N	172	0.78
		500	N	172	0.78
Commercial	Air Compressors	50	P	815	0.48
		120	P	815	0.48
		175	P	815	0.48
		250	N	815	0.48
		500	N	815	0.48
		750	N	815	0.48
		9999	N	815	0.48
	Generator Sets	50	N	338	0.74
		120	N	338	0.74
		175	N	338	0.74
		250	N	338	0.74
		500	N	338	0.74
		750	N	338	0.74
		9999	N	338	0.74
	Pressure Washers	50	P	145	0.30
		120	P	145	0.30
	Pumps	50	P	403	0.74
		120	P	403	0.74

Table A-17. PSR Offroad Load Factors - CSF1

Used in conjunction with Tier 2-3 emission factors.

Source: mailout MSC99-32, http://www.arb.ca.gov/msei/onroad/downloads/pubs/mo9932.zip (4/2/2009)

Category	Equipment	HP	P/N	Activity (hrs/yr)	Load
		175	P	403	0.74
		250	N	403	0.74
		500	N	403	0.74
		9999	N	403	0.74
	Welders	50	P	643	0.45
		120	P	643	0.45
		175	P	643	0.45
Construction	Bore/Drill Rigs	50	P	726	0.75
		120	P	726	0.75
		175	P	726	0.75
		250	N	726	0.75
		500	N	726	0.75
		750	N	726	0.75
		9999	N	726	0.75
	Concrete/Industrial Saws	50	P	580	0.73
		120	P	580	0.73
		175	P	580	0.73
	Cranes	50	P	1464	0.43
		120	P	1464	0.43
		175	P	1464	0.43
		250	N	1464	0.43
		500	N	1464	0.43
		750	N	1464	0.43
	Crawler Tractors	50	P	936	0.64
		120	P	936	0.64
		175	P	936	0.64
		250	N	936	0.64
		500	N	936	0.64
		750	N	936	0.64
		9999	N	936	0.64
	Crushing/Proc. Equipment	50	P	955	0.78
		120	P	955	0.78
		175	P	955	0.78
		250	N	955	0.78
		500	N	955	0.78
		750	N	955	0.78
		9999	N	955	0.78
	Excavators	50	P	1162	0.57
		120	P	1162	0.57
		175	P	1162	0.57
		250	N	1162	0.57
		500	N	1162	0.57
		750	N	1162	0.57
	Graders	50	P	965	0.61
		120	P	965	0.61
		175	P	965	0.61
		250	N	965	0.61
		500	N	965	0.61
		750	N	965	0.61
	Off-Highway Tractors	120	P	855	0.65
		175	P	855	0.65

Table A-17. PSR Offroad Load Factors - CSF1

Used in conjunction with Tier 2-3 emission factors.

Source: mailout MSC99-32, http://www.arb.ca.gov/msei/onroad/downloads/pubs/mo9932.zip (4/2/2009)

Category	Equipment	HP	P/N	Activity (hrs/yr)	Load
		250	N	855	0.65
		750	N	855	0.65
		9999	N	855	0.65
	Off-Highway Trucks	175	P	1641	0.57
		250	N	1641	0.57
		500	N	1641	0.57
		750	N	1641	0.57
		9999	N	1641	0.57
	Other Construction Equipment	50	P	606	0.62
		120	P	606	0.62
		175	P	606	0.62
		500	N	606	0.62
	Pavers	50	P	828	0.62
		120	P	828	0.62
		175	P	828	0.62
		250	N	828	0.62
		500	N	828	0.62
	Paving Equipment	50	P	622	0.53
		120	P	622	0.53
		175	P	622	0.53
		250	N	622	0.53
	Rollers	50	P	748	0.56
		120	P	748	0.56
		175	P	748	0.56
		250	N	748	0.56
		500	N	748	0.56
	Rough Terrain Forklifts	50	P	1198	0.60
		120	P	1198	0.60
		175	P	1198	0.60
		250	N	1198	0.60
		500	N	1198	0.60
	Rubber Tired Dozers	175	P	899	0.59
		250	N	899	0.59
		500	N	899	0.59
		750	N	899	0.59
		9999	N	899	0.59
	Rubber Tired Loaders	50	P	1346	0.54
		120	P	1346	0.54
		175	P	1346	0.54
		250	N	1346	0.54
		500	N	1346	0.54
		750	N	1346	0.54
		9999	N	1346	0.54
	Scrapers	120	P	1090	0.72
		175	P	1090	0.72
		250	N	1090	0.72
		500	N	1090	0.72
		750	N	1090	0.72
	Signal Boards	50	P	535	0.78
		120	P	535	0.78
		175	P	535	0.78

Table A-17. PSR Offroad Load Factors - CSF1

Used in conjunction with Tier 2-3 emission factors.

Source: mailout MSC99-32, http://www.arb.ca.gov/msei/onroad/downloads/pubs/mo9932.zip (4/2/2009)

Category	Equipment	HP	P/N	Activity (hrs/yr)	Load
		250	N	535	0.78
	Skid Steer Loaders	50	P	811	0.55
		120	P	811	0.55
	Surfacing Equipment	50	P	561	0.45
		120	P	561	0.45
		175	P	561	0.45
		250	N	561	0.45
		500	N	561	0.45
		750	N	561	0.45
	Tractors/Loaders/Backhoes	50	P	1135	0.55
		120	P	1135	0.55
		175	P	1135	0.55
		250	N	1135	0.55
	Trenchers	50	P	620	0.75
		120	P	620	0.75
		175	P	620	0.75
		250	N	620	0.75
		500	N	620	0.75
		750	N	620	0.75
Dredging	Compressor (Dredging)	50	P	815	0.48
		120	P	815	0.48
	Crane	750	N	1464	0.43
	Deck/door engine	250	N	142	0.80
	Dredger	175	P	878	0.51
		250	N	878	0.51
		750	N	878	0.51
	Generator (Dredging)	50	P	1011	0.74
		120	P	1011	0.74
		175	P	1011	0.74
		250	N	1011	0.74
		500	N	1011	0.74
		750	N	1011	0.74
		9999	N	1011	0.74
	Hoist/swing/winch	50	P	878	0.51
		120	P	878	0.51
		175	P	878	0.51
		250	N	878	0.51
		500	N	878	0.51
		750	N	878	0.51
		9999	N	878	0.51
	Other (Dredging)	120	P	878	0.51
		175	P	878	0.51
		250	N	878	0.51
		500	N	878	0.51
	Pump (Dredging)	175	P	403	0.74
		250	N	403	0.74
		500	N	403	0.74
		9999	N	403	0.74
Drilling	Compressors (Workover)	120	P	1231	0.60
		175	P	1231	0.60
		250	N	1231	0.60

Table A-17. PSR Offroad Load Factors - CSF1

Used in conjunction with Tier 2-3 emission factors.

Source: mailout MSC99-32, http://www.arb.ca.gov/msei/onroad/downloads/pubs/mo9932.zip (4/2/2009)

Category	Equipment	HP	P/N	Activity (hrs/yr)	Load
		750	N	1231	0.60
	Generator (Drilling)	120	P	1231	0.60
		175	P	1231	0.60
		250	N	1231	0.60
		750	N	1231	0.60
	Generator (Workover)	120	P	1231	0.60
		175	P	1231	0.60
		250	N	1231	0.60
		750	N	1231	0.60
		9999	N	1231	0.60
	Lift (Drilling)	250	N	1231	0.60
		750	N	1231	0.60
	Other Drilling Equipment	120	P	1231	0.60
		175	P	1231	0.60
		250	N	1231	0.60
		750	N	1231	0.60
		9999	N	1231	0.60
	Other Workover Equipment	120	P	1231	0.60
		175	P	1231	0.60
		250	N	1231	0.60
		750	N	1231	0.60
		9999	N	1231	0.60
	Pump (Drilling)	120	P	1231	0.60
		175	P	1231	0.60
		250	N	1231	0.60
		750	N	1231	0.60
		9999	N	1231	0.60
	Pump (Workover)	120	P	1231	0.60
		175	P	1231	0.60
		250	N	1231	0.60
		750	N	1231	0.60
		9999	N	1231	0.60
	Snubbing	120	P	1231	0.60
	Swivel	120	P	1231	0.60
		175	P	1231	0.60
		250	N	1231	0.60
		750	N	1231	0.60
Ground Support Equipment	A/C Tug Narrow Body	250	N	606.1839847	0.80
	A/C Tug Wide Body	500	N	759.2692308	0.80
	Air Conditioner	175	N	808.1666667	0.75
	Air Start Unit	500	N	332.9655172	0.90
	Baggage Tug	120	N	1623.8	0.55
	Belt Loader	120	N	1037.643678	0.50
	Bobtail	120	N	1867.428571	0.55
	Cargo Loader	120	N	901.7941176	0.50
	Cargo Tractors	120	N	101	0.54
	Catering Truck	250	N	1600	0.52
	Forklift	175	P	731.5	0.30
	Fuel Truck	250	N	3489.166667	0.25
	Generator	175	N	1629.714286	0.78
	Ground Power Unit	175	N	968.4296875	0.75

Table A-17. PSR Offroad Load Factors - CSF1

Used in conjunction with Tier 2-3 emission factors.

Source: mailout MSC99-32, http://www.arb.ca.gov/msei/onroad/downloads/pubs/mo9932.zip (4/2/2009)

Category	Equipment	HP	P/N	Activity (hrs/yr)	Load
	Hydrant Truck	175	N	224.25	0.70
	Lav Truck	175	N	1306.5	0.25
	Lift	120	N	917.3636364	0.50
	Other	175	N	1645.590909	0.50
	Passenger Stand	120	N	70	0.59
	Service Truck	175	N	1930.75	0.20
	Sweeper	120	N	12	0.51
Industrial	Aerial Lifts	50	P	384	0.46
		120	P	384	0.46
		500	N	384	0.46
		750	N	384	0.46
	Forklifts	50	P	1800	0.30
		120	P	1800	0.30
		175	P	1800	0.30
		250	N	1800	0.30
		500	N	1800	0.30
	Other General Industrial Equipment	50	N	878	0.51
		120	N	878	0.51
		175	N	878	0.51
		250	N	878	0.51
		500	N	878	0.51
		750	N	878	0.51
		9999	N	878	0.51
	Other Material Handling Equipment	50	N	421	0.59
		120	N	421	0.59
		175	N	421	0.59
		250	N	421	0.59
		500	N	421	0.59
	Sweepers/Scrubbers	50	N	1220	0.68
		120	N	1220	0.68
		175	N	1220	0.68
		250	N	1220	0.68
Lawn and Garden	Chippers/Stump Grinders	120	P	465	0.73
		175	P	465	0.73
		250	N	465	0.73
		500	N	465	0.73
		750	N	465	0.73
	Leaf Blowers/Vacuums	120	N	120	0.40
		250	N	120	0.40
	Snowblowers	175	P	400	0.65
		250	N	400	0.65
		500	N	400	0.65
Logging	Fellers/Bunchers	120	P	1276	0.71
		175	P	1276	0.71
		250	N	1276	0.71
		500	N	1276	0.71
		750	N	1276	0.71
	Shredders	175	P	120	0.40
	Skidders	120	P	1442	0.74
		175	P	1442	0.74
		250	N	1442	0.74

Table A-17. PSR Offroad Load Factors - CSF1

Used in conjunction with Tier 2-3 emission factors.

Source: mailout MSC99-32, http://www.arb.ca.gov/msei/onroad/downloads/pubs/mo9932.zip (4/2/2009)

Category	Equipment	HP	P/N	Activity (hrs/yr)	Load
		500	N	1442	0.74
Military Tactical Support	A/C unit	120	P	300	0.60
		250	N	300	0.60
		500	N	300	0.60
	Aircraft Support	120	P	300	0.60
		175	P	300	0.60
	Cart	120	P	300	0.60
		175	P	300	0.60
		250	N	300	0.60
	Communications	50	P	300	0.60
		120	P	300	0.60
	Compressor (Military)	50	P	300	0.60
		120	P	300	0.60
		175	P	300	0.60
		250	N	300	0.60
		500	N	300	0.60
	Crane	120	P	300	0.60
		175	P	300	0.60
		250	N	300	0.60
	Deicer	120	P	300	0.60
	Generator (Military)	50	P	300	0.60
		120	P	300	0.60
		175	P	300	0.60
		250	N	300	0.60
		500	N	300	0.60
	Hydraulic unit	120	P	300	0.60
	Lift (Military)	120	P	300	0.60
	Light	50	P	300	0.60
	Other tactical support equipment	50	P	300	0.60
		120	P	300	0.60
		175	P	300	0.60
		250	N	300	0.60
		500	N	300	0.60
		750	N	300	0.60
	Pressure Washer	175	P	300	0.60
	Pump (Military)	50	P	300	0.60
		120	P	300	0.60
	Start Cart	120	P	300	0.60
		500	N	300	0.60
	Test Stand	120	P	300	0.60
		175	P	300	0.60
		250	N	300	0.60
		500	N	300	0.60
	Welder	50	P	300	0.60
		120	P	300	0.60
Misc. Portable Equipment	Misc Portable Equipment	120	P	484	0.56
		175	P	484	0.56
		250	N	484	0.56
		500	N	484	0.56
		750	N	484	0.56
		9999	N	484	0.56

Table A-17. PSR Offroad Load Factors - CSF1

Used in conjunction with Tier 2-3 emission factors.

Source: mailout MSC99-32, http://www.arb.ca.gov/msei/onroad/downloads/pubs/mo9932.zip (4/2/2009)

Category	Equipment	HP	P/N	Activity (hrs/yr)	Load
Transport Refrigeration	Transport Refrigeration Unit	50	N	1341	0.28
		120	P	1341	0.28

Table A-18. Onroad Emissions Calculation - CSF1

Emission factors generated by EMFAC assuming 1990-2012 composite fleet of light, medium, and heavy duty vehicles.

Light Duty Autos and Trucks

Overall Personnel to Work Sites Worker Commute Trips *	Workers	Months	Veh/Day	RT/day (mi)	Miles/Day	Total Miles	Composite Emissions for Fleet of Vehicles NOX (lb/1000mi)	ROG (lb/1000mi)	PM (lb/1000mi)	CO (lb/1000mi)	SOX (lb/1000mi)	CO2 (lb/1000mi)
Maximum Labor Force	462	12	462	60	27,720	7,318,080	0.9535	0.8283	0.0771	8.6058	0.0096	910.1854
Typical Labor Force	375	10	375	60	22,500	4,950,000	0.9535	0.8283	0.0771	8.6058	0.0096	910.1854
* Estimated rideshare factor	1			SubTot Personnel (mi)		12,268,080						

Max Daily 30

Operational Emissions - Light Duty	RT/day (mi)	Vehicle Days	Total Miles	NOX (lb/1000mi)	ROG (lb/1000mi)	PM (lb/1000mi)	CO (lb/1000mi)	SOX (lb/1000mi)	CO2 (lb/1000mi)
SubTot Crew and QA/QC Mobilize (mi)	60	1,610	96,600	0.9535	0.8283	0.0771	8.6058	0.0096	910.1854

TOTAL Light Duty Autos and Trucks (vmt) 12,364,680

Medium to Heavy Duty Trucks Max Daily 30

Operational Emissions - Medium Duty	RT/day (mi)	Vehicle Days	Total Miles	Composite Emissions for Fleet of Vehicles NOX (lb/1000mi)	ROG (lb/1000mi)	PM (lb/1000mi)	CO (lb/1000mi)	SOX (lb/1000mi)	CO2 (lb/1000mi)
Splicing/testing vans, dump trucks under 200hp	60	100	6,000	2.9326	0.7038	0.1173	7.3021	0.0000	1671.5543
Miscellaneous hardware deliveries	60	100	6000	2.9326	0.7038	0.1173	7.3021	0.0000	1671.5543

TOTAL Medium Duty Trucks (vmt) 12,000

Heavy-Heavy Duty Trucks Max Daily 30

Operational Emissions - Heavy Duty	RT/day (mi)	Vehicle Days	Total Miles	Composite Emissions for Fleet of Vehicles NOX (lb/1000mi)	ROG (lb/1000mi)	PM (lb/1000mi)	CO (lb/1000mi)	SOX (lb/1000mi)	CO2 (lb/1000mi)
Local material deliveries and waste removal	60	1,995	119,700	23.9168	1.7724	0.9190	7.9650	0.0438	4157.5492
Port to marshalling yards material deliveries	150	1,050	157,500	23.9168	1.7724	0.9190	7.9650	0.0438	4157.5492
Equipment deliveries	60	0	0	23.9168	1.7724	0.9190	7.9650	0.0438	4157.5492
Water transportation	60	20	1,200	23.9168	1.7724	0.9190	7.9650	0.0438	4157.5492
Fuel transportation	60	310	18,600	23.9168	1.7724	0.9190	7.9650	0.0438	4157.5492

TOTAL Heavy-Heavy Duty Trucks (vmt) 297,000

Table A-18. Onroad Emissions Calculation - CSF1

Emission factors generated by EMFAC assuming 1990-2012 composite fleet of light, medium, and heavy duty vehicles.

Overall Onroad Emissions

NOX lbs/day	ROG lbs/day	PM lbs/day	CO lbs/day	SOX lbs/day	CO2 lbs/day	NOX (ton)	ROG (ton)	PM (ton)	CO (ton)	SOX (ton)	CO2 (ton)
339.99	66.36	15.18	567.15	1.01	102,008.77	9.46	5.39	0.61	54.43	0.07	6,254.50

Light Duty Autos and Trucks

Overall Personnel to Work Sites / Worker Commute Trips *	Workers	Months	Veh/Day	RT/day (mi)	Miles/Day	Total Miles	NOX lbs/day	ROG lbs/day	PM lbs/day	CO lbs/day	SOX lbs/day	CO2 lbs/day	NOX (ton)	ROG (ton)	PM (ton)	CO (ton)	SOX (ton)	CO2 (ton)
Maximum Labor Force	462	12	462	60	27,720	7,318,080	26.43	22.96	2.14	238.55	0.27	25230.34	3.4890	3.0308	0.2819	31.4891	0.0352	3330.4048
Typical Labor Force	375	10	375	60	22,500	4,950,000	21.45	18.64	1.73	193.63	0.22	20479.17	2.3600	2.0501	0.1907	21.2994	0.0238	2252.7089
* Estimated rideshare factor	1				SubTot Personnel (mi)	12,268,080												

Total Emissions for Vehicles

Max Daily 30

Operational Emissions - Light Duty	RT/day (mi)	Vehicle Days	Total Miles	NOX lbs/day	ROG lbs/day	PM lbs/day	CO lbs/day	SOX lbs/day	CO2 lbs/day	NOX (ton)	ROG (ton)	PM (ton)	CO (ton)	SOX (ton)	CO2 (ton)
SubTot Crew and QA/QC Mobilize (mi)	60	1,610	96,600	1.72	1.49	0.14	15.49	0.02	1638.33	0.0461	0.0400	0.0037	0.4157	0.0005	43.9620

TOTAL Light Duty Autos and Trucks (vmt) 12,364,680

Medium to Heavy Duty Trucks

Max Daily 30

Total Emissions for Vehicles

Operational Emissions - Medium Duty	RT/day (mi)	Vehicle Days	Total Miles	NOX lbs/day	ROG lbs/day	PM lbs/day	CO lbs/day	SOX lbs/day	CO2 lbs/day	NOX (ton)	ROG (ton)	PM (ton)	CO (ton)	SOX (ton)	CO2 (ton)
Splicing/testing vans, dump trucks under 200hp	60	100	6,000	5.28	1.27	0.21	13.14	0.00	3008.80	0.0088	0.0021	0.0004	0.0219	0.0000	5.0147
Miscellaneous hardware deliveries	60	100	6000	5.28	1.27	0.21	13.14	0.00	3008.80	0.0088	0.0021	0.0004	0.0219	0.0000	5.0147

TOTAL Medium Duty Trucks (vmt) 12,000

Heavy-Heavy Duty Trucks

Max Daily 30

Total Emissions for Vehicles

Operational Emissions - Heavy Duty	RT/day (mi)	Vehicle Days	Total Miles	NOX lbs/day	ROG lbs/day	PM lbs/day	CO lbs/day	SOX lbs/day	CO2 lbs/day	NOX (ton)	ROG (ton)	PM (ton)	CO (ton)	SOX (ton)	CO2 (ton)
Local material deliveries and waste removal	60	1,995	119,700	43.05	3.19	1.65	14.34	0.08	7483.59	1.4314	0.1061	0.0550	0.4767	0.0026	248.8293
Port to marshalling yards material deliveries	150	1,050	157,500	107.63	7.98	4.14	35.84	0.20	18708.97	1.8835	0.1396	0.0724	0.6272	0.0034	327.4070
Equipment deliveries	60	0	0	43.05	3.19	1.65	14.34	0.08	7483.59	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water transportation	60	20	1,200	43.05	3.19	1.65	14.34	0.08	7483.59	0.0144	0.0011	0.0006	0.0048	0.0000	2.4945
Fuel transportation	60	310	18,600	43.05	3.19	1.65	14.34	0.08	7483.59	0.2224	0.0165	0.0085	0.0741	0.0004	38.6652

TOTAL Heavy-Heavy Duty Trucks (vmt) 297,000

Table A-19. Onroad Vehicle Mix and Schedules - CSF1

Source: Equipment mix and schedules from similar projects

Total Vehicle Workdays		
Light	Medium	Heavy
1,610.00	100.00	2,325.00

Site Preparation

1 month

Primary Equipment Description	HP Estimate	Primary Equip Quantity	Activity Schedule Estimate (Days)	Duration of Use (Hours/ Day)	Total Hours of Utilization	Onroad Vehicle Category	Light Duty Fractional Total Vehicle Workdays	Medium Duty Fractional Total Vehicle Workdays	Heavy Duty Fractional Total Vehicle Workdays
					2,460				
1/2 Ton Pick-up Truck, 4X4	200	6	30	4	720	light	60.0		
Mechanic Truck	300	2	30	8	480	heavy			40.0
Fuel Truck	300	2	30	8	480	heavy			40.0
40' Flat Bed Truck & Trailer	350	2	30	10	600	heavy			50.0
Dump Truck (Trash)	350	1	30	6	180	heavy			15.0

Grading and Earthwork

3 months

Primary Equipment Description	HP Estimate	Primary Equip Quantity	Activity Schedule Estimate (Days)	Duration of Use (Hours/ Day)	Total Hours of Utilization	Onroad Vehicle Category	Light Duty Fractional Total Vehicle Workdays	Medium Duty Fractional Total Vehicle Workdays	Heavy Duty Fractional Total Vehicle Workdays
					9,000				
1/2 Ton Pick-up Truck, 4X4	200	6	90	4	2160	light	180.0		
Mechanic Truck	300	2	90	8	1440	heavy			120.0
Fuel Truck	300	2	90	8	1440	heavy			120.0
40' Flat Bed Truck & Trailer	350	2	90	10	1800	heavy			150.0
Dump Truck	350	4	90	6	2160	heavy			180.0

Table A-19. Onroad Vehicle Mix and Schedules - CSF1

Source: Equipment mix and schedules from similar projects

Total Vehicle Workdays		
Light	**Medium**	**Heavy**
1,610.00	**100.00**	**2,325.00**

Concrete Foundations

3 months

Primary Equipment Description	HP Estimate	Primary Equip Quantity	Activity Schedule Estimate (Days)	Duration of Use (Hours/ Day)	Total Hours of Utilization	Onroad Vehicle Category	Light Duty Fractional Total Vehicle Workdays	Medium Duty Fractional Total Vehicle Workdays	Heavy Duty Fractional Total Vehicle Workdays
					10,800				
1/2 Ton Pick-up Truck, 4X4	200	6	90	4	2160	light	180.0		
Mechanic Truck	300	2	90	8	1440	heavy			120.0
Fuel Truck	300	2	90	8	1440	heavy			120.0
10 cu.yd. Concrete Mixer Trucks	425	8	90	8	5760	heavy			480.0

Structural Steel Work

4 months

Primary Equipment Description	HP Estimate	Primary Equip Quantity	Activity Schedule Estimate (Days)	Duration of Use (Hours/ Day)	Total Hours of Utilization	Onroad Vehicle Category	Light Duty Fractional Total Vehicle Workdays	Medium Duty Fractional Total Vehicle Workdays	Heavy Duty Fractional Total Vehicle Workdays
					18,960				
1/2 Ton Pick-up Truck, 4X4	200	8	120	4	3840	light	320.0		
1 Ton Crew Cab 4X4	300	1	120	2	240	light	20.0		
30 Ton Boom Truck	300	1	120	2	240	heavy			20.0
1 Ton Crew Cab Flat Bed, 4X4	300	9	120	4	4320	light	360.0		
40' Flat Bed Truck & Trailer	350	2	120	10	2400	heavy			200.0
3/4 Ton Pick-up Truck, 4X4	300	4	120	4	1920	light	160.0		
1 Ton Crew Cab Flat Bed, 4X4	300	2	120	4	960	light	80.0		
Wire Trucks & Trailers	350	6	120	6	4320	heavy			360.0
Dump Truck (Trash)	350	1	120	6	720	heavy			60.0

Table A-19. Onroad Vehicle Mix and Schedules - CSF1

Source: Equipment mix and schedules from similar projects

Total Vehicle Workdays		
Light	Medium	Heavy
1,610.00	100.00	2,325.00

Electrical/Instrumentation Work

2 months

Primary Equipment Description	HP Estimate	Primary Equip Quantity	Activity Schedule Estimate (Days)	Duration of Use (Hours/ Day)	Total Hours of Utilization	Onroad Vehicle Category	Light Duty Fractional Total Vehicle Workdays	Medium Duty Fractional Total Vehicle Workdays	Heavy Duty Fractional Total Vehicle Workdays
					3,180				
Foreman Truck	180	1	60	4	240	light	20.0		
Mechanic Truck	250	1	60	10	600	heavy			50.0
5-Ton Flatbed Truck	180	5	60	5	1500	heavy			125.0
Pickup Trucks	180	4	60	2	480	light	40.0		
Crew Trucks	180	2	60	2	240	light	20.0		
Support Trucks	180	1	60	2	120	light	10.0		

Architectural and Landscape

2 months

Primary Equipment Description	HP Estimate	Primary Equip Quantity	Activity Schedule Estimate (Days)	Duration of Use (Hours/ Day)	Total Hours of Utilization	Onroad Vehicle Category	Light Duty Fractional Total Vehicle Workdays	Medium Duty Fractional Total Vehicle Workdays	Heavy Duty Fractional Total Vehicle Workdays
					3,180				
1/2 Ton Pick-up Truck, 4X4	200	6	60	2	720	light	60.0		
Fuel Truck	300	2	60	3	360	heavy			30.0
Crew Trucks	180	2	60	5	600	light	50.0		
5 CY Dump Trucks	180	2	60	10	1200	medium		100.0	
Mulch Truck	350	1	60	5	300	heavy			25.0

Testing

1 month

Primary Equipment Description	HP Estimate	Primary Equip Quantity	Activity Schedule Estimate (Days)	Duration of Use (Hours/ Day)	Total Hours of Utilization	Onroad Vehicle Category	Light Duty Fractional Total Vehicle Workdays	Medium Duty Fractional Total Vehicle Workdays	Heavy Duty Fractional Total Vehicle Workdays
					840				
1/2 Ton Pick-up Truck, 4X4	200	1	30	8	240	light	20.0		
1/2 Ton Pick-up Truck, 4X4	200	1	30	8	240	light	20.0		
1 Ton Crew Cab 4X4	300	1	30	4	120	light	10.0		
Water Trucks	350	1	30	8	240	heavy			20.0

Estimated Deliveries from Port to Marshalling Yard and Miscellaneous Hardware

Material	No. Deliveries	Origin	SD Co R/T Miles	Imp Co R/T Miles
Transmission Lines				
Steel	500	Long Beach	150	60
Conductors	400	Long Beach	150	60
Misc Hardware	100	Local	60	60
Underground Structures				
Conductors	100	Long Beach	150	0
Substations				
Steel	40	Long Beach	150	0
Equipment	100	Local	60	0
Transformers	10	Long Beach	150	0

Table A-20 Onroad Emission Factors - CSF1

Source: EMFAC2007 v.2.3, burden reports for Imperial County.

Composite fleet: 1990 - 2012 for light, medium, and heavy duty vehicle classes

1990-2012 Composite Fleet County-Wide

Imperial County Vehicle Class	2012 Fleet (VMT/1000)	NOX (ton/day)	ROG (ton/day)	PM (ton/day)	CO (ton/day)	SOX (ton/day)	CO2 (ton/day)	NOX (lb/1000mi)	ROG (lb/1000mi)	PM (lb/1000mi)	CO (lb/1000mi)	SOX (lb/1000mi)	CO2 (lb/1000mi)
LDA-TOT	2,362	1.11	0.97	0.08	10.66	0.01	970.00	0.940	0.821	0.068	9.026	0.008	821.338
LDT1-TOT	745	0.31	0.36	0.03	3.09	0.00	380.00	0.832	0.966	0.081	8.295	0.000	1020.134
LDT2-TOT	1,046	0.56	0.39	0.05	4.12	0.01	540.00	1.071	0.746	0.096	7.878	0.019	1032.505
MDV-TOT	488	0.23	0.13	0.02	1.63	0.00	340.00	0.943	0.533	0.082	6.680	0.000	1393.443
LHDT1-TOT	80	0.18	0.03	0.00	0.21	0.00	80.00	4.500	0.750	0.000	5.250	0.000	2000.000
LHDT2-TOT	38	0.12	0.03	0.00	0.17	0.00	30.00	6.316	1.579	0.000	8.947	0.000	1578.947
MHDT-TOT	76	0.47	0.05	0.02	0.48	0.00	120.00	12.368	1.316	0.526	12.632	0.000	3157.895
HHDT-TOT	914	10.93	0.81	0.42	3.64	0.02	1900.00	23.917	1.772	0.919	7.965	0.044	4157.549

1990-2011 Composite Fleet County-Wide

Imperial Composite Vehicle Class	2012 Fleet (VMT/1000)	NOX (ton/day)	ROG (ton/day)	PM (ton/day)	CO (ton/day)	SOX (ton/day)	CO2 (ton/day)	NOX (lb/1000mi)	ROG (lb/1000mi)	PM (lb/1000mi)	CO (lb/1000mi)	SOX (lb/1000mi)	CO2 (lb/1000mi)
Light Duty Autos and Trucks Composite	4,153	1.98	1.72	0.16	17.87	0.02	1890.00	0.954	0.828	0.077	8.606	0.010	910.185
Medium to Heavy Trucks Composite	682	1.00	0.24	0.04	2.49	0.00	570.00	2.933	0.704	0.117	7.302	0.000	1671.554
Heavy-Heavy Duty Trucks Composite	914	10.93	0.81	0.42	3.64	0.02	1900.00	23.917	1.772	0.919	7.965	0.044	4157.549

	LDA-TOT	LDT1-TOT	LDT2-TOT	MDV-TOT	LHDT1-TOT	LHDT2-TOT	MHDT-TOT	HHDT-TOT
Vehicles	61298	20052	26935	13011	1891	980	1418	5237
VMT/1000	2362	745	1046	488	80	38	76	914
Trips	389206	125371	170198	83032	51459	23293	45278	29332
Reactive Organic Gas Emissions								
Run Exh	0.33	0.06	0.07	0.03	0.01	0.01	0.02	0.71
Idle Exh	0	0	0	0	0	0	0	0.09
Start Ex	0.28	0.06	0.08	0.04	0.01	0.01	0.02	0.01
Total Ex	0.61	0.12	0.15	0.06	0.02	0.02	0.03	0.81
Diurnal	0.08	0.03	0.03	0.01	0	0	0	0
Hot Soak	0.08	0.04	0.04	0.01	0	0	0	0
Running	0.16	0.15	0.15	0.04	0.01	0.02	0.02	0
Resting	0.04	0.02	0.02	0.01	0	0	0	0
Total	0.97	0.36	0.39	0.13	0.03	0.03	0.05	0.81
Carbon Monoxide Emissions								
Run Exh	7.67	2.26	3.04	1.19	0.06	0.07	0.2	3.08
Idle Exh	0	0	0	0	0.01	0.01	0.01	0.43
Start Ex	3	0.83	1.08	0.43	0.14	0.1	0.27	0.13
Total Ex	10.66	3.09	4.12	1.63	0.21	0.17	0.48	3.64
Oxides of Nitrogen Emissions								
Run Exh	0.92	0.25	0.42	0.17	0.1	0.08	0.41	9.78
Idle Exh	0	0	0	0	0	0	0.01	1.14
Start Ex	0.18	0.06	0.14	0.06	0.08	0.04	0.05	0.02
Total Ex	1.11	0.31	0.56	0.23	0.18	0.12	0.47	10.93
Carbon Dioxide Emissions (000)								
Run Exh	0.94	0.37	0.52	0.33	0.08	0.03	0.11	1.84
Idle Exh	0	0	0	0	0	0	0	0.06
Start Ex	0.03	0.01	0.02	0.01	0	0	0	0
Total Ex	0.97	0.38	0.54	0.34	0.08	0.03	0.12	1.9
Total Particulate Emissions								
Run Exh	0.02	0.01	0.03	0.01	0	0	0.01	0.34
Idle Exh	0	0	0	0	0	0	0	0.01
Start Ex	0	0	0	0	0	0	0	0
Total Ex	0.03	0.01	0.03	0.01	0	0	0.01	0.35
TireWear	0.02	0.01	0.01	0	0	0	0	0.04
BrakeWr	0.03	0.01	0.01	0.01	0	0	0	0.03
Total	0.08	0.03	0.05	0.02	0	0	0.02	0.42
Lead	0	0	0	0	0	0	0	0
SOx	0.01	0	0.01	0	0	0	0	0.02
Fuel Consumption (000 gallons)								
Gasoline	101.22	38.21	55.78	35.37	6.73	2.46	1.19	0.67
Diesel	0.04	0.85	0.04	0.03	1.13	0.9	9.4	170.52

< --- > Title : Mt Signal Solar Farm Projects
Version : Emfac2007 V2.3 Nov 1 2006
Run Date : 2011/09/14 10:51:30
Scen Year: 2013 -- All model years in the range 1990 to 2013 selected
Season : Annual
Area : Imperial County
I/M Stat : COO Basic (2005)
Emissions: Tons Per Day

Table A-21. Fugitive Dust Generating Activity Estimates - CSF1

Proposed Activity Sites and Areas	
(Activity Areas)	**Imperial**
Source: Project Description Table B-3, B-7, B-9.	**Valley**
Site Area	**(acres)**
Total site area	1431.0
Construction Staging Areas and Fly Yards	
Staging Area	20.0
Total Activity Sites and Areas (acres)	1451.0
Duration of Activity (months)	**3**
Total Acre-Months	**4,353**

Proposed Access Roads	**Imperial**
(Grading)	**Valley**
Assume 1% of site would be used for access roads	**(acres)**
Proposed Solar Field Access Roads	14.31

Proposed Structures - Solar Array	**Average**	**Imperial**	
(Excavation, Material Unloading)	**Excavation**	**Valley**	**All Links**
	(cu.yd per #)	**#**	**(cu.yd)**
Each Structure			
Total	1	1600000	1,600,000
			All Links
Avg Rate of Excavation	**(cu.yd/day)**	**(cu.yd)**	**(cu.yd)**
Each Structure	250	1,600,000	1,600,000

Table A-22. Fugitive Dust Emissions by Activity - CSF1

Source: Emission factors from USEPA AP-42 and South Coast Air Quality Management District, where noted.

SubTotals of Fugitive Dust Emissions
Overall Fugitive Dust Emissions

	PM10 lbs/day	PM2.5 lbs/day		PM10 (ton)	PM2.5 (ton)
	29.7	7.4	**Overall Proposed Proj.**	18.9	3.7

Activity Sites and Areas

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

E = Level 2 Factor = tonPM10/ac-month 0.011 tonPM10/acre-month — 22 = activity days/mo

f = 0.21 for PM2.5 0.21 PM2.5 fraction (SCAQMD Methodology for PM 2.5, October 2006)

Control Effectiveness (watering) = 85.0%

Emission Factors

	Activity Areas (acre-mo)	Activity Areas (ac-day)	PM10 (lb/day)	PM2.5 (lb/day)	Activity Areas (acre-mo)	Overall PM10 (ton)	Overall PM2.5 (ton)
3.3000 lbPM10 (per acre activity-per mo)	4,353	198	29.68	---	4,353	7.2	---
0.6930 lbPM2.5 (per acre activity-per mo)	4,353	198	---	6.23	4,353	---	1.5

Access Roads

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

E = Level 2 Factor = tonPM10/ac-month 0.011 tonPM10/acre-month — 22 = activity days/mo

f = 0.21 for PM2.5 0.21 PM2.5 fraction (SCAQMD Methodology for PM 2.5, October 2006)

Control Effectiveness (watering) = 85.0%

Emission Factors

	Activity Areas (acre-mo)	Activity Areas (ac-day)	PM10 (lb/day)	PM2.5 (lb/day)	Activity Areas (acre-mo)	Overall PM10 (ton)	Overall PM2.5 (ton)
3.3000 lbPM10 (per acre activity-per mo)	14	1	0.10	---	14	0.0	---
0.6930 lbPM2.5 (per acre activity-per mo)	14	1	---	0.02	14	---	0.0

Grading (Bulldozing of Overburden)

Source: USEPA AP-42, Table 11.9-1, 10/98

E = 0.75 * (s^1.5) / (M^1.4) = lbPM10/hr

E = 0.105 * 5.7 * (s^1.2) / (M^1.3) = lbPM2.5/hr

s = silt content = 8.50 percent (average for construction sites, USEPA AP-42 Table 13.2.2-1)

M = moisture content = 12.00 percent (SCAQMD CEQA Handbook Table A9-9-G-1, with watering)

Emission Factors

	Doz/Grad/Scrap (hr/day)	PM10 (lb/day)	PM2.5 (lb/day)	Doz/Grad/Scrap (hr)	Overall PM10 (ton)	Overall PM2.5 (ton)
0.573 lbPM10 (per hr bulldozer or grader)	24	13.76	---	2,520	0.7	---
0.309 lbPM2.5 (per hr bulldozer or grader)	24	---	7.41	2,520	---	0.4

Excavation / Trenching (Removal of Overburden)

Source: USEPA AP-42, Table 11.9-2 (dragline operations), 10/98

E = 0.75 * 0.0021 (d^0.7)/(M^0.3) = lbPM10/yd3

E = 0.017 * 0.0021 (d^1.1)/(M^0.3) = lbPM2.5/yd3

d = drop height = 5 ft (estimate)

M = moisture content = 12.00 percent (SCAQMD CEQA Handbook Table A9-9-G-1, with watering)

Emission Factors

	Excavation (yd3/day)	PM10 (lb/day)	PM2.5 (lb/day)	Excavation (cu.yd)	Overall PM10 (ton)	Overall PM2.5 (ton)
0.0023 lbPM10 (per yd3 excavated)	250	0.58	---	1,600,000	1.845	---
0.0001 lbPM2.5 (per yd3 excavated)	250	---	0.02	1,600,000	---	0.080

Material Unloading/Loading

Source: USEPA AP-42, p. 13.2.4-3, 11/06

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

U = average wind speed = 15.00 mph (upper bound wind, p.13.2.4-4)

M = moisture content = 12.00 percent (SCAQMD CEQA Handbook Table A9-9-G-1, with watering) — 4 = transfers

lb of material / yd3 = 2600.00 for moist soil

k = 0.35 for PM10 0.35 for PM10

k = 0.053 for PM2.5 0.05 for PM2.5

Emission Factors

	Excavation (yd3/day)	Unloading (yd3/day)	PM10 (lb/day)	PM2.5 (lb/day)	Excavation (cu.yd)	Unloading (cu.yd)	Overall PM10 (ton)	Overall PM2.5 (ton)
0.00049 lbPM10 (per yd3 unloaded)	250	1000	0.49	---	1,600,000	6,400,000	1.582	---
0.00007 lbPM2.5 (per yd3 unloaded)	250	1000	---	0.07	1,600,000	6,400,000	---	0.240

Table A-23. Air Emissions Calculations Summary, CSF2

Construction Phase Emissions, CSF2

Offroad Tiers 2 emission factors (EFs) are applied to NOx, PM, and CO. Load factors (LFs) are used in conjunction with Tiers 2 EFs.
2012 SCAB EFs (OFFROAD2007 model) are applied to CO2, ROG, SOX. LFs already incorporated in OFFROAD model.
Onroad model (EMFAC) assumes 1990-2012 composite fleet across light, medium, and heavy duty vehicle classes.
Helicopter emissions are calculated using EDMS 5.1 and CCAR reccomended emission factors.
Onroad/offroad equipment mix and schedules, including helicopter classes and usage,as provided by construction contractor (Sargent & Lundy LLC).

	Maximum Daily Emissions of Proposed Project	NOX lbs/day	ROG lbs/day	PM10 lbs/day	PM2.5 lbs/day	CO lbs/day	SOX lbs/day	CO2 lbs/day
Imperial County	Offroad Vehicles and Equipment	732.21	345.49	25.83	22.99	442.42	28.26	134042.06
	Onroad Vehicles	304.85	63.18	13.85	13.71	539.30	0.96	101881.80
	Fugitive Dust	---	---	29.68	7.41	---	---	---
	Total for Imperial County *	**1037.07**	**408.66**	**69.35**	**44.10**	**981.71**	**29.23**	**235923.85**

Overall Emissions of CSF2	NOX (ton)	ROG (ton)	PM10 (ton)	PM2.5 (ton)	CO (ton)	SOX (ton)	CO2 (ton)
Offroad Vehicles and Equipment	65.90	31.09	2.32	2.07	39.82	2.54	12,063.8
Onroad Vehicles	8.76	5.20	0.58	0.58	51.88	0.06	6,221.2
Fugitive Dust			18.87	3.69			
Total Emissions for Project Duration	**74.65**	**36.30**	**21.78**	**6.33**	**91.70**	**2.61**	**18,285.0**

Table A-24. 2014 SCAB Fleet Average Emission Factors (OFFROAD2007)

These emission factors are applied to CO2, ROG, SOX only. Load factors are already incorporated.

Equipment	MaxHP	NOX (lbs/hr)	ROG (lbs/hr)	PM (lbs/hr)	CO (lbs/hr)	SOX (lbs/hr)	CO2 (lbs/hr)
Aerial Lifts	15	0.0101	0.0528	0.0633	0.0001	0.0026	8.7
	25	0.0160	0.0494	0.0919	0.0001	0.0048	11.0
	50	0.0534	0.1694	0.1765	0.0003	0.0142	19.6
	120	0.0509	0.2400	0.3531	0.0004	0.0272	38.1
	500	0.1106	0.4444	1.3843	0.0021	0.0408	213
	750	0.2063	0.8033	2.5864	0.0039	0.0751	385
Aerial Lifts Total		0.0483	0.1877	0.2867	0.0004	0.0184	34.7
Air Compressors	15	0.0114	0.0474	0.0697	0.0001	0.0044	7.2
	25	0.0247	0.0711	0.1275	0.0002	0.0075	14.4
	50	0.0831	0.2446	0.2134	0.0003	0.0201	22.3
	120	0.0758	0.3216	0.4682	0.0006	0.0416	47.0
	175	0.0984	0.5035	0.7837	0.0010	0.0431	88.5
	250	0.0948	0.2873	1.0299	0.0015	0.0316	131
	500	0.1543	0.5129	1.5945	0.0023	0.0519	232
	750	0.2412	0.7927	2.5509	0.0036	0.0819	358
	1000	0.3865	1.2935	4.7637	0.0049	0.1363	486
Air Compressors Total		0.0842	0.3313	0.5635	0.0007	0.0396	63.6
Bore/Drill Rigs	15	0.0120	0.0632	0.0754	0.0002	0.0029	10.3
	25	0.0193	0.0658	0.1222	0.0002	0.0048	16.0
	50	0.0255	0.2253	0.2394	0.0004	0.0095	31.0
	120	0.0409	0.4684	0.4254	0.0009	0.0204	77.1
	175	0.0671	0.7539	0.6527	0.0016	0.0246	141
	250	0.0737	0.3426	0.6140	0.0021	0.0179	188
	500	0.1206	0.5512	0.9516	0.0031	0.0294	311
	750	0.2388	1.0890	1.8972	0.0062	0.0582	615
	1000	0.3889	1.6591	5.4092	0.0093	0.1411	928
Bore/Drill Rigs Total		0.0729	0.5030	0.7136	0.0017	0.0248	165
Cement and Mortar Mixers	15	0.0074	0.0386	0.0466	0.0001	0.0020	6.3
	25	0.0259	0.0794	0.1481	0.0002	0.0078	17.6
Cement and Mortar Mixers Total		0.0089	0.0420	0.0550	0.0001	0.0025	7.2
Concrete/Industrial Saws	25	0.0199	0.0678	0.1256	0.0002	0.0048	16.5
	50	0.0864	0.2825	0.2750	0.0004	0.0226	30.2
	120	0.0978	0.4796	0.6733	0.0009	0.0538	74.1
	175	0.1457	0.8685	1.2772	0.0018	0.0645	160
Concrete/Industrial Saws Total		0.0917	0.4031	0.5267	0.0007	0.0413	58.5
Cranes	50	0.0932	0.2808	0.2313	0.0003	0.0221	23.2
	120	0.0859	0.3587	0.5189	0.0006	0.0453	50.1
	175	0.0977	0.4806	0.7306	0.0009	0.0412	80.3
	250	0.0979	0.2817	0.9088	0.0013	0.0317	112
	500	0.1468	0.4948	1.2979	0.0018	0.0470	180
	750	0.2485	0.8312	2.2480	0.0030	0.0803	303
	9999	0.9122	3.0993	9.8090	0.0098	0.3001	971
Cranes Total		0.1276	0.4553	1.1066	0.0014	0.0466	129
Crawler Tractors	50	0.1094	0.3164	0.2544	0.0003	0.0251	24.9
	120	0.1217	0.4814	0.7280	0.0008	0.0627	65.8
	175	0.1594	0.7413	1.1857	0.0014	0.0663	121
	250	0.1672	0.4797	1.4702	0.0019	0.0562	166
	500	0.2420	0.8885	2.0637	0.0025	0.0798	259
	750	0.4355	1.5882	3.7861	0.0047	0.1446	465
	1000	0.6595	2.5182	7.0047	0.0066	0.2228	658
Crawler Tractors Total		0.1499	0.5767	1.0853	0.0013	0.0644	114
Crushing/Proc. Equipment	50	0.1559	0.4812	0.4182	0.0006	0.0383	44.0
	120	0.1284	0.5703	0.8000	0.0010	0.0704	83.1
	175	0.1801	0.9583	1.4195	0.0019	0.0782	167
	250	0.1744	0.5287	1.8241	0.0028	0.0562	245
	500	0.2480	0.8092	2.4341	0.0037	0.0801	374
	750	0.3929	1.2625	3.9931	0.0059	0.1283	589
	9999	1.0512	3.3574	12.4161	0.0131	0.3572	1,308
Crushing/Proc. Equipment Total		0.1597	0.6651	1.0867	0.0015	0.0677	132
Dumpers/Tenders	25	0.0095	0.0317	0.0595	0.0001	0.0027	7.6
Dumpers/Tenders Total		0.0095	0.0317	0.0595	0.0001	0.0027	7.6
Excavators	25	0.0198	0.0677	0.1253	0.0002	0.0047	16.4
	50	0.0728	0.2757	0.2354	0.0003	0.0189	25.0
	120	0.0998	0.5137	0.6331	0.0009	0.0519	73.6
	175	0.1134	0.6660	0.8323	0.0013	0.0457	112
	250	0.1180	0.3480	1.0099	0.0018	0.0333	159
	500	0.1657	0.5102	1.3127	0.0023	0.0463	234
	750	0.2764	0.8452	2.2503	0.0039	0.0782	387
Excavators Total		0.1143	0.5289	0.8299	0.0013	0.0428	120

Table A-24. 2014 SCAB Fleet Average Emission Factors (OFFROAD2007)

These emission factors are applied to CO2, ROG, SOX only. Load factors are already incorporated.

Equipment	MaxHP	NOX (lbs/hr)	ROG (lbs/hr)	PM (lbs/hr)	CO (lbs/hr)	SOX (lbs/hr)	CO2 (lbs/hr)
Forklifts	50	0.0381	0.1569	0.1376	0.0002	0.0106	14.7
	120	0.0390	0.2158	0.2571	0.0004	0.0206	31.2
	175	0.0524	0.3311	0.3883	0.0006	0.0214	56.1
	250	0.0542	0.1595	0.4606	0.0009	0.0149	77.1
	500	0.0752	0.2182	0.5845	0.0011	0.0206	111
Forklifts Total		0.0497	0.2215	0.3551	0.0006	0.0178	54.4
Generator Sets	15	0.0142	0.0670	0.0971	0.0002	0.0054	10.2
	25	0.0256	0.0868	0.1557	0.0002	0.0085	17.6
	50	0.0785	0.2545	0.2731	0.0004	0.0213	30.6
	120	0.1008	0.4857	0.7130	0.0009	0.0537	77.9
	175	0.1236	0.7367	1.1536	0.0016	0.0538	142
	250	0.1181	0.4248	1.5252	0.0024	0.0422	213
	500	0.1683	0.6904	2.1655	0.0033	0.0627	337
	750	0.2811	1.1145	3.6123	0.0055	0.1032	544
	9999	0.7280	2.5702	9.5914	0.0105	0.2595	1,049
Generator Sets Total		0.0702	0.2974	0.5083	0.0007	0.0296	61.0
Graders	50	0.0985	0.3168	0.2668	0.0004	0.0239	27.5
	120	0.1166	0.5268	0.7270	0.0009	0.0614	75.0
	175	0.1386	0.7331	1.0511	0.0014	0.0577	124
	250	0.1407	0.4177	1.2844	0.0019	0.0445	172
	500	0.1759	0.5992	1.5242	0.0023	0.0550	229
	750	0.3746	1.2665	3.3218	0.0049	0.1182	486
Graders Total		0.1362	0.5987	1.0796	0.0015	0.0539	133
Off-Highway Tractors	120	0.2008	0.7118	1.1800	0.0011	0.1014	93.7
	175	0.1960	0.8272	1.4624	0.0015	0.0820	130
	250	0.1564	0.4499	1.3527	0.0015	0.0560	130
	750	0.6254	2.6908	5.4422	0.0057	0.2197	568
	1000	0.9416	4.2058	9.6214	0.0082	0.3259	814
Off-Highway Tractors Total		0.1986	0.7438	1.6111	0.0017	0.0767	151
Off-Highway Trucks	175	0.1355	0.7569	0.9614	0.0014	0.0539	125
	250	0.1326	0.3761	1.1048	0.0019	0.0368	167
	500	0.2065	0.6134	1.5945	0.0027	0.0567	272
	750	0.3371	0.9944	2.6748	0.0044	0.0937	442
	1000	0.5191	1.5673	5.5862	0.0063	0.1665	625
Off-Highway Trucks Total		0.2034	0.6148	1.6679	0.0027	0.0579	260
Other Construction Equipment	15	0.0118	0.0617	0.0737	0.0002	0.0029	10.1
	25	0.0160	0.0544	0.1010	0.0002	0.0039	13.2
	50	0.0670	0.2573	0.2471	0.0004	0.0183	28.0
	120	0.0915	0.5237	0.6571	0.0009	0.0503	80.9
	175	0.0868	0.5867	0.7476	0.0012	0.0374	107
	500	0.1379	0.5080	1.3457	0.0025	0.0441	254
Other Construction Equipment Total		0.0820	0.3697	0.7168	0.0013	0.0296	123
Other General Industrial Equipr	15	0.0066	0.0391	0.0466	0.0001	0.0018	6.4
	25	0.0185	0.0632	0.1170	0.0002	0.0044	15.3
	50	0.0878	0.2626	0.2155	0.0003	0.0211	21.7
	120	0.1082	0.4435	0.6351	0.0007	0.0583	62.0
	175	0.1174	0.5703	0.8698	0.0011	0.0498	95.9
	250	0.1111	0.3089	1.0899	0.0015	0.0346	136
	500	0.2032	0.6064	1.8639	0.0026	0.0630	265
	750	0.3375	0.9995	3.1813	0.0044	0.1061	437
	1000	0.4892	1.5297	5.6194	0.0056	0.1666	560
Other General Industrial Equipmen Total		0.1448	0.4985	1.2360	0.0016	0.0527	152
Other Material Handling Equipr	50	0.1219	0.3632	0.2997	0.0004	0.0293	30.3
	120	0.1051	0.4319	0.6201	0.0007	0.0568	60.7
	175	0.1481	0.7226	1.1054	0.0014	0.0631	122
	250	0.1174	0.3291	1.1643	0.0016	0.0368	145
	500	0.1448	0.4365	1.3440	0.0019	0.0453	192
	9999	0.6617	2.0216	7.4315	0.0073	0.2197	741
Other Material Handling Equipment Total		0.1381	0.4814	1.2068	0.0015	0.0511	141
Pavers	25	0.0239	0.0788	0.1472	0.0002	0.0070	18.7
	50	0.1281	0.3506	0.2860	0.0004	0.0289	28.0
	120	0.1311	0.5011	0.7948	0.0008	0.0682	69.2
	175	0.1695	0.7742	1.3079	0.0014	0.0720	128
	250	0.1962	0.5822	1.8076	0.0022	0.0696	194
	500	0.2165	0.8647	1.9551	0.0023	0.0756	233
Pavers Total		0.1429	0.5277	0.8112	0.0009	0.0564	77.9
Paving Equipment	25	0.0152	0.0520	0.0965	0.0002	0.0038	12.6
	50	0.1094	0.2974	0.2439	0.0003	0.0247	23.9
	120	0.1028	0.3923	0.6241	0.0006	0.0538	54.5

Table A-24. 2014 SCAB Fleet Average Emission Factors (OFFROAD2007)

These emission factors are applied to CO2, ROG, SOX only. Load factors are already incorporated.

Equipment	MaxHP	NOX (lbs/hr)	ROG (lbs/hr)	PM (lbs/hr)	CO (lbs/hr)	SOX (lbs/hr)	CO2 (lbs/hr)
	175	0.1323	0.6049	1.0274	0.0011	0.0565	101
	250	0.1207	0.3595	1.1333	0.0014	0.0429	122
Paving Equipment Total		0.1082	0.4273	0.7312	0.0008	0.0502	68.9

Table A-24. 2014 SCAB Fleet Average Emission Factors (OFFROAD2007)

These emission factors are applied to CO2, ROG, SOX only. Load factors are already incorporated.

Equipment	MaxHP	NOX (lbs/hr)	ROG (lbs/hr)	PM (lbs/hr)	CO (lbs/hr)	SOX (lbs/hr)	CO2 (lbs/hr)
Plate Compactors	15	0.0050	0.0263	0.0314	0.0001	0.0012	4.3
Plate Compactors Total		0.0050	0.0263	0.0314	0.0001	0.0012	4.3
Pressure Washers	15	0.0068	0.0321	0.0465	0.0001	0.0026	4.9
	25	0.0104	0.0352	0.0631	0.0001	0.0035	7.1
	50	0.0281	0.1001	0.1230	0.0002	0.0085	14.3
	120	0.0274	0.1429	0.2101	0.0003	0.0143	24.1
Pressure Washers Total		0.0145	0.0603	0.0838	0.0001	0.0053	9.4
Pumps	15	0.0117	0.0488	0.0716	0.0001	0.0045	7.4
	25	0.0333	0.0959	0.1721	0.0002	0.0101	19.5
	50	0.0949	0.3004	0.3098	0.0004	0.0251	34.3
	120	0.1049	0.4934	0.7241	0.0009	0.0563	77.9
	175	0.1275	0.7382	1.1562	0.0016	0.0556	140
	250	0.1175	0.4096	1.4689	0.0023	0.0416	201
	500	0.1815	0.7226	2.2468	0.0034	0.0667	345
	750	0.3092	1.1947	3.8390	0.0057	0.1124	571
	9999	0.9669	3.3910	12.5393	0.0136	0.3422	1,355
Pumps Total		0.0683	0.2873	0.4427	0.0006	0.0295	49.6
Rollers	15	0.0074	0.0386	0.0461	0.0001	0.0018	6.3
	25	0.0161	0.0549	0.1019	0.0002	0.0040	13.3
	50	0.0947	0.2831	0.2492	0.0003	0.0226	26.0
	120	0.0921	0.4030	0.5906	0.0007	0.0494	59.0
	175	0.1178	0.6182	0.9537	0.0012	0.0510	108
	250	0.1180	0.3717	1.2002	0.0017	0.0407	153
	500	0.1555	0.5926	1.5340	0.0022	0.0537	219
Rollers Total		0.0912	0.4018	0.6164	0.0008	0.0419	67.1
Rough Terrain Forklifts	50	0.1055	0.3654	0.3185	0.0004	0.0271	33.9
	120	0.0877	0.4292	0.5612	0.0007	0.0474	62.4
	175	0.1265	0.7246	0.9750	0.0014	0.0534	125
	250	0.1230	0.3717	1.1633	0.0019	0.0376	171
	500	0.1745	0.5501	1.5313	0.0025	0.0529	257
Rough Terrain Forklifts Total		0.0929	0.4608	0.6101	0.0008	0.0477	70.3
Rubber Tired Dozers	175	0.2034	0.8392	1.4854	0.0015	0.0841	129
	250	0.2322	0.6560	1.9517	0.0021	0.0821	183
	500	0.3072	1.3307	2.5592	0.0026	0.1058	265
	750	0.4633	1.9954	3.9201	0.0040	0.1603	399
	1000	0.7196	3.2150	7.1336	0.0060	0.2458	592
Rubber Tired Dozers Total		0.2854	1.1058	2.3867	0.0025	0.0993	239
Rubber Tired Loaders	25	0.0204	0.0697	0.1291	0.0002	0.0049	16.9
	50	0.1092	0.3535	0.3000	0.0004	0.0266	31.1
	120	0.0902	0.4119	0.5654	0.0007	0.0477	58.9
	175	0.1168	0.6261	0.8915	0.0012	0.0489	106
	250	0.1186	0.3553	1.0966	0.0017	0.0375	149
	500	0.1769	0.6085	1.5507	0.0023	0.0554	237
	750	0.3648	1.2450	3.2733	0.0049	0.1153	486
	1000	0.4927	1.7350	5.6204	0.0060	0.1686	594
Rubber Tired Loaders Total		0.1122	0.4683	0.8620	0.0012	0.0461	109
Scrapers	120	0.1770	0.6882	1.0571	0.0011	0.0913	93.9
	175	0.1973	0.9065	1.4751	0.0017	0.0824	148
	250	0.2135	0.6146	1.8936	0.0024	0.0726	209
	500	0.3033	1.1355	2.6139	0.0032	0.1012	321
	750	0.5260	1.9562	4.6194	0.0056	0.1767	555
Scrapers Total		0.2648	0.9890	2.2371	0.0027	0.0928	262
Signal Boards	15	0.0072	0.0377	0.0450	0.0001	0.0018	6.2
	50	0.1035	0.3331	0.3273	0.0005	0.0269	36.2
	120	0.1072	0.5163	0.7320	0.0009	0.0584	80.2
	175	0.1415	0.8317	1.2462	0.0017	0.0621	155
	250	0.1520	0.5213	1.8056	0.0029	0.0525	255
Signal Boards Total		0.0181	0.0929	0.1332	0.0002	0.0071	16.7
Skid Steer Loaders	25	0.0195	0.0610	0.1145	0.0002	0.0059	13.8
	50	0.0443	0.2196	0.2161	0.0003	0.0134	25.5
	120	0.0380	0.2727	0.3020	0.0005	0.0205	42.8
Skid Steer Loaders Total		0.0406	0.2262	0.2369	0.0004	0.0152	30.3
Surfacing Equipment	50	0.0442	0.1367	0.1310	0.0002	0.0110	14.1
	120	0.0904	0.4182	0.6174	0.0007	0.0477	63.8
	175	0.0842	0.4716	0.7317	0.0010	0.0363	85.8
	250	0.0955	0.3237	1.0228	0.0015	0.0341	135
	500	0.1433	0.6069	1.5156	0.0022	0.0516	221
	750	0.2284	0.9503	2.4407	0.0035	0.0820	347
Surfacing Equipment Total		0.1194	0.4930	1.1688	0.0017	0.0427	166

Table A-24. 2014 SCAB Fleet Average Emission Factors (OFFROAD2007)

These emission factors are applied to CO2, ROG, SOX only. Load factors are already incorporated.

Equipment	MaxHP	NOX (lbs/hr)	ROG (lbs/hr)	PM (lbs/hr)	CO (lbs/hr)	SOX (lbs/hr)	CO2 (lbs/hr)
Sweepers/Scrubbers	15	0.0124	0.0729	0.0870	0.0002	0.0034	11.9
	25	0.0237	0.0808	0.1495	0.0002	0.0057	19.6
	50	0.0911	0.3300	0.2939	0.0004	0.0241	31.6
	120	0.0991	0.5098	0.6481	0.0009	0.0543	75.0
	175	0.1317	0.7996	1.0280	0.0016	0.0561	139
	250	0.1086	0.3327	1.0406	0.0018	0.0325	162
Sweepers/Scrubbers Total		0.1029	0.5086	0.6353	0.0009	0.0447	78.5
Tractors/Loaders/Backhoes	25	0.0193	0.0654	0.1228	0.0002	0.0052	15.9
	50	0.0792	0.3103	0.2765	0.0004	0.0211	30.3
	120	0.0634	0.3503	0.4252	0.0006	0.0337	51.7
	175	0.0924	0.5857	0.7161	0.0011	0.0380	101
	250	0.1142	0.3608	1.0294	0.0019	0.0330	172
	500	0.2186	0.7245	1.8255	0.0039	0.0627	345
	750	0.3304	1.0864	2.8317	0.0058	0.0958	517
Tractors/Loaders/Backhoes Total		0.0728	0.3747	0.4977	0.0008	0.0341	66.8
Trenchers	15	0.0099	0.0517	0.0617	0.0001	0.0024	8.5
	25	0.0397	0.1355	0.2509	0.0004	0.0095	32.9
	50	0.1477	0.3990	0.3332	0.0004	0.0333	32.9
	120	0.1212	0.4640	0.7489	0.0008	0.0629	64.9
	175	0.1864	0.8579	1.4773	0.0016	0.0798	144
	250	0.2226	0.6786	2.0933	0.0025	0.0813	223
	500	0.2835	1.2125	2.6464	0.0031	0.1024	311
	750	0.5377	2.2784	5.0912	0.0059	0.1947	587
Trenchers Total		0.1350	0.4606	0.6384	0.0007	0.0517	58.7
Welders	15	0.0098	0.0408	0.0599	0.0001	0.0038	6.2
	25	0.0193	0.0555	0.0996	0.0001	0.0058	11.3
	50	0.0886	0.2652	0.2435	0.0003	0.0219	26.0
	120	0.0601	0.2632	0.3850	0.0005	0.0328	39.5
	175	0.1021	0.5438	0.8502	0.0011	0.0448	98.2
	250	0.0801	0.2545	0.9129	0.0013	0.0274	119
	500	0.1028	0.3644	1.1332	0.0016	0.0359	168
Welders Total		0.0589	0.2041	0.2436	0.0003	0.0206	25.6

Table A-25. Offroad Emissions Calculation - Using SCAB Emission Factors - CSF2

2012 SCAB emission factors (EFs) corresponding to OFFROAD2007 model are applied to CO2, ROG, and SOX.
Tier 2 and 3 EFs are applied to NOx, PM, and CO. Calculation details are provided in *Offroad Tier 2* and *Offroad Tier 3* worksheets.
Load factors are used in conjunction with Tier 2and 3 EFs.

Offroad Equipment Project Total

ROG lbs/day	SOx lbs/day	CO2 lbs/day	ROG (tons)	SOX (tons)	CO2 (tons)
345.49	28.26	134042.06	31.09	2.54	12,063.79

Mount Signal Solar Farm 1
Site Preparation
7 months

Primary Equipment Description	Offroad Equip Category	HP Estimate	Primary Equip Quantity	Activity Schedule Estimate (Days)	Duration of Use (Hours/ Day)	Total Hours of Utilization 150,840	HP Used for OFFROAD	2012 SCAB ROG (lbs/hr)	2012 SCAB SOX (lbs/hr)	2012 SCAB CO2 (lbs/hr)	2012 SCAB ROG lbs/day	2012 SCAB SOx lbs/day	2012 SCAB CO2 lbs/day	2012 SCAB ROG (tons)	2012 SCAB SOX (tons)	2012 SCAB CO2 (tons)
10,000 lb Rough Terrain Fork Lift	Rough Terrain Forklift	200	7	180	4	5040	250	0.3717	0.0376	170.7965						
Track Type Dozer	Grader	350	7	180	2	2520	500	0.5992	0.0550	229.4843	8.3887	0.7696	3212.7805	0.7550	0.0693	289.1502
Drum Type Compactor	Paving Equipment	250	7	180	2	2520	250	0.3595	0.0429	122.2913	5.0327	0.6013	1712.0785	0.4529	0.0541	154.0871
Backhoe	Tractor/loader/backhoe	200	14	180	4	10080	250	0.3608	0.0330	171.7370	20.2057	1.8482	9617.2730	1.8185	0.1663	865.5546
Racking Post Ramming Machine	Other Construction Equipment	200	48	180	8	69120	500	0.5080	0.0441	254.2385	195.0783	16.9216	97627.5853	17.5570	1.5229	8786.4827
80 Ton Rough Terrain Cranes	Off-highway Truck	400	6	180	2	2160	500	0.6134	0.0567	272.3340	7.3612	0.6805	3268.0076	0.6625	0.0612	294.1207
Generator	Generator Sets	30	28	180	8	40320	50	0.2545	0.0213	30.6230	57.0002	4.7758	6859.5477	5.1300	0.4298	617.3593
Pickup Truck	Off-highway Truck	250	16	180	4	11520	250	0.3761	0.0368	166.5454	24.0729	2.3584	10658.9068	2.1666	0.2123	959.3016
ATV	ATVs	50	16	180	4	11520	50	0.4077	0.0013	1.3532	26.0918	0.0864	86.6040	2.3483	0.0078	7.7944
4000 Gallon Water Truck	Off-highway Truck	250	2	180	1	360	250	0.3761	0.0368	166.5454	0.7523	0.0737	333.0908	0.0677	0.0066	29.9782
Fuel Truck	Off-highway Truck	300	4	180	1	720	500	0.3761	0.0368	166.5454	1.5046	0.1474	666.1817	0.1354	0.0133	59.9564

Table A-26. Offroad Emissions Calculations - Using Tier 2 Emission Factors - CSF2

Tier 2 emission factors (EFs) are applied to NOx, PM, and CO. Load Factors (LFs) are used in conjunction with Tier 2 EFs.
2012 SCAB EFs (OFFROAD2007) are applied to CO2, ROG, and SOX. Calculation detail is provided in *Offroad SCAB* worksheet.

Offroad Equipment Project

NOX lbs/day	PM lbs/day	CO lbs/day	NOX (tons)	PM (tons)
732.21	25.83	442.42	65.90	2.32

Mount Signal Solar Farm 1

7 months

Primary Equipment Description	Offroad Equip Category	HP Estimate	Primary Equip Quantity	Activity Schedule Estimate (Days)	Duration of Use (Hours/ Day)	Total Hours of Utilization 150,840	Load Factor for Tier 2	HP Used for OFFROAD	TIER 2 NOX (lbs/hr)	TIER 2 PM (lbs/hr)	TIER 2 CO (lbs/hr)	TIER 2 NOX lbs/day	TIER 2 PM lbs/day	TIER 2 CO lbs/day	TIER 2 CO (tons)	TIER 2 PM (tons)
10,000 lb Rough Terrain Fork Lift	Rough Terrain Forklift	200	7	180	4	5040	0.6	250	1.2963	0.0397	0.6878	36.30	1.11	19.26	3.2667	0.1000
Track Type Dozer	Grader	350	7	180	2	2520	0.61	500	2.2593	0.0706	1.2238	31.63	0.99	17.13	2.8467	0.0890
Drum Type Compactor	Paving Equipment	250	7	180	2	2520	0.53	250	1.4313	0.0438	0.7595	20.04	0.61	10.63	1.8035	0.0552
Backhoe	Tractor/loader/backhoe	200	14	180	4	10080	0.55	250	1.1883	0.0364	0.6305	66.54	2.04	35.31	5.9889	0.1833
Racking Post Ramming Machine	Other Construction Equipment	200	48	180	8	69120	0.5	500	1.0802	0.0331	0.5732	414.81	12.70	220.11	37.3333	1.1429
80 Ton Rough Terrain Cranes	Off-highway Truck	400	6	180	2	2160	0.57	500	2.4127	0.0754	1.3069	28.95	0.90	15.68	2.6057	0.0814
Generator	Generator Sets	30	28	180	8	40320	0.74	50	0.2741	0.0220	0.2007	61.39	4.93	44.95	5.5253	0.4440
Pickup Truck	Off-highway Truck	250	16	180	4	11520	0.57	250	1.5394	0.0471	0.8168	98.52	3.02	52.28	8.8667	0.2714
ATV	ATVs	50	16	180	4	11520	0.5	50	0.0001	0.0049	0.6371	0.01	0.32	40.78	0.0007	0.0285
4000 Gallon Water Truck	Off-highway Truck	250	2	180	1	360	0.57	250	1.5394	0.0471	0.8168	3.08	0.09	1.63	0.2771	0.0085
Fuel Truck	Fuel Truck	300	4	180	1	720	0.57	500	1.8095	0.0565	0.9802	7.24	0.23	3.92	0.6514	0.0204

Total

CO (tons)
39.82

TIER 2 CO (tons)
1.7333
1.5419
0.9569
3.1778
19.8095
1.4114
4.0453
4.7048
3.6699
0.1470
0.3529

Table A-27. ARB and USEPA Off-Road Compression-Ignition (Diesel) Engine Standards (NMHC+NOx/CO/PM in g/bhp-hr). When ARB and USEPA standards differ, the standards shown here represent the more stringent of the two.

Maximum horsepower	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015+
<11	See Table 2 footnote (a)					7.8 / 6.0 / 0.75					5.6 / 6.0 / 0.6			5.6 / 6.0 / 0.30[a]							
11≤hp<25						7.1 / 4.9 / 0.60					5.6 / 4.9 / 0.60			5.6 / 4.9 / 0.30							
25≤hp<50	-					7.1 /4.1 / 0.60				5.6 / 4.1 / 0.45				5.6 / 4.1 / 0.22					3.5 / 4.1 / 0.02		
50≤hp< 75						- / 6.9 / - / -[b]				5.6 / 3.7 / 0.30				3.5 / 3.7 / 0.22[c]					3.5 / 3.7 / 0.02[c]		
75≤hp<100														3.5 / 3.7 / 0.30			0.14 / 2.5 / 3.7 / 0.015[b,d]				0.14 / 0.30 / 3.7 / 0.015[b]
100≤hp<175									4.9 / 3.7 / 0.22				3.0 / 3.7 / 0.22								
175≤hp<300									4.9 / 2.6 / 0.15			3.0 / 2.6 / 0.15[e]					0.14 / 1.5 / 2.6 / 0.015[b,d]				0.14 / 0.30 / 2.2 / 0.015[b]
300≤hp<600	-		1.0 / 6.9 / 8.5 / 0.40[b]					4.8 / 2.6 / 0.15													
600≤hp≤750																					
Mobile Machines > 750hp			-			1.0 / 6.9 / 8.5 / 0.40[b]					4.8 / 2.6 / 0.15						0.30 / 2.6 / 2.6 / 0.07[b]				0.14 / 2.6 / 2.6 / 0.03[b]
750hp<GEN ≤1200hp																					0.14 / 0.50 / 2.6 / 0.02[b]
GEN>1200 hp																	0.30 / 0.50 / 2.6 / 0.07[b]				

a) The PM standard for hand-start, air cooled, direct injection engines below 11 hp may be delayed until 2010 and be set at 0.45 g/bhp-hr.
b) Standards given are NMHC/NOx/CO/PM in g/bhp-hr.
c) Engine families in this power category may alternately meet Tier 3 PM standards (0.30 g/bhp-hr) from 2008-2011 in exchange for introducing final PM standards in 2012.
d) The implementation schedule shown is the three-year alternate NOx approach. Other schedules are available.
e) Certain manufacturers have agreed to comply with these standards by 2005.

: Tier 1 : Tier 2 : Tier 3 : Tier 4 Interim / Final

	TIER 2 Emission Factors						TIER 3 Emission Factors						% reduction from TIER 2 to TIER 3		
	NOx		CO		PM		NOx		CO		PM		NOx	CO	PM
Maximum horsepower	g/bhp-hr	lb/bhp-hr	g/bhp-hr	lb/bhp-hr	g/bhp-hr	lb/bhp-hr	g/bhp-hr	lb/bhp-hr	g/bhp-hr	lb/bhp-hr	g/bhp-hr	lb/bhp-hr			
<11	5.6	0.0123457	6	0.0132275	0.6	0.0013228	5.6	0.0123457	6	0.0132275	0.6	0.0013228	0.00%	0.00%	0.00%
11≤hp<25	5.6	0.0123457	4.9	0.0108025	0.6	0.0013228	5.6	0.0123457	4.9	0.0108025	0.6	0.0013228	0.00%	0.00%	0.00%
25≤hp<50	5.6	0.0123457	4.1	0.0090388	0.45	0.0009921	5.6	0.0123457	4.1	0.0090388	0.45	0.0009921	0.00%	0.00%	0.00%
50≤hp< 75	5.6	0.0123457	3.7	0.008157	0.3	0.0006614	5.6	0.0123457	3.7	0.008157	0.3	0.0006614	0.00%	0.00%	0.00%
75≤hp<100	5.6	0.0123457	3.7	0.008157	0.3	0.0006614	3.5	0.007716	3.7	0.008157	0.3	0.0006614	37.50%	0.00%	0.00%
100≤hp<175	4.9	0.0108025	3.7	0.008157	0.22	0.000485	3	0.0066138	3.7	0.008157	0.22	0.000485	38.78%	0.00%	0.00%
175≤hp<300	4.9	0.0108025	2.6	0.0057319	0.15	0.0003307	3	0.0066138	2.6	0.0057319	0.15	0.0003307	38.78%	0.00%	0.00%
300≤hp<600	4.8	0.010582	2.6	0.0057319	0.15	0.0003307	3	0.0066138	2.6	0.0057319	0.15	0.0003307	37.50%	0.00%	0.00%
600≤hp≤750	4.8	0.010582	2.6	0.0057319	0.15	0.0003307	3	0.0066138	2.6	0.0057319	0.15	0.0003307	37.50%	0.00%	0.00%
Mobile Machines > 750hp	4.8	0.010582	2.6	0.0057319	0.15	0.0003307	4.8	0.010582	2.6	0.0057319	0.15	0.0003307	0.00%	0.00%	0.00%
	4.8	0.010582	2.6	0.0057319	0.15	0.0003307	4.8	0.010582	2.6	0.0057319	0.15	0.0003307	0.00%	0.00%	0.00%
750hp<GEN ≤1200hp	4.8	0.010582	2.6	0.0057319	0.15	0.0003307	4.8	0.010582	2.6	0.0057319	0.15	0.0003307	0.00%	0.00%	0.00%
GEN>1200 hp	4.8	0.010582	2.6	0.0057319	0.15	0.0003307	4.8	0.010582	2.6	0.0057319	0.15	0.0003307	0.00%	0.00%	0.00%

: Tier 2

: Tier 3

Table A-28. PSR Offroad Load Factors - CSF2

Used in conjunction with Tier 2-3 emission factors.

Source: mailout MSC99-32, http://www.arb.ca.gov/msei/onroad/downloads/pubs/mo9932.zip (4/2/2009)

Category	Equipment	HP	P/N	Activity (hrs/yr)	Load
Agricultural	Agricultural Mowers	120	P	363	0.43
	Agricultural Tractors	50	P	475	0.70
		120	P	475	0.70
		175	P	475	0.70
		250	N	475	0.70
		500	N	475	0.70
	Balers	50	P	95	0.58
		120	P	95	0.58
	Combines	120	P	150	0.70
		175	P	150	0.70
		250	N	150	0.70
		500	N	150	0.70
	Hydro Power Units	50	P	790	0.48
		120	P	790	0.48
	Irrigation Pumps	50	P	749	0.65
		120	P	749	0.65
		175	P	749	0.65
		250	N	749	0.65
		500	N	749	0.65
	Other Agricultural Equipment	50	P	381	0.51
		120	P	381	0.51
		175	P	381	0.51
		250	N	381	0.51
		500	N	381	0.51
	Sprayers	50	P	90	0.50
		120	P	90	0.50
		175	P	90	0.50
		250	N	90	0.50
		500	N	90	0.50
	Swathers	120	P	110	0.55
		175	P	110	0.55
	Tillers >5 HP	250	N	172	0.78
		500	N	172	0.78
Commercial	Air Compressors	50	P	815	0.48
		120	P	815	0.48
		175	P	815	0.48
		250	N	815	0.48
		500	N	815	0.48
		750	N	815	0.48
		9999	N	815	0.48
	Generator Sets	50	N	338	0.74
		120	N	338	0.74
		175	N	338	0.74
		250	N	338	0.74
		500	N	338	0.74
		750	N	338	0.74
		9999	N	338	0.74
	Pressure Washers	50	P	145	0.30
		120	P	145	0.30
	Pumps	50	P	403	0.74
		120	P	403	0.74

Table A-28. PSR Offroad Load Factors - CSF2

Used in conjunction with Tier 2-3 emission factors.

Source: mailout MSC99-32, http://www.arb.ca.gov/msei/onroad/downloads/pubs/mo9932.zip (4/2/2009)

Category	Equipment	HP	P/N	Activity (hrs/yr)	Load
		175	P	403	0.74
		250	N	403	0.74
		500	N	403	0.74
		9999	N	403	0.74
	Welders	50	P	643	0.45
		120	P	643	0.45
		175	P	643	0.45
Construction	Bore/Drill Rigs	50	P	726	0.75
		120	P	726	0.75
		175	P	726	0.75
		250	N	726	0.75
		500	N	726	0.75
		750	N	726	0.75
		9999	N	726	0.75
	Concrete/Industrial Saws	50	P	580	0.73
		120	P	580	0.73
		175	P	580	0.73
	Cranes	50	P	1464	0.43
		120	P	1464	0.43
		175	P	1464	0.43
		250	N	1464	0.43
		500	N	1464	0.43
		750	N	1464	0.43
	Crawler Tractors	50	P	936	0.64
		120	P	936	0.64
		175	P	936	0.64
		250	N	936	0.64
		500	N	936	0.64
		750	N	936	0.64
		9999	N	936	0.64
	Crushing/Proc. Equipment	50	P	955	0.78
		120	P	955	0.78
		175	P	955	0.78
		250	N	955	0.78
		500	N	955	0.78
		750	N	955	0.78
		9999	N	955	0.78
	Excavators	50	P	1162	0.57
		120	P	1162	0.57
		175	P	1162	0.57
		250	N	1162	0.57
		500	N	1162	0.57
		750	N	1162	0.57
	Graders	50	P	965	0.61
		120	P	965	0.61
		175	P	965	0.61
		250	N	965	0.61
		500	N	965	0.61
		750	N	965	0.61
	Off-Highway Tractors	120	P	855	0.65
		175	P	855	0.65

Table A-28. PSR Offroad Load Factors - CSF2

Used in conjunction with Tier 2-3 emission factors.

Source: mailout MSC99-32, http://www.arb.ca.gov/msei/onroad/downloads/pubs/mo9932.zip (4/2/2009)

Category	Equipment	HP	P/N	Activity (hrs/yr)	Load
		250	N	855	0.65
		750	N	855	0.65
		9999	N	855	0.65
	Off-Highway Trucks	175	P	1641	0.57
		250	N	1641	0.57
		500	N	1641	0.57
		750	N	1641	0.57
		9999	N	1641	0.57
	Other Construction Equipment	50	P	606	0.62
		120	P	606	0.62
		175	P	606	0.62
		500	N	606	0.62
	Pavers	50	P	828	0.62
		120	P	828	0.62
		175	P	828	0.62
		250	N	828	0.62
		500	N	828	0.62
	Paving Equipment	50	P	622	0.53
		120	P	622	0.53
		175	P	622	0.53
		250	N	622	0.53
	Rollers	50	P	748	0.56
		120	P	748	0.56
		175	P	748	0.56
		250	N	748	0.56
		500	N	748	0.56
	Rough Terrain Forklifts	50	P	1198	0.60
		120	P	1198	0.60
		175	P	1198	0.60
		250	N	1198	0.60
		500	N	1198	0.60
	Rubber Tired Dozers	175	P	899	0.59
		250	N	899	0.59
		500	N	899	0.59
		750	N	899	0.59
		9999	N	899	0.59
	Rubber Tired Loaders	50	P	1346	0.54
		120	P	1346	0.54
		175	P	1346	0.54
		250	N	1346	0.54
		500	N	1346	0.54
		750	N	1346	0.54
		9999	N	1346	0.54
	Scrapers	120	P	1090	0.72
		175	P	1090	0.72
		250	N	1090	0.72
		500	N	1090	0.72
		750	N	1090	0.72
	Signal Boards	50	P	535	0.78
		120	P	535	0.78
		175	P	535	0.78

Table A-28. PSR Offroad Load Factors - CSF2

Used in conjunction with Tier 2-3 emission factors.

Source: mailout MSC99-32, http://www.arb.ca.gov/msei/onroad/downloads/pubs/mo9932.zip (4/2/2009)

Category	Equipment	HP	P/N	Activity (hrs/yr)	Load
		250	N	535	0.78
	Skid Steer Loaders	50	P	811	0.55
		120	P	811	0.55
	Surfacing Equipment	50	P	561	0.45
		120	P	561	0.45
		175	P	561	0.45
		250	N	561	0.45
		500	N	561	0.45
		750	N	561	0.45
	Tractors/Loaders/Backhoes	50	P	1135	0.55
		120	P	1135	0.55
		175	P	1135	0.55
		250	N	1135	0.55
	Trenchers	50	P	620	0.75
		120	P	620	0.75
		175	P	620	0.75
		250	N	620	0.75
		500	N	620	0.75
		750	N	620	0.75
Dredging	Compressor (Dredging)	50	P	815	0.48
		120	P	815	0.48
	Crane	750	N	1464	0.43
	Deck/door engine	250	N	142	0.80
	Dredger	175	P	878	0.51
		250	N	878	0.51
		750	N	878	0.51
	Generator (Dredging)	50	P	1011	0.74
		120	P	1011	0.74
		175	P	1011	0.74
		250	N	1011	0.74
		500	N	1011	0.74
		750	N	1011	0.74
		9999	N	1011	0.74
	Hoist/swing/winch	50	P	878	0.51
		120	P	878	0.51
		175	P	878	0.51
		250	N	878	0.51
		500	N	878	0.51
		750	N	878	0.51
		9999	N	878	0.51
	Other (Dredging)	120	P	878	0.51
		175	P	878	0.51
		250	N	878	0.51
		500	N	878	0.51
	Pump (Dredging)	175	P	403	0.74
		250	N	403	0.74
		500	N	403	0.74
		9999	N	403	0.74
Drilling	Compressors (Workover)	120	P	1231	0.60
		175	P	1231	0.60
		250	N	1231	0.60

Table A-28. PSR Offroad Load Factors - CSF2

Used in conjunction with Tier 2-3 emission factors.

Source: mailout MSC99-32, http://www.arb.ca.gov/msei/onroad/downloads/pubs/mo9932.zip (4/2/2009)

Category	Equipment	HP	P/N	Activity (hrs/yr)	Load
		750	N	1231	0.60
	Generator (Drilling)	120	P	1231	0.60
		175	P	1231	0.60
		250	N	1231	0.60
		750	N	1231	0.60
	Generator (Workover)	120	P	1231	0.60
		175	P	1231	0.60
		250	N	1231	0.60
		750	N	1231	0.60
		9999	N	1231	0.60
	Lift (Drilling)	250	N	1231	0.60
		750	N	1231	0.60
	Other Drilling Equipment	120	P	1231	0.60
		175	P	1231	0.60
		250	N	1231	0.60
		750	N	1231	0.60
		9999	N	1231	0.60
	Other Workover Equipment	120	P	1231	0.60
		175	P	1231	0.60
		250	N	1231	0.60
		750	N	1231	0.60
		9999	N	1231	0.60
	Pump (Drilling)	120	P	1231	0.60
		175	P	1231	0.60
		250	N	1231	0.60
		750	N	1231	0.60
		9999	N	1231	0.60
	Pump (Workover)	120	P	1231	0.60
		175	P	1231	0.60
		250	N	1231	0.60
		750	N	1231	0.60
		9999	N	1231	0.60
	Snubbing	120	P	1231	0.60
	Swivel	120	P	1231	0.60
		175	P	1231	0.60
		250	N	1231	0.60
		750	N	1231	0.60
Ground Support Equipment	A/C Tug Narrow Body	250	N	606.1839847	0.80
	A/C Tug Wide Body	500	N	759.2692308	0.80
	Air Conditioner	175	N	808.1666667	0.75
	Air Start Unit	500	N	332.9655172	0.90
	Baggage Tug	120	N	1623.8	0.55
	Belt Loader	120	N	1037.643678	0.50
	Bobtail	120	N	1867.428571	0.55
	Cargo Loader	120	N	901.7941176	0.50
	Cargo Tractors	120	N	101	0.54
	Catering Truck	250	N	1600	0.52
	Forklift	175	P	731.5	0.30
	Fuel Truck	250	N	3489.166667	0.25
	Generator	175	N	1629.714286	0.78
	Ground Power Unit	175	N	968.4296875	0.75

Table A-28. PSR Offroad Load Factors - CSF2

Used in conjunction with Tier 2-3 emission factors.

Source: mailout MSC99-32, http://www.arb.ca.gov/msei/onroad/downloads/pubs/mo9932.zip (4/2/2009)

Category	Equipment	HP	P/N	Activity (hrs/yr)	Load
	Hydrant Truck	175	N	224.25	0.70
	Lav Truck	175	N	1306.5	0.25
	Lift	120	N	917.3636364	0.50
	Other	175	N	1645.590909	0.50
	Passenger Stand	120	N	70	0.59
	Service Truck	175	N	1930.75	0.20
	Sweeper	120	N	12	0.51
Industrial	Aerial Lifts	50	P	384	0.46
		120	P	384	0.46
		500	N	384	0.46
		750	N	384	0.46
	Forklifts	50	P	1800	0.30
		120	P	1800	0.30
		175	P	1800	0.30
		250	N	1800	0.30
		500	N	1800	0.30
	Other General Industrial Equipment	50	N	878	0.51
		120	N	878	0.51
		175	N	878	0.51
		250	N	878	0.51
		500	N	878	0.51
		750	N	878	0.51
		9999	N	878	0.51
	Other Material Handling Equipment	50	N	421	0.59
		120	N	421	0.59
		175	N	421	0.59
		250	N	421	0.59
		500	N	421	0.59
	Sweepers/Scrubbers	50	N	1220	0.68
		120	N	1220	0.68
		175	N	1220	0.68
		250	N	1220	0.68
Lawn and Garden	Chippers/Stump Grinders	120	P	465	0.73
		175	P	465	0.73
		250	N	465	0.73
		500	N	465	0.73
		750	N	465	0.73
	Leaf Blowers/Vacuums	120	N	120	0.40
		250	N	120	0.40
	Snowblowers	175	P	400	0.65
		250	N	400	0.65
		500	N	400	0.65
Logging	Fellers/Bunchers	120	P	1276	0.71
		175	P	1276	0.71
		250	N	1276	0.71
		500	N	1276	0.71
		750	N	1276	0.71
	Shredders	175	P	120	0.40
	Skidders	120	P	1442	0.74
		175	P	1442	0.74
		250	N	1442	0.74

Table A-28. PSR Offroad Load Factors - CSF2

Used in conjunction with Tier 2-3 emission factors.

Source: mailout MSC99-32, http://www.arb.ca.gov/msei/onroad/downloads/pubs/mo9932.zip (4/2/2009)

Category	Equipment	HP	P/N	Activity (hrs/yr)	Load
		500	N	1442	0.74
Military Tactical Support	A/C unit	120	P	300	0.60
		250	N	300	0.60
		500	N	300	0.60
	Aircraft Support	120	P	300	0.60
		175	P	300	0.60
	Cart	120	P	300	0.60
		175	P	300	0.60
		250	N	300	0.60
	Communications	50	P	300	0.60
		120	P	300	0.60
	Compressor (Military)	50	P	300	0.60
		120	P	300	0.60
		175	P	300	0.60
		250	N	300	0.60
		500	N	300	0.60
	Crane	120	P	300	0.60
		175	P	300	0.60
		250	N	300	0.60
	Deicer	120	P	300	0.60
	Generator (Military)	50	P	300	0.60
		120	P	300	0.60
		175	P	300	0.60
		250	N	300	0.60
		500	N	300	0.60
	Hydraulic unit	120	P	300	0.60
	Lift (Military)	120	P	300	0.60
	Light	50	P	300	0.60
	Other tactical support equipment	50	P	300	0.60
		120	P	300	0.60
		175	P	300	0.60
		250	N	300	0.60
		500	N	300	0.60
		750	N	300	0.60
	Pressure Washer	175	P	300	0.60
	Pump (Military)	50	P	300	0.60
		120	P	300	0.60
	Start Cart	120	P	300	0.60
		500	N	300	0.60
	Test Stand	120	P	300	0.60
		175	P	300	0.60
		250	N	300	0.60
		500	N	300	0.60
	Welder	50	P	300	0.60
		120	P	300	0.60
Misc. Portable Equipment	Misc Portable Equipment	120	P	484	0.56
		175	P	484	0.56
		250	N	484	0.56
		500	N	484	0.56
		750	N	484	0.56
		9999	N	484	0.56

Table A-28. PSR Offroad Load Factors - CSF2

Used in conjunction with Tier 2-3 emission factors.

Source: mailout MSC99-32, http://www.arb.ca.gov/msei/onroad/downloads/pubs/mo9932.zip (4/2/2009)

Category	Equipment	HP	P/N	Activity (hrs/yr)	Load
Transport Refrigeration	Transport Refrigeration Unit	50	N	1341	0.28
		120	P	1341	0.28

Table A-29. Onroad Emissions Calculation - CSF2

Emission factors generated by EMFAC assuming 1990-2012 composite fleet of light, medium, and heavy duty vehicles.

Light Duty Autos and Trucks

Overall Personnel to Work Sites / Worker Commute Trips *	Workers	Months	Veh/Day	RT/day (mi)	Miles/Day	Total Miles	NOX (lb/1000mi)	ROG (lb/1000mi)	PM (lb/1000mi)	CO (lb/1000mi)	SOX (lb/1000mi)	CO2 (lb/1000mi)
							Composite Emissions for Fleet of Vehicles					
Maximum Labor Force	462	12	462	60	27,720	7,318,080	0.9046	0.8021	0.0746	8.2070	0.0093	904.6398
Typical Labor Force	375	10	375	60	22,500	4,950,000	0.9046	0.8021	0.0746	8.2070	0.0093	904.6398
* Estimated rideshare factor	1			SubTot Personnel (mi)		12,268,080						

Max Daily 30

Operational Emissions - Light Duty	RT/day (mi)	Vehicle Days	Total Miles	NOX (lb/1000mi)	ROG (lb/1000mi)	PM (lb/1000mi)	CO (lb/1000mi)	SOX (lb/1000mi)	CO2 (lb/1000mi)
SubTot Crew and QA/QC Mobilize (mi)	60	1,610	96,600	0.9046	0.8021	0.0746	8.2070	0.0093	904.6398

TOTAL Light Duty Autos and Trucks (vmt) 12,364,680

Medium to Heavy Duty Trucks Max Daily 30

Operational Emissions - Medium Duty	RT/day (mi)	Vehicle Days	Total Miles	NOX (lb/1000mi)	ROG (lb/1000mi)	PM (lb/1000mi)	CO (lb/1000mi)	SOX (lb/1000mi)	CO2 (lb/1000mi)
				Composite Emissions for Fleet of Vehicles					
Splicing/testing vans, dump trucks under 200hp	60	100	6,000	2.7626	0.7194	0.1151	7.1367	0.0000	1697.8417
Miscellaneous hardware deliveries	60	100	6000	2.7626	0.7194	0.1151	7.1367	0.0000	1697.8417

TOTAL Medium Duty Trucks (vmt) 12,000

Heavy-Heavy Duty Trucks Max Daily 30

Operational Emissions - Heavy Duty	RT/day (mi)	Vehicle Days	Total Miles	NOX (lb/1000mi)	ROG (lb/1000mi)	PM (lb/1000mi)	CO (lb/1000mi)	SOX (lb/1000mi)	CO2 (lb/1000mi)
				Composite Emissions for Fleet of Vehicles					
Local material deliveries and waste removal	60	1,995	119,700	21.1837	1.6122	0.8163	7.4082	0.0408	4163.2653
Port to marshalling yards material deliveries	150	1,050	157,500	21.1837	1.6122	0.8163	7.4082	0.0408	4163.2653
Equipment deliveries	60	0	0	21.1837	1.6122	0.8163	7.4082	0.0408	4163.2653
Water transportation	60	20	1,200	21.1837	1.6122	0.8163	7.4082	0.0408	4163.2653
Fuel transportation	60	310	18,600	21.1837	1.6122	0.8163	7.4082	0.0408	4163.2653

TOTAL Heavy-Heavy Duty Trucks (vmt) 297,000

Table A-29. Onroad Emissions Calculation - CSF2

Emission factors generated by EMFAC assuming 1990-2012 composite fleet of light, medium, and heavy duty vehicles.

Overall Onroad Emissions

NOX lbs/day	ROG lbs/day	PM lbs/day	CO lbs/day	SOX lbs/day	CO2 lbs/day	NOX (ton)	ROG (ton)	PM (ton)	CO (ton)	SOX (ton)	CO2 (ton)
304.85	63.18	13.85	539.30	0.96	101,881.80	8.76	5.20	0.58	51.88	0.06	6,221.22

Light Duty Autos and Trucks

Total Emissions for Vehicles

Overall Personnel to Work Sites / Worker Commute Trips *	Workers	Months	Veh/Day	RT/day (mi)	Miles/Day	Total Miles	NOX lbs/day	ROG lbs/day	PM lbs/day	CO lbs/day	SOX lbs/day	CO2 lbs/day	NOX (ton)	ROG (ton)	PM (ton)	CO (ton)	SOX (ton)	CO2 (ton)
Maximum Labor Force	462	12	462	60	27,720	7,318,080	25.08	22.23	2.07	227.50	0.26	25076.61	3.3101	2.9347	0.2730	30.0299	0.0341	3310.1131
Typical Labor Force	375	10	375	60	22,500	4,950,000	20.35	18.05	1.68	184.66	0.21	20354.39	2.2390	1.9851	0.1847	20.3124	0.0231	2238.9834
* Estimated rideshare factor	1				SubTot Personnel (mi)	12,268,080												

Max Daily 30

Operational Emissions - Light Duty	RT/day (mi)	Vehicle Days	Total Miles	NOX lbs/day	ROG lbs/day	PM lbs/day	CO lbs/day	SOX lbs/day	CO2 lbs/day	NOX (ton)	ROG (ton)	PM (ton)	CO (ton)	SOX (ton)	CO2 (ton)
SubTot Crew and QA/QC Mobilize (mi)	60	1,610	96,600	1.63	1.44	0.13	14.77	0.02	1628.35	0.0437	0.0387	0.0036	0.3964	0.0005	43.6941

TOTAL Light Duty Autos and Trucks (vmt) **12,364,680**

Medium to Heavy Duty Trucks Max Daily 30

Total Emissions for Vehicles

Operational Emissions - Medium Duty	RT/day (mi)	Vehicle Days	Total Miles	NOX lbs/day	ROG lbs/day	PM lbs/day	CO lbs/day	SOX lbs/day	CO2 lbs/day	NOX (ton)	ROG (ton)	PM (ton)	CO (ton)	SOX (ton)	CO2 (ton)
Splicing/testing vans, dump trucks under 200hp	60	100	6,000	4.97	1.29	0.21	12.85	0.00	3056.12	0.0083	0.0022	0.0003	0.0214	0.0000	5.0935
Miscellaneous hardware deliveries	60	100	6000	4.97	1.29	0.21	12.85	0.00	3056.12	0.0083	0.0022	0.0003	0.0214	0.0000	5.0935

TOTAL Medium Duty Trucks (vmt) **12,000**

Heavy-Heavy Duty Trucks Max Daily 30

Total Emissions for Vehicles

Operational Emissions - Heavy Duty	RT/day (mi)	Vehicle Days	Total Miles	NOX lbs/day	ROG lbs/day	PM lbs/day	CO lbs/day	SOX lbs/day	CO2 lbs/day	NOX (ton)	ROG (ton)	PM (ton)	CO (ton)	SOX (ton)	CO2 (ton)
Local material deliveries and waste removal	60	1,995	119,700	38.13	2.90	1.47	13.33	0.07	7493.88	1.2678	0.0965	0.0489	0.4434	0.0024	249.1714
Port to marshalling yards material deliveries	150	1,050	157,500	95.33	7.26	3.67	33.34	0.18	18734.69	1.6682	0.1270	0.0643	0.5834	0.0032	327.8571
Equipment deliveries	60	0	0	38.13	2.90	1.47	13.33	0.07	7493.88	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water transportation	60	20	1,200	38.13	2.90	1.47	13.33	0.07	7493.88	0.0127	0.0010	0.0005	0.0044	0.0000	2.4980
Fuel transportation	60	310	18,600	38.13	2.90	1.47	13.33	0.07	7493.88	0.1970	0.0150	0.0076	0.0689	0.0004	38.7184

TOTAL Heavy-Heavy Duty Trucks (vmt) **297,000**

Table A-30. Onroad Vehicle Mix and Schedules - CSF2

Source: Equipment mix and schedules from similar projects

Total Vehicle Workdays		
Light	Medium	Heavy
1,610.00	100.00	2,325.00

Site Preparation

1 month

Primary Equipment Description	HP Estimate	Primary Equip Quantity	Activity Schedule Estimate (Days)	Duration of Use (Hours/ Day)	Total Hours of Utilization	Onroad Vehicle Category	Light Duty Fractional Total Vehicle Workdays	Medium Duty Fractional Total Vehicle Workdays	Heavy Duty Fractional Total Vehicle Workdays
					2,460				
1/2 Ton Pick-up Truck, 4X4	200	6	30	4	720	light	60.0		
Mechanic Truck	300	2	30	8	480	heavy			40.0
Fuel Truck	300	2	30	8	480	heavy			40.0
40' Flat Bed Truck & Trailer	350	2	30	10	600	heavy			50.0
Dump Truck (Trash)	350	1	30	6	180	heavy			15.0

Grading and Earthwork

3 months

Primary Equipment Description	HP Estimate	Primary Equip Quantity	Activity Schedule Estimate (Days)	Duration of Use (Hours/ Day)	Total Hours of Utilization	Onroad Vehicle Category	Light Duty Fractional Total Vehicle Workdays	Medium Duty Fractional Total Vehicle Workdays	Heavy Duty Fractional Total Vehicle Workdays
					9,000				
1/2 Ton Pick-up Truck, 4X4	200	6	90	4	2160	light	180.0		
Mechanic Truck	300	2	90	8	1440	heavy			120.0
Fuel Truck	300	2	90	8	1440	heavy			120.0
40' Flat Bed Truck & Trailer	350	2	90	10	1800	heavy			150.0
Dump Truck	350	4	90	6	2160	heavy			180.0

Table A-30. Onroad Vehicle Mix and Schedules - CSF2

Source: Equipment mix and schedules from similar projects

Total Vehicle Workdays		
Light	**Medium**	**Heavy**
1,610.00	**100.00**	**2,325.00**

Concrete Foundations

3 months

Primary Equipment Description	HP Estimate	Primary Equip Quantity	Activity Schedule Estimate (Days)	Duration of Use (Hours/ Day)	Total Hours of Utilization	Onroad Vehicle Category	Light Duty Fractional Total Vehicle Workdays	Medium Duty Fractional Total Vehicle Workdays	Heavy Duty Fractional Total Vehicle Workdays
					10,800				
1/2 Ton Pick-up Truck, 4X4	200	6	90	4	2160	light	180.0		
Mechanic Truck	300	2	90	8	1440	heavy			120.0
Fuel Truck	300	2	90	8	1440	heavy			120.0
10 cu.yd. Concrete Mixer Trucks	425	8	90	8	5760	heavy			480.0

Structural Steel Work

4 months

Primary Equipment Description	HP Estimate	Primary Equip Quantity	Activity Schedule Estimate (Days)	Duration of Use (Hours/ Day)	Total Hours of Utilization	Onroad Vehicle Category	Light Duty Fractional Total Vehicle Workdays	Medium Duty Fractional Total Vehicle Workdays	Heavy Duty Fractional Total Vehicle Workdays
					18,960				
1/2 Ton Pick-up Truck, 4X4	200	8	120	4	3840	light	320.0		
1 Ton Crew Cab 4X4	300	1	120	2	240	light	20.0		
30 Ton Boom Truck	300	1	120	2	240	heavy			20.0
1 Ton Crew Cab Flat Bed, 4X4	300	9	120	4	4320	light	360.0		
40' Flat Bed Truck & Trailer	350	2	120	10	2400	heavy			200.0
3/4 Ton Pick-up Truck, 4X4	300	4	120	4	1920	light	160.0		
1 Ton Crew Cab Flat Bed, 4X4	300	2	120	4	960	light	80.0		
Wire Trucks & Trailers	350	6	120	6	4320	heavy			360.0
Dump Truck (Trash)	350	1	120	6	720	heavy			60.0

Table A-30. Onroad Vehicle Mix and Schedules - CSF2

Source: Equipment mix and schedules from similar projects

Total Vehicle Workdays		
Light	Medium	Heavy
1,610.00	100.00	2,325.00

Electrical/Instrumentation Work

2 months

Primary Equipment Description	HP Estimate	Primary Equip Quantity	Activity Schedule Estimate (Days)	Duration of Use (Hours/ Day)	Total Hours of Utilization	Onroad Vehicle Category	Light Duty Fractional Total Vehicle Workdays	Medium Duty Fractional Total Vehicle Workdays	Heavy Duty Fractional Total Vehicle Workdays
					3,180				
Foreman Truck	180	1	60	4	240	light	20.0		
Mechanic Truck	250	1	60	10	600	heavy			50.0
5-Ton Flatbed Truck	180	5	60	5	1500	heavy			125.0
Pickup Trucks	180	4	60	2	480	light	40.0		
Crew Trucks	180	2	60	2	240	light	20.0		
Support Trucks	180	1	60	2	120	light	10.0		

Architectural and Landscape

2 months

Primary Equipment Description	HP Estimate	Primary Equip Quantity	Activity Schedule Estimate (Days)	Duration of Use (Hours/ Day)	Total Hours of Utilization	Onroad Vehicle Category	Light Duty Fractional Total Vehicle Workdays	Medium Duty Fractional Total Vehicle Workdays	Heavy Duty Fractional Total Vehicle Workdays
					3,180				
1/2 Ton Pick-up Truck, 4X4	200	6	60	2	720	light	60.0		
Fuel Truck	300	2	60	3	360	heavy			30.0
Crew Trucks	180	2	60	5	600	light	50.0		
5 CY Dump Trucks	180	2	60	10	1200	medium		100.0	
Mulch Truck	350	1	60	5	300	heavy			25.0

Testing

1 month

Primary Equipment Description	HP Estimate	Primary Equip Quantity	Activity Schedule Estimate (Days)	Duration of Use (Hours/ Day)	Total Hours of Utilization	Onroad Vehicle Category	Light Duty Fractional Total Vehicle Workdays	Medium Duty Fractional Total Vehicle Workdays	Heavy Duty Fractional Total Vehicle Workdays
					840				
1/2 Ton Pick-up Truck, 4X4	200	1	30	8	240	light	20.0		
1/2 Ton Pick-up Truck, 4X4	200	1	30	8	240	light	20.0		
1 Ton Crew Cab 4X4	300	1	30	4	120	light	10.0		
Water Trucks	350	1	30	8	240	heavy			20.0

Estimated Deliveries from Port to Marshalling Yard and Miscellaneous Hardware

Material	No. Deliveries	Origin	SD Co R/T Miles	Imp Co R/T Miles
Transmission Lines				
Steel	500	Long Beach	150	60
Conductors	400	Long Beach	150	60
Misc Hardware	100	Local	60	60
Underground Structures				
Conductors	100	Long Beach	150	0
Substations				
Steel	40	Long Beach	150	0
Equipment	100	Local	60	0
Transformers	10	Long Beach	150	0

Table A-31. Onroad Emission Factors - CSF2

Source: EMFAC2007 v.2.3, burden reports for Imperial County.

Composite fleet: 1990 - 2012 for light, medium, and heavy duty vehicle classes

Imperial County Vehicle Class	2012 Fleet (VMT/1000)
LDA-TOT	2,437
LDT1-TOT	776
LDT2-TOT	1,076
MDV-TOT	494
LHDT1-TOT	81
LHDT2-TOT	40
MHDT-TOT	80
HHDT-TOT	980

1990-2012 Composite Fleet County-Wide

NOX (ton/day)	ROG (ton/day)	PM (ton/day)	CO (ton/day)	SOX (ton/day)	CO2 (ton/day)
1.10	0.97	0.08	10.66	0.01	1000.00
0.30	0.36	0.03	2.96	0.00	390.00
0.54	0.39	0.05	3.98	0.01	550.00
0.22	0.14	0.02	1.63	0.00	350.00
0.18	0.03	0.00	0.21	0.00	80.00
0.12	0.03	0.00	0.17	0.00	40.00
0.44	0.05	0.02	0.47	0.00	120.00
10.38	0.79	0.40	3.63	0.02	2040.00

NOX (lb/1000mi)	ROG (lb/1000mi)	PM (lb/1000mi)	CO (lb/1000mi)	SOX (lb/1000mi)	CO2 (lb/1000mi)
0.903	0.796	0.066	8.748	0.008	820.681
0.773	0.928	0.077	7.629	0.000	1005.155
1.004	0.725	0.093	7.398	0.019	1022.305
0.891	0.567	0.081	6.599	0.000	1417.004
4.444	0.741	0.000	5.185	0.000	1975.309
6.000	1.500	0.000	8.500	0.000	2000.000
11.000	1.250	0.500	11.750	0.000	3000.000
21.184	1.612	0.816	7.408	0.041	4163.265

Imperial Composite Vehicle Class	2012 Fleet (VMT/1000)
Light Duty Autos and Trucks Composite	4,289
Medium to Heavy Trucks Composite	695
Heavy-Heavy Duty Trucks Composite	980

1990-2011 Composite Fleet County-Wide

NOX (ton/day)	ROG (ton/day)	PM (ton/day)	CO (ton/day)	SOX (ton/day)	CO2 (ton/day)
1.94	1.72	0.16	17.60	0.02	1940.00
0.96	0.25	0.04	2.48	0.00	590.00
10.38	0.79	0.40	3.63	0.02	2040.00

NOX (lb/1000mi)	ROG (lb/1000mi)	PM (lb/1000mi)	CO (lb/1000mi)	SOX (lb/1000mi)	CO2 (lb/1000mi)
0.905	0.802	0.075	8.207	0.009	904.640
2.763	0.719	0.115	7.137	0.000	1697.842
21.184	1.612	0.816	7.408	0.041	4163.265

	LDA-TOT	LDT1-TOT	LDT2-TOT	MDV-TOT	LHDT1-TOT	LHDT2-TOT	MHDT-TOT	HHDT-TOT
Vehicles	63519	20858	27824	13382	1947	1020	1497	5554
VMT/1000	2437	776	1076	494	81	40	80	980
Trips	402986	130222	175510	85157	53266	24312	47724	31171
Reactive Organic Gas Emissions								
Run Exh	0.33	0.05	0.06	0.03	0.01	0.01	0.02	0.69
Idle Exh	0	0	0	0	0	0	0	0.09
Start Ex	0.28	0.06	0.08	0.04	0.01	0.01	0.02	0.01
Total Ex	0.61	0.11	0.14	0.06	0.02	0.02	0.03	0.79
Diurnal	0.08	0.03	0.03	0.01	0	0	0	0
Hot Soak	0.08	0.04	0.04	0.01	0	0	0	0
Running	0.16	0.15	0.16	0.05	0.01	0.02	0.02	0
Resting	0.05	0.02	0.02	0.01	0	0	0	0
Total	0.97	0.36	0.39	0.14	0.03	0.03	0.05	0.79
Carbon Monoxide Emissions								
Run Exh	7.67	2.16	2.93	1.19	0.06	0.07	0.2	3.04
Idle Exh	0	0	0	0	0.01	0.01	0.01	0.45
Start Ex	3	0.8	1.05	0.43	0.14	0.09	0.26	0.14
Total Ex	10.66	2.96	3.98	1.63	0.21	0.17	0.47	3.63
Oxides of Nitrogen Emissions								
Run Exh	0.92	0.24	0.4	0.16	0.09	0.08	0.38	9.14
Idle Exh	0	0	0	0	0	0	0.01	1.22
Start Ex	0.18	0.06	0.13	0.06	0.08	0.04	0.05	0.02
Total Ex	1.1	0.3	0.54	0.22	0.18	0.12	0.44	10.38
Carbon Dioxide Emissions (000)								
Run Exh	0.97	0.38	0.54	0.34	0.08	0.03	0.12	1.97
Idle Exh	0	0	0	0	0	0	0	0.07
Start Ex	0.03	0.01	0.02	0.01	0	0	0	0
Total Ex	1	0.39	0.55	0.35	0.08	0.04	0.12	2.04
Total Particulate Emissions								
Run Exh	0.02	0.01	0.03	0.01	0	0	0.01	0.33
Idle Exh	0	0	0	0	0	0	0	0.01
Start Ex	0	0	0	0	0	0	0	0
Total Ex	0.03	0.01	0.03	0.01	0	0	0.01	0.34
TireWear	0.02	0.01	0.01	0	0	0	0	0.04
BrakeWr	0.03	0.01	0.01	0.01	0	0	0	0.03
Total	0.08	0.03	0.05	0.02	0	0	0.02	0.4
Lead	0	0	0	0	0	0	0	0
SOx	0.01	0	0.01	0	0	0	0	0.02
Fuel Consumption (000 gallons)								
Gasoline	104.27	39.93	57.37	35.77	6.86	2.56	1.25	0.73
Diesel	0.03	0.8	0.04	0.03	1.11	0.93	9.94	182.68

< --- > Title : Mt Signal Solar Farm Projects
Version : Emfac2007 V2.3 Nov 1 2006
Run Date : 2011/09/14 10:51:30
Scen Year: 2014 -- All model years in the range 1990 to 2014 selected
Season : Annual
Area : Imperial County
I/M Stat : COO Basic (2005)
Emissions: Tons Per Day

Table A-32. Fugitive Dust Generating Activity Estimates - CSF2

Proposed Activity Sites and Areas	
(Activity Areas)	**Imperial**
Source: Project Description Table B-3, B-7, B-9.	**Valley**
Site Area	**(acres)**
Total site area	1431.0
Construction Staging Areas and Fly Yards	
Staging Area	20.0
Total Activity Sites and Areas (acres)	1451.0
Duration of Activity (months)	**3**
Total Acre-Months	**4,353**

Proposed Access Roads	**Imperial**
(Grading)	**Valley**
Assume 1% of site would be used for access roads	**(acres)**
Proposed Solar Field Access Roads	14.31

Proposed Structures - Solar Array	**Average**	**Imperial**	
(Excavation, Material Unloading)	**Excavation**	**Valley**	**All Links**
	(cu.yd per #)	**#**	**(cu.yd)**
Each Structure			
Total	1	1600000	1,600,000
			All Links
Avg Rate of Excavation	**(cu.yd/day)**	**(cu.yd)**	**(cu.yd)**
Each Structure	250	1,600,000	1,600,000

Table A-33. Fugitive Dust Emissions by Activity - CSF2

Source: Emission factors from USEPA AP-42 and South Coast Air Quality Management District, where noted.

SubTotals of Fugitive Dust Emissions
Overall Fugitive Dust Emissions

	PM10 lbs/day	PM2.5 lbs/day		PM10 (ton)	PM2.5 (ton)
	29.7	7.4	**Overall Proposed Proj.**	18.9	3.7

Activity Sites and Areas

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

E = Level 2 Factor = tonPM10/ac-month 0.011 tonPM10/acre-month — 22 = activity days/mo

f = 0.21 for PM2.5 0.21 PM2.5 fraction (SCAQMD Methodology for PM 2.5, October 2006)

Control Effectiveness (watering) = 85.0%

Emission Factors

	Activity Areas (acre-mo)	Activity Areas (ac-day)	PM10 (lb/day)	PM2.5 (lb/day)	Activity Areas (acre-mo)	Overall PM10 (ton)	Overall PM2.5 (ton)
3.3000 lbPM10 (per acre activity-per mo)	4,353	198	29.68	---	4,353	7.2	---
0.6930 lbPM2.5 (per acre activity-per mo)	4,353	198	---	6.23	4,353	---	1.5

Access Roads

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

E = Level 2 Factor = tonPM10/ac-month 0.011 tonPM10/acre-month — 22 = activity days/mo

f = 0.21 for PM2.5 0.21 PM2.5 fraction (SCAQMD Methodology for PM 2.5, October 2006)

Control Effectiveness (watering) = 85.0%

Emission Factors

	Activity Areas (acre-mo)	Activity Areas (ac-day)	PM10 (lb/day)	PM2.5 (lb/day)	Activity Areas (acre-mo)	Overall PM10 (ton)	Overall PM2.5 (ton)
3.3000 lbPM10 (per acre activity-per mo)	14	1	0.10	---	14	0.0	---
0.6930 lbPM2.5 (per acre activity-per mo)	14	1	---	0.02	14	---	0.0

Grading (Bulldozing of Overburden)

Source: USEPA AP-42, Table 11.9-1, 10/98

E = 0.75 * (s^1.5) / (M^1.4) = lbPM10/hr

E = 0.105 * 5.7 * (s^1.2) / (M^1.3) = lbPM2.5/hr

s = silt content = 8.50 percent (average for construction sites, USEPA AP-42 Table 13.2.2-1)

M = moisture content = 12.00 percent (SCAQMD CEQA Handbook Table A9-9-G-1, with watering)

Emission Factors

	Doz/Grad/Scrap (hr/day)	PM10 (lb/day)	PM2.5 (lb/day)	Doz/Grad/Scrap (hr)	Overall PM10 (ton)	Overall PM2.5 (ton)
0.573 lbPM10 (per hr bulldozer or grader)	24	13.76	---	2,520	0.7	---
0.309 lbPM2.5 (per hr bulldozer or grader)	24	---	7.41	2,520	---	0.4

Excavation / Trenching (Removal of Overburden)

Source: USEPA AP-42, Table 11.9-2 (dragline operations), 10/98

E = 0.75 * 0.0021 (d^0.7)/(M^0.3) = lbPM10/yd3

E = 0.017 * 0.0021 (d^1.1)/(M^0.3) = lbPM2.5/yd3

d = drop height = 5 ft (estimate)

M = moisture content = 12.00 percent (SCAQMD CEQA Handbook Table A9-9-G-1, with watering)

Emission Factors

	Excavation (yd3/day)	PM10 (lb/day)	PM2.5 (lb/day)	Excavation (cu.yd)	Overall PM10 (ton)	Overall PM2.5 (ton)
0.0023 lbPM10 (per yd3 excavated)	250	0.58	---	1,600,000	1.845	---
0.0001 lbPM2.5 (per yd3 excavated)	250	---	0.02	1,600,000	---	0.080

Material Unloading/Loading

Source: USEPA AP-42, p. 13.2.4-3, 11/06

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

U = average wind speed = 15.00 mph (upper bound wind, p.13.2.4-4)

M = moisture content = 12.00 percent (SCAQMD CEQA Handbook Table A9-9-G-1, with watering) — 4 = transfers

lb of material / yd3 = 2600.00 for moist soil

k = 0.35 for PM10 0.35 for PM10

k = 0.053 for PM2.5 0.05 for PM2.5

Emission Factors

	Excavation (yd3/day)	Unloading (yd3/day)	PM10 (lb/day)	PM2.5 (lb/day)	Excavation (cu.yd)	Unloading (cu.yd)	Overall PM10 (ton)	Overall PM2.5 (ton)
0.00049 lbPM10 (per yd3 unloaded)	250	1000	0.49	---	1,600,000	6,400,000	1.582	---
0.00007 lbPM2.5 (per yd3 unloaded)	250	1000	---	0.07	1,600,000	6,400,000	---	0.240

Table A-34. Air Emissions Calculations Summary - Transmission Line

Transmission Line Construction

Offroad Tiers 2 emission factors (EFs) are applied to NOx, PM, and CO. Load factors (LFs) are used in conjunction with Tiers 2 EFs.
2012 SCAB EFs (OFFROAD2007 model) are applied to CO2, ROG, SOX. LFs already incorporated in OFFROAD model.
Onroad model (EMFAC) assumes 1990-2012 composite fleet across light, medium, and heavy duty vehicle classes.
Helicopter emissions are calculated using EDMS 5.1 and CCAR reccomended emission factors.
Onroad/offroad equipment mix and schedules, including helicopter classes and usage,as provided by construction contractor (Sargent & Lundy LLC).

Maximum Daily Emissions of Proposed Project		NOX lbs/day	ROG lbs/day	PM10 lbs/day	PM2.5 lbs/day	CO lbs/day	SOX lbs/day	CO2 lbs/day
Imperial County	Offroad Vehicles and Equipment	391.06	109.51	12.33	10.98	212.25	11.17	46607.49
	Onroad Vehicles	266.72	60.27	12.38	12.25	525.96	0.89	94387.92
	Helicopters	39.65	9.67	14.85	14.70	39.65	9.34	22824.50
	Fugitive Dust	---	---	40.70	8.42	---	---	---
	Total for Imperial County *	**697.43**	**179.46**	**80.26**	**46.35**	**777.86**	**21.40**	**163819.92**

Overall Emissions of Tranmission Line	NOX (ton)	ROG (ton)	PM10 (ton)	PM2.5 (ton)	CO (ton)	SOX (ton)	CO2 (ton)
Offroad Vehicles and Equipment	25.20	6.95	0.79	0.70	13.66	0.71	2988.06
Onroad Vehicles	11.00	5.42	0.67	0.67	53.22	0.07	6711.64
Helicopters	6.48	3.78	1.99	1.97	6.48	1.35	3293.96
Fugitive Dust			12.25	2.66			
Total Emissions for Project Duration	**42.68**	**16.16**	**15.71**	**6.00**	**73.35**	**2.12**	**12993.66**

Table A-35. Offroad Emissions Calculation - Using SCAB Emission Factors - Transmission Line

2012 SCAB emission factors (EFs) corresponding to OFFROAD2007 model are applied to CO2, ROG, and SOX.
Tier 2 and 3 EFs are applied to NOx, PM, and CO. Calculation details are provided in *Offroad Tier 2* and *Offroad Tier 3* worksheets.
Load factors are used in conjunction with Tier 2and 3 EFs.

Offroad Equipment Project Total

ROG lbs/day	SOX lbs/day	CO2 lbs/day	ROG (tons)	SOX (tons)	CO2 (tons)
109.51	11.17	46607.49	6.95	0.71	2,988.06

Tranmission Line
12 months

Primary Equipment Description	Offroad Equip Category	HP Estimate	Primary Equip Quantity	Activity Schedule Estimate (Days)	Duration of Use (Hours/ Day)	Total Hours of Utilization 26,792	HP Used for OFFROAD	2012 SCAB ROG (lbs/hr)	2012 SCAB SOX (lbs/hr)	2012 SCAB CO2 (lbs/hr)	2012 SCAB ROG lbs/day	2012 SCAB SOX lbs/day	2012 SCAB CO2 lbs/day	2012 SCAB ROG (tons)	2012 SCAB SOX (tons)	2012 SCAB CO2 (tons)
10,000 lb Rough Terrain Fork Lift	Rough Terrain Forklift	200	2	156	4	1248	500	0.5985	0.0642	256.5709	4.7880	0.5140	2052.5672	0.3735	0.0401	160.1002
Road Grader	Grader	350	2	156	4	1248	500	0.6639	0.0671	229.4843	5.3109	0.5364	1835.8741	0.4142	0.0418	143.1982
Track Type Dozer	Grader	350	1	70	4	280	500	0.6639	0.0671	229.4843	2.6554	0.2682	917.9370	0.0929	0.0094	32.1278
Drum Type Compactor	Paving Equipment	250	1	70	2	140	250	0.3946	0.0507	122.2913	0.7893	0.1014	244.5825	0.0276	0.0035	8.5604
Excavator	Excavator	300	1	70	4	280	500	0.5493	0.0574	233.7354	2.1972	0.2296	934.9417	0.0769	0.0080	32.7230
Backhoe	Tractor/loader/backhoe	350	1	156	8	1248	500	0.7714	0.0784	344.8535	6.1712	0.6274	2758.8282	0.4814	0.0489	215.1886
Backhoe	Tractor/loader/backhoe	200	2	140	8	2240	250	0.3755	0.0415	171.7370	6.0080	0.6647	2747.7920	0.4206	0.0465	192.3454
Pressure Diggers	Bore/Drill Rigs	500	2	140	8	2240	500	0.5526	0.0437	311.3086	8.8415	0.6991	4980.9372	0.6189	0.0489	348.6656
Rock Drill	Bore/Drill Rig	200	2	140	6	1680	250	0.3435	0.0268	188.1018	4.1216	0.3217	2257.2221	0.2885	0.0225	158.0055
10,000 lb Rough Terrain Fork Lift	Rough Terrain Forklift	200	2	140	4	1120	250	0.3896	0.0458	170.7965	3.1169	0.3665	1366.3717	0.2182	0.0257	95.6460
80 Ton Rough Terrain Cranes	Off-highway Truck	400	2	140	4	1120	500	0.6661	0.0705	272.3339	5.3287	0.5643	2178.6711	0.3730	0.0395	152.5070
10,000 lb Rough Terrain Fork Lift	Rough Terrain Forklift	200	2	140	4	1120	250	0.3896	0.0458	170.7965	3.1169	0.3665	1366.3717	0.2182	0.0257	95.6460
Compressor Truck	Off-highway Truck	350	2	140	2	560	500	0.6661	0.0705	272.3339	2.6644	0.2822	1089.3355	0.1865	0.0198	76.2535
Compressor Truck	Off-highway Truck	350	2	140	2	560	500	0.6661	0.0705	272.3339	2.6644	0.2822	1089.3355	0.1865	0.0198	76.2535
180 Ton Rough Terrain Crane	Off-highway Truck	500	2	140	4	1120	500	0.6661	0.0705	272.3339	5.3287	0.5643	2178.6711	0.3730	0.0395	152.5070
Sleeving Rigs	Bore/Drill Rigs	350	2	152	4	1216	500	0.5526	0.0437	311.3086	4.4208	0.3496	2490.4686	0.3360	0.0266	189.2756
Hydralic Pump Motor	Pumps	10	2	10	5	100	15	0.0508	0.0054	7.4238	0.5077	0.0540	74.2376	0.0025	0.0003	0.3712
580 Case Backhoe	Tractor/loader/backhoe	120	1	152	2	304	120	0.3557	0.0432	51.7280	0.7114	0.0864	103.4560	0.0541	0.0066	7.8627
Spacing Carts	Other Gen Indust Equipment	10	4	152	4	2432	15	0.0391	0.0018	6.3955	0.6248	0.0289	102.3274	0.0475	0.0022	7.7769
3 Drum Strawline Pullers	Other Gen Indust Equipment	300	2	152	6	1824	500	0.6772	0.0758	265.4117	8.1265	0.9101	3184.9410	0.6176	0.0692	242.0555
60lk Puller	Other Gen Indust Equipment	525	1	152	3	456	500	0.6772	0.0758	265.4117	2.0316	0.2275	796.2352	0.1544	0.0173	60.5139
Triple Conductor Tensioner	Other Gen Indust Equipment	350	1	152	2	304	500	0.6772	0.0758	265.4117	1.3544	0.1517	530.8235	0.1029	0.0115	40.3426
Sag Cat w2 winches	Grader	350	2	152	2	608	500	0.6639	0.0671	229.4843	2.6554	0.2682	917.9370	0.2018	0.0204	69.7632
D8 Cats	Grader	300	4	152	1	608	500	0.6639	0.0671	229.4843	2.6554	0.2682	917.9370	0.2018	0.0204	69.7632
Backhoe	Tractor/loader/backhoe	350	2	76	8	1216	500	0.7714	0.0784	344.8535	12.3424	1.2548	5517.6563	0.4690	0.0477	209.6709
Track Type Dozer	Grader	350	1	76	8	608	500	0.6639	0.0671	229.4843	5.3109	0.5364	1835.8741	0.2018	0.0204	69.7632
Drum Type Compactor	Paving Equipment	250	1	76	6	456	250	0.3946	0.0507	122.2913	2.3679	0.3041	733.7475	0.0900	0.0116	27.8824
Excavator	Excavator	300	1	76	6	456	500	0.5493	0.0574	233.7354	3.2958	0.3444	1402.4126	0.1252	0.0131	53.2917

Table A-36. Offroad Emissions Calculations - Using Tier 2 Emission Factors - Transmission Line

Tier 2 emission factors (EFs) are applied to NOx, PM, and CO. Load Factors (LFs) are used in conjunction with Tier 2 EFs.
2012 SCAB EFs (OFFROAD2007) are applied to CO2, ROG, and SOX. Calculation detail is provided in *Offroad SCAB* worksheet.

Offroad Equipment Project Total

NOX lbs/day	PM lbs/day	CO lbs/day	NOX (tons)	PM (tons)	CO (tons)
391.06	12.33	212.25	25.20	0.79	13.66

Tranmission Line
12 months

Primary Equipment Description	Offroad Equip Category	HP Estimate	Primary Equip Quantity	Activity Schedule Estimate (Days)	Duration of Use (Hours/ Day)	Total Hours of Utilization 26,792	Load Factor for Tier 2	HP Used for OFFROAD	TIER 2 NOX (lbs/hr)	TIER 2 PM (lbs/hr)	TIER 2 CO (lbs/hr)	TIER 2 NOX lbs/day	TIER 2 PM lbs/day	TIER 2 CO lbs/day	TIER 2 NOX (tons)	TIER 2 PM (tons)	TIER 2 CO (tons)
10,000 lb Rough Terrain Fork Lift	Rough Terrain Forklift	200	2	156	4	1248	0.6	500	1.2963	0.0397	0.6878	10.37	0.32	5.50	0.8089	0.0248	0.4292
Road Grader	Grader	350	2	156	4	1248	0.61	500	2.2593	0.0706	1.2238	18.07	0.56	9.79	1.4098	0.0441	0.7636
Track Type Dozer	Grader	350	1	70	4	280	0.61	500	2.2593	0.0706	1.2238	9.04	0.28	4.90	0.3163	0.0099	0.1713
Drum Type Compactor	Paving Equipment	250	1	70	2	140	0.53	250	1.4313	0.0438	0.7595	2.86	0.09	1.52	0.1002	0.0031	0.0532
Excavator	Excavator	300	1	70	4	280	0.57	500	1.8095	0.0565	0.9802	7.24	0.23	3.92	0.2533	0.0079	0.1372
Backhoe	Tractor/loader/backhoe	350	1	156	8	1248	0.55	500	2.0370	0.0637	1.1034	16.30	0.51	8.83	1.2711	0.0397	0.6885
Backhoe	Tractor/loader/backhoe	200	2	140	8	2240	0.55	250	1.1883	0.0364	0.6305	19.01	0.58	10.09	1.3309	0.0407	0.7062
Pressure Diggers	Bore/Drill Rigs	500	2	140	8	2240	0.75	500	3.9683	0.1240	2.1495	63.49	1.98	34.39	4.4444	0.1389	2.4074
Rock Drill	Bore/Drill Rig	200	2	140	6	1680	0.75	250	1.6204	0.0496	0.8598	19.44	0.60	10.32	1.3611	0.0417	0.7222
10,000 lb Rough Terrain Fork Lift	Rough Terrain Forklift	200	2	140	4	1120	0.6	250	1.2963	0.0397	0.6878	10.37	0.32	5.50	0.7259	0.0222	0.3852
80 Ton Rough Terrain Cranes	Off-highway Truck	400	2	140	4	1120	0.57	500	2.4127	0.0754	1.3069	19.30	0.60	10.46	1.3511	0.0422	0.7319
10,000 lb Rough Terrain Fork Lift	Rough Terrain Forklift	200	2	140	4	1120	0.6	250	1.2963	0.0397	0.6878	10.37	0.32	5.50	0.7259	0.0222	0.3852
Compressor Truck	Off-highway Truck	350	2	140	2	560	0.57	500	2.1111	0.0660	1.1435	8.44	0.26	4.57	0.5911	0.0185	0.3202
Compressor Truck	Off-highway Truck	350	2	140	2	560	0.57	500	2.1111	0.0660	1.1435	8.44	0.26	4.57	0.5911	0.0185	0.3202
180 Ton Rough Terrain Crane	Off-highway Truck	500	2	140	4	1120	0.57	500	3.0159	0.0942	1.6336	24.13	0.75	13.07	1.6889	0.0528	0.9148
Sleeving Rigs	Bore/Drill Rigs	350	2	152	4	1216	0.75	500	2.7778	0.0868	1.5046	22.22	0.69	12.04	1.6889	0.0528	0.9148
Hydralic Pump Motor	Pumps	10	2	10	5	100	0.74	15	0.0914	0.0098	0.0979	0.91	0.10	0.98	0.0046	0.0005	0.0049
580 Case Backhoe	Tractor/loader/backhoe	120	1	152	2	304	0.55	120	0.7130	0.0320	0.5384	1.43	0.06	1.08	0.1084	0.0049	0.0818
Spacing Carts	Other Gen Indust Equipment	10	4	152	4	2432	0.51	15	0.0630	0.0067	0.0675	1.01	0.11	1.08	0.0766	0.0082	0.0820
3 Drum Strawline Pullers	Other Gen Indust Equipment	300	2	152	6	1824	0.51	500	1.6190	0.0506	0.8770	19.43	0.61	10.52	1.4766	0.0461	0.7998
60lk Puller	Other Gen Indust Equipment	525	1	152	3	456	0.51	500	2.8333	0.0885	1.5347	8.50	0.27	4.60	0.6460	0.0202	0.3499
Triple Conductor Tensioner	Other Gen Indust Equipment	350	1	152	2	304	0.51	500	1.8889	0.0590	1.0231	3.78	0.12	2.05	0.2871	0.0090	0.1555
Sag Cat w2 winches	Grader	350	2	152	2	608	0.61	500	2.2593	0.0706	1.2238	9.04	0.28	4.90	0.6868	0.0215	0.3720
D8 Cats	Grader	300	4	152	1	608	0.61	500	1.9365	0.0605	1.0489	7.75	0.24	4.20	0.5887	0.0184	0.3189
Backhoe	Tractor/loader/backhoe	350	2	76	8	1216	0.55	500	2.0370	0.0637	1.1034	32.59	1.02	17.65	1.2385	0.0387	0.6709
Track Type Dozer	Grader	350	1	76	8	608	0.61	500	2.2593	0.0706	1.2238	18.07	0.56	9.79	0.6868	0.0215	0.3720
Drum Type Compactor	Paving Equipment	250	1	76	6	456	0.53	250	1.4313	0.0438	0.7595	8.59	0.26	4.56	0.3263	0.0100	0.1732
Excavator	Excavator	300	1	76	6	456	0.57	500	1.8095	0.0565	0.9802	10.86	0.34	5.88	0.4126	0.0129	0.2235

Table A-37. 2012 SCAB Fleet Average Emission Factors (OFFROAD2007)

These emission factors are applied to CO2, ROG, SOX only. Load factors are already incorporated.

Equipment	MaxHP	NOX (lbs/hr)	ROG (lbs/hr)	PM (lbs/hr)	CO (lbs/hr)	SOX (lbs/hr)	CO2 (lbs/hr)
Aerial Lifts	15	0.0102	0.0528	0.0642	0.0001	0.0030	8.7
	25	0.0175	0.0517	0.0957	0.0001	0.0055	11.0
	50	0.0650	0.1822	0.1916	0.0003	0.0169	19.6
	120	0.0607	0.2451	0.4012	0.0004	0.0324	38.1
	500	0.1276	0.4941	1.6553	0.0021	0.0491	213
	750	0.2379	0.8930	3.0795	0.0039	0.0903	385
Aerial Lifts Composite		0.0576	0.1976	0.3249	0.0004	0.0219	34.7
Air Compressors	15	0.0129	0.0494	0.0768	0.0001	0.0052	7.2
	25	0.0286	0.0779	0.1337	0.0002	0.0087	14.4
	50	0.1010	0.2646	0.2310	0.0003	0.0239	22.3
	120	0.0891	0.3287	0.5333	0.0006	0.0492	47.0
	175	0.1135	0.5074	0.8954	0.0010	0.0512	88.5
	250	0.1066	0.3052	1.2194	0.0015	0.0379	131
	500	0.1709	0.5726	1.9077	0.0023	0.0623	232
	750	0.2681	0.8849	3.0371	0.0036	0.0980	358
	1000	0.4533	1.5617	5.4098	0.0049	0.1589	486
Air Compressors Composite		0.0984	0.3445	0.6494	0.0007	0.0469	63.6
Bore/Drill Rigs	15	0.0120	0.0632	0.0754	0.0002	0.0029	10.3
	25	0.0194	0.0658	0.1233	0.0002	0.0054	16.0
	50	0.0351	0.2335	0.2768	0.0004	0.0149	31.0
	120	0.0514	0.4724	0.5026	0.0009	0.0328	77.1
	175	0.0750	0.7538	0.7479	0.0016	0.0366	141
	250	0.0838	0.3435	0.8722	0.0021	0.0268	188
	500	0.1354	0.5526	1.3152	0.0031	0.0437	311
	750	0.2685	1.0916	2.6320	0.0062	0.0865	615
	1000	0.4491	1.6773	6.6123	0.0093	0.1699	928
Bore/Drill Rigs Composite		0.0854	0.5068	0.9013	0.0017	0.0367	165
Cement and Mortar Mixers	15	0.0075	0.0386	0.0475	0.0001	0.0023	6.3
	25	0.0293	0.0852	0.1548	0.0002	0.0091	17.6
Cement and Mortar Mixers Composite		0.0093	0.0425	0.0564	0.0001	0.0029	7.2
Concrete/Industrial Saws	25	0.0199	0.0678	0.1261	0.0002	0.0050	16.5
	50	0.1047	0.3015	0.2972	0.0004	0.0268	30.2
	120	0.1155	0.4880	0.7625	0.0009	0.0639	74.1
	175	0.1685	0.8723	1.4507	0.0018	0.0767	160
Concrete/Industrial Saws Composite		0.1090	0.4148	0.5910	0.0007	0.0491	58.5
Cranes	50	0.1101	0.2979	0.2478	0.0003	0.0258	23.2
	120	0.0982	0.3650	0.5844	0.0006	0.0533	50.1
	175	0.1089	0.4838	0.8259	0.0009	0.0479	80.3
	250	0.1103	0.3103	1.0712	0.0013	0.0388	112
	500	0.1635	0.5691	1.5327	0.0018	0.0571	180
	750	0.2767	0.9554	2.6486	0.0030	0.0974	303
	9999	0.9905	3.5715	10.9484	0.0098	0.3384	971
Cranes Composite		0.1425	0.4946	1.2753	0.0014	0.0553	129
Crawler Tractors	50	0.1262	0.3333	0.2713	0.0003	0.0289	24.9
	120	0.1374	0.4906	0.8120	0.0008	0.0729	65.8
	175	0.1758	0.7491	1.3245	0.0014	0.0765	121
	250	0.1854	0.5225	1.7044	0.0019	0.0667	166
	500	0.2659	1.0217	2.3914	0.0025	0.0942	259
	750	0.4784	1.8248	4.3817	0.0047	0.1705	465
	1000	0.7229	2.8959	7.7626	0.0066	0.2503	658
Crawler Tractors Composite		0.1671	0.6051	1.2309	0.0013	0.0752	114
Crushing/Proc. Equipment	50	0.1927	0.5215	0.4545	0.0006	0.0462	44.0
	120	0.1525	0.5829	0.9172	0.0010	0.0851	83.1
	175	0.2088	0.9654	1.6343	0.0019	0.0946	167
	250	0.1953	0.5592	2.1896	0.0028	0.0682	245
	500	0.2733	0.8961	2.9457	0.0037	0.0972	374
	750	0.4361	1.3892	4.8387	0.0059	0.1560	589
	9999	1.2112	4.0327	14.2648	0.0131	0.4203	1,308
Crushing/Proc. Equipment Composite		0.1872	0.6911	1.2633	0.0015	0.0819	132
Dumpers/Tenders	25	0.0100	0.0324	0.0614	0.0001	0.0031	7.6
Dumpers/Tenders Composite		0.0100	0.0324	0.0614	0.0001	0.0031	7.6
Excavators	25	0.0198	0.0677	0.1253	0.0002	0.0048	16.4
	50	0.0912	0.2933	0.2568	0.0003	0.0237	25.0
	120	0.1183	0.5220	0.7300	0.0009	0.0657	73.6
	175	0.1288	0.6678	0.9613	0.0013	0.0569	112
	250	0.1301	0.3630	1.2438	0.0018	0.0415	159
	500	0.1805	0.5493	1.6112	0.0023	0.0574	234
	750	0.3013	0.9096	2.7605	0.0039	0.0969	387
Excavators Composite		0.1300	0.5401	0.9817	0.0013	0.0536	120

Table A-37. 2012 SCAB Fleet Average Emission Factors (OFFROAD2007)

These emission factors are applied to CO2, ROG, SOX only. Load factors are already incorporated.

Equipment	MaxHP	NOX (lbs/hr)	ROG (lbs/hr)	PM (lbs/hr)	CO (lbs/hr)	SOX (lbs/hr)	CO2 (lbs/hr)
Forklifts	50	0.0514	0.1682	0.1488	0.0002	0.0136	14.7
	120	0.0489	0.2195	0.3017	0.0004	0.0277	31.2
	175	0.0624	0.3304	0.4664	0.0006	0.0278	56.1
	250	0.0595	0.1638	0.5872	0.0009	0.0187	77.1
	500	0.0806	0.2241	0.7257	0.0011	0.0252	111
Forklifts Composite		0.0585	0.2257	0.4330	0.0006	0.0231	54.4
Generator Sets	15	0.0157	0.0698	0.1063	0.0002	0.0061	10.2
	25	0.0276	0.0951	0.1632	0.0002	0.0096	17.6
	50	0.0959	0.2734	0.2966	0.0004	0.0255	30.6
	120	0.1206	0.4956	0.8099	0.0009	0.0640	77.9
	175	0.1460	0.7413	1.3131	0.0016	0.0644	142
	250	0.1372	0.4502	1.8047	0.0024	0.0508	213
	500	0.1952	0.7617	2.5896	0.0033	0.0756	337
	750	0.3257	1.2296	4.3019	0.0055	0.1241	544
	9999	0.8673	3.0642	10.8871	0.0105	0.3104	1,049
Generator Sets Composite		0.0832	0.3121	0.5779	0.0007	0.0351	61.0
Graders	50	0.1182	0.3365	0.2882	0.0004	0.0286	27.5
	120	0.1348	0.5355	0.8223	0.0009	0.0740	75.0
	175	0.1554	0.7363	1.1931	0.0014	0.0688	124
	250	0.1575	0.4508	1.5344	0.0019	0.0547	172
	500	0.1947	0.6639	1.8193	0.0023	0.0671	229
	750	0.4147	1.4022	3.9602	0.0049	0.1439	486
Graders Composite		0.1533	0.6129	1.2503	0.0015	0.0649	133
Off-Highway Tractors	120	0.2224	0.7269	1.2964	0.0011	0.1143	93.7
	175	0.2135	0.8404	1.6085	0.0015	0.0923	130
	250	0.1718	0.4896	1.5282	0.0015	0.0644	130
	750	0.6814	3.0883	6.1417	0.0057	0.2515	568
	1000	1.0246	4.8137	10.5080	0.0082	0.3620	814
Off-Highway Tractors Composite		0.2170	0.7878	1.7969	0.0017	0.0871	151
Off-Highway Trucks	175	0.1533	0.7593	1.1072	0.0014	0.0666	125
	250	0.1469	0.3944	1.3513	0.0019	0.0461	167
	500	0.2263	0.6661	1.9463	0.0027	0.0705	272
	750	0.3695	1.0792	3.2612	0.0044	0.1164	442
	1000	0.5790	1.7854	6.4025	0.0063	0.1933	625
Off-Highway Trucks Composite		0.2241	0.6635	2.0158	0.0027	0.0715	260
Other Construction Equipmen	15	0.0118	0.0617	0.0737	0.0002	0.0028	10.1
	25	0.0160	0.0544	0.1019	0.0002	0.0044	13.2
	50	0.0842	0.2740	0.2707	0.0004	0.0228	28.0
	120	0.1104	0.5320	0.7540	0.0009	0.0633	80.9
	175	0.1008	0.5880	0.8599	0.0012	0.0467	107
	500	0.1517	0.5426	1.6573	0.0025	0.0545	254
Other Construction Equipment Composite		0.0925	0.3847	0.8599	0.0013	0.0366	123
Other General Industrial Equip	15	0.0066	0.0391	0.0466	0.0001	0.0018	6.4
	25	0.0185	0.0632	0.1170	0.0002	0.0045	15.3
	50	0.1085	0.2856	0.2332	0.0003	0.0253	21.7
	120	0.1274	0.4542	0.7277	0.0007	0.0703	62.0
	175	0.1349	0.5757	1.0001	0.0011	0.0599	95.9
	250	0.1235	0.3281	1.2983	0.0015	0.0417	136
	500	0.2232	0.6772	2.2367	0.0026	0.0758	265
	750	0.3707	1.1162	3.8016	0.0044	0.1273	437
	1000	0.5621	1.8453	6.4018	0.0056	0.1947	560
Other General Industrial Equipmen Composite		0.1635	0.5362	1.4520	0.0016	0.0632	152
Other Material Handling Equip	50	0.1506	0.3950	0.3243	0.0004	0.0352	30.3
	120	0.1239	0.4423	0.7103	0.0007	0.0684	60.7
	175	0.1703	0.7292	1.2706	0.0014	0.0759	122
	250	0.1305	0.3496	1.3863	0.0016	0.0443	145
	500	0.1590	0.4876	1.6124	0.0019	0.0545	192
	9999	0.7467	2.4395	8.4619	0.0073	0.2565	741
Other Material Handling Equipment Composite		0.1566	0.5108	1.4125	0.0015	0.0613	141
Pavers	25	0.0255	0.0811	0.1531	0.0002	0.0080	18.7
	50	0.1451	0.3680	0.3038	0.0004	0.0327	28.0
	120	0.1467	0.5107	0.8788	0.0008	0.0776	69.2
	175	0.1864	0.7833	1.4495	0.0014	0.0819	128
	250	0.2182	0.6365	2.0698	0.0022	0.0818	194
	500	0.2383	0.9957	2.2418	0.0023	0.0883	233
Pavers Composite		0.1596	0.5445	0.8980	0.0009	0.0642	77.9
Paving Equipment	25	0.0153	0.0520	0.0974	0.0002	0.0042	12.6
	50	0.1239	0.3124	0.2591	0.0003	0.0279	23.9
	120	0.1150	0.3997	0.6897	0.0006	0.0610	54.5

Table A-37. 2012 SCAB Fleet Average Emission Factors (OFFROAD2007)

These emission factors are applied to CO2, ROG, SOX only. Load factors are already incorporated.

Equipment	MaxHP	NOX (lbs/hr)	ROG (lbs/hr)	PM (lbs/hr)	CO (lbs/hr)	SOX (lbs/hr)	CO2 (lbs/hr)
	175	0.1455	0.6114	1.1384	0.0011	0.0640	101
	250	0.1349	0.3946	1.2976	0.0014	0.0507	122
Paving Equipment Composite		0.1204	0.4365	0.8114	0.0008	0.0570	68.9

Table A-37. 2012 SCAB Fleet Average Emission Factors (OFFROAD2007)

These emission factors are applied to CO2, ROG, SOX only. Load factors are already incorporated.

Equipment	MaxHP	NOX (lbs/hr)	ROG (lbs/hr)	PM (lbs/hr)	CO (lbs/hr)	SOX (lbs/hr)	CO2 (lbs/hr)
Plate Compactors	15	0.0050	0.0263	0.0314	0.0001	0.0013	4.3
Plate Compactors Composite		0.0050	0.0263	0.0314	0.0001	0.0013	4.3
Pressure Washers	15	0.0075	0.0334	0.0509	0.0001	0.0029	4.9
	25	0.0112	0.0385	0.0662	0.0001	0.0039	7.1
	50	0.0349	0.1074	0.1339	0.0002	0.0102	14.3
	120	0.0332	0.1458	0.2385	0.0003	0.0172	24.1
Pressure Washers Composite		0.0173	0.0635	0.0921	0.0001	0.0063	9.4
Pumps	15	0.0133	0.0508	0.0790	0.0001	0.0054	7.4
	25	0.0386	0.1051	0.1803	0.0002	0.0117	19.5
	50	0.1155	0.3229	0.3362	0.0004	0.0299	34.3
	120	0.1250	0.5036	0.8226	0.0009	0.0669	77.9
	175	0.1498	0.7431	1.3164	0.0016	0.0664	140
	250	0.1357	0.4345	1.7375	0.0023	0.0501	201
	500	0.2089	0.8032	2.6861	0.0034	0.0803	345
	750	0.3557	1.3279	4.5700	0.0057	0.1350	571
	9999	1.1456	4.0641	14.2305	0.0136	0.4081	1,355
Pumps Composite		0.0813	0.2983	0.4999	0.0006	0.0351	49.6
Rollers	15	0.0074	0.0386	0.0461	0.0001	0.0018	6.3
	25	0.0162	0.0549	0.1029	0.0002	0.0045	13.3
	50	0.1105	0.2994	0.2677	0.0003	0.0263	26.0
	120	0.1054	0.4098	0.6619	0.0007	0.0574	59.0
	175	0.1320	0.6220	1.0725	0.0012	0.0591	108
	250	0.1347	0.4083	1.4103	0.0017	0.0498	153
	500	0.1755	0.6752	1.8093	0.0022	0.0652	219
Rollers Composite		0.1038	0.4107	0.6936	0.0008	0.0488	67.1
Rough Terrain Forklifts	50	0.1315	0.3910	0.3455	0.0004	0.0330	33.9
	120	0.1038	0.4364	0.6425	0.0007	0.0585	62.4
	175	0.1444	0.7268	1.1204	0.0014	0.0652	125
	250	0.1353	0.3896	1.4082	0.0019	0.0458	171
	500	0.1894	0.5985	1.8577	0.0025	0.0642	257
Rough Terrain Forklifts Composite		0.1093	0.4680	0.6995	0.0008	0.0587	70.3
Rubber Tired Dozers	175	0.2209	0.8528	1.6304	0.0015	0.0945	129
	250	0.2545	0.7124	2.1985	0.0021	0.0942	183
	500	0.3345	1.5220	2.8822	0.0026	0.1210	265
	750	0.5042	2.2809	4.4100	0.0040	0.1832	399
	1000	0.7807	3.6654	7.7816	0.0060	0.2729	592
Rubber Tired Dozers Composite		0.3114	1.2491	2.6866	0.0025	0.1137	239
Rubber Tired Loaders	25	0.0205	0.0697	0.1295	0.0002	0.0052	16.9
	50	0.1315	0.3756	0.3242	0.0004	0.0319	31.1
	120	0.1045	0.4187	0.6404	0.0007	0.0576	58.9
	175	0.1312	0.6288	1.0135	0.0012	0.0583	106
	250	0.1330	0.3838	1.3129	0.0017	0.0462	149
	500	0.1961	0.6755	1.8555	0.0023	0.0677	237
	750	0.4044	1.3812	3.9115	0.0049	0.1408	486
	1000	0.5480	1.9543	6.3337	0.0060	0.1909	594
Rubber Tired Loaders Composite		0.1272	0.4855	1.0034	0.0012	0.0558	109
Scrapers	120	0.1990	0.7011	1.1749	0.0011	0.1054	93.9
	175	0.2172	0.9158	1.6429	0.0017	0.0945	148
	250	0.2367	0.6699	2.1849	0.0024	0.0859	209
	500	0.3333	1.3000	3.0162	0.0032	0.1190	321
	750	0.5779	2.2380	5.3231	0.0056	0.2075	555
Scrapers Composite		0.2916	1.0984	2.5680	0.0027	0.1087	262
Signal Boards	15	0.0072	0.0377	0.0450	0.0001	0.0017	6.2
	50	0.1270	0.3587	0.3564	0.0005	0.0324	36.2
	120	0.1284	0.5269	0.8360	0.0009	0.0703	80.2
	175	0.1661	0.8370	1.4268	0.0017	0.0750	155
	250	0.1746	0.5516	2.1599	0.0029	0.0639	255
Signal Boards Composite		0.0203	0.0940	0.1470	0.0002	0.0083	16.7
Skid Steer Loaders	25	0.0211	0.0635	0.1189	0.0002	0.0067	13.8
	50	0.0596	0.2332	0.2402	0.0003	0.0180	25.5
	120	0.0482	0.2769	0.3536	0.0005	0.0286	42.8
Skid Steer Loaders Composite		0.0534	0.2360	0.2686	0.0004	0.0207	30.3
Surfacing Equipment	50	0.0513	0.1441	0.1411	0.0002	0.0128	14.1
	120	0.1040	0.4251	0.6895	0.0007	0.0557	63.8
	175	0.0950	0.4745	0.8195	0.0010	0.0422	85.8
	250	0.1095	0.3526	1.1993	0.0015	0.0413	135
	500	0.1631	0.6813	1.7819	0.0022	0.0622	221
	750	0.2601	1.0660	2.8642	0.0035	0.0986	347
Surfacing Equipment Composite		0.1362	0.5467	1.3678	0.0017	0.0512	166

Table A-37. 2012 SCAB Fleet Average Emission Factors (OFFROAD2007)

These emission factors are applied to CO2, ROG, SOX only. Load factors are already incorporated.

Equipment	MaxHP	NOX (lbs/hr)	ROG (lbs/hr)	PM (lbs/hr)	CO (lbs/hr)	SOX (lbs/hr)	CO2 (lbs/hr)
Sweepers/Scrubbers	15	0.0124	0.0729	0.0870	0.0002	0.0034	11.9
	25	0.0237	0.0808	0.1501	0.0002	0.0060	19.6
	50	0.1195	0.3565	0.3179	0.0004	0.0302	31.6
	120	0.1233	0.5204	0.7534	0.0009	0.0706	75.0
	175	0.1575	0.8008	1.2212	0.0016	0.0717	139
	250	0.1205	0.3447	1.3019	0.0018	0.0402	162
Sweepers/Scrubbers Composite		0.1278	0.5215	0.7403	0.0009	0.0576	78.5
Tractors/Loaders/Backhoes	25	0.0199	0.0662	0.1250	0.0002	0.0061	15.9
	50	0.1006	0.3305	0.3030	0.0004	0.0267	30.3
	120	0.0760	0.3557	0.4910	0.0006	0.0432	51.7
	175	0.1058	0.5866	0.8294	0.0011	0.0478	101
	250	0.1264	0.3755	1.2813	0.0019	0.0415	172
	500	0.2386	0.7714	2.2621	0.0039	0.0784	345
	750	0.3611	1.1563	3.5105	0.0058	0.1199	517
Tractors/Loaders/Backhoes Composite		0.0862	0.3824	0.5816	0.0008	0.0435	66.8
Trenchers	15	0.0099	0.0517	0.0617	0.0001	0.0024	8.5
	25	0.0398	0.1355	0.2519	0.0004	0.0101	32.9
	50	0.1656	0.4176	0.3536	0.0004	0.0374	32.9
	120	0.1354	0.4732	0.8257	0.0008	0.0709	64.9
	175	0.2050	0.8694	1.6306	0.0016	0.0901	144
	250	0.2483	0.7418	2.3854	0.0025	0.0951	223
	500	0.3135	1.4011	3.0220	0.0031	0.1190	311
	750	0.5949	2.6307	5.8034	0.0059	0.2259	587
Trenchers Composite		0.1507	0.4749	0.6995	0.0007	0.0582	58.7
Welders	15	0.0111	0.0425	0.0660	0.0001	0.0045	6.2
	25	0.0224	0.0609	0.1044	0.0001	0.0068	11.3
	50	0.1071	0.2854	0.2637	0.0003	0.0260	26.0
	120	0.0708	0.2687	0.4376	0.0005	0.0387	39.5
	175	0.1183	0.5475	0.9688	0.0011	0.0531	98.2
	250	0.0909	0.2704	1.0791	0.0013	0.0329	119
	500	0.1154	0.4072	1.3538	0.0016	0.0431	168
Welders Composite		0.0703	0.2150	0.2702	0.0003	0.0243	25.6

Table A-38. ARB and USEPA Off-Road Compression-Ignition (Diesel) Engine Standards (NMHC+NOx/CO/PM in g/bhp-hr). When ARB and USEPA standards differ, the standards shown here represent the more stringent of the two.

Maximum horsepower	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015+
<11	See Table 2 footnote (a)					7.8 / 6.0 / 0.75					5.6 / 6.0 / 0.6			5.6 / 6.0 / 0.30[a]							
11≤hp<25						7.1 / 4.9 / 0.60					5.6 / 4.9 / 0.60			5.6 / 4.9 / 0.30							
25≤hp<50	-					7.1 /4.1 / 0.60				5.6 / 4.1 / 0.45				5.6 / 4.1 / 0.22					3.5 / 4.1 / 0.02		
50≤hp< 75						- / 6.9 / - / -[b]				5.6 / 3.7 / 0.30				3.5 / 3.7 / 0.22[c]					3.5 / 3.7 / 0.02[c]		
75≤hp<100														3.5 / 3.7 / 0.30			0.14 / 2.5 / 3.7 / 0.015[b,d]				0.14 / 0.30 / 3.7 / 0.015[b]
100≤hp<175									4.9 / 3.7 / 0.22				3.0 / 3.7 / 0.22								
175≤hp<300									4.9 / 2.6 / 0.15			3.0 / 2.6 / 0.15[e]					0.14 / 1.5 / 2.6 / 0.015[b,d]				0.14 / 0.30 / 2.2 / 0.015[b]
300≤hp<600	-		1.0 / 6.9 / 8.5 / 0.40[b]					4.8 / 2.6 / 0.15													
600≤hp≤750																					
Mobile Machines > 750hp			-			1.0 / 6.9 / 8.5 / 0.40[b]					4.8 / 2.6 / 0.15						0.30 / 2.6 / 2.6 / 0.07[b]				0.14 / 2.6 / 2.6 / 0.03[b]
750hp<GEN ≤1200hp																					0.14 / 0.50 / 2.6 / 0.02[b]
GEN>1200 hp																	0.30 / 0.50 / 2.6 / 0.07[b]				

a) The PM standard for hand-start, air cooled, direct injection engines below 11 hp may be delayed until 2010 and be set at 0.45 g/bhp-hr.
b) Standards given are NMHC/NOx/CO/PM in g/bhp-hr.
c) Engine families in this power category may alternately meet Tier 3 PM standards (0.30 g/bhp-hr) from 2008-2011 in exchange for introducing final PM standards in 2012.
d) The implementation schedule shown is the three-year alternate NOx approach. Other schedules are available.
e) Certain manufacturers have agreed to comply with these standards by 2005.

: Tier 1 : Tier 2 : Tier 3 : Tier 4 Interim / Final

	TIER 2 Emission Factors						TIER 3 Emission Factors						% reduction from TIER 2 to TIER 3		
	NOx		CO		PM		NOx		CO		PM		NOx	CO	PM
Maximum horsepower	g/bhp-hr	lb/bhp-hr	g/bhp-hr	lb/bhp-hr	g/bhp-hr	lb/bhp-hr	g/bhp-hr	lb/bhp-hr	g/bhp-hr	lb/bhp-hr	g/bhp-hr	lb/bhp-hr			
<11	5.6	0.0123457	6	0.0132275	0.6	0.0013228	5.6	0.0123457	6	0.0132275	0.6	0.0013228	0.00%	0.00%	0.00%
11≤hp<25	5.6	0.0123457	4.9	0.0108025	0.6	0.0013228	5.6	0.0123457	4.9	0.0108025	0.6	0.0013228	0.00%	0.00%	0.00%
25≤hp<50	5.6	0.0123457	4.1	0.0090388	0.45	0.0009921	5.6	0.0123457	4.1	0.0090388	0.45	0.0009921	0.00%	0.00%	0.00%
50≤hp< 75	5.6	0.0123457	3.7	0.008157	0.3	0.0006614	5.6	0.0123457	3.7	0.008157	0.3	0.0006614	0.00%	0.00%	0.00%
75≤hp<100	5.6	0.0123457	3.7	0.008157	0.3	0.0006614	3.5	0.007716	3.7	0.008157	0.3	0.0006614	37.50%	0.00%	0.00%
100≤hp<175	4.9	0.0108025	3.7	0.008157	0.22	0.000485	3	0.0066138	3.7	0.008157	0.22	0.000485	38.78%	0.00%	0.00%
175≤hp<300	4.9	0.0108025	2.6	0.0057319	0.15	0.0003307	3	0.0066138	2.6	0.0057319	0.15	0.0003307	38.78%	0.00%	0.00%
300≤hp<600	4.8	0.010582	2.6	0.0057319	0.15	0.0003307	3	0.0066138	2.6	0.0057319	0.15	0.0003307	37.50%	0.00%	0.00%
600≤hp≤750	4.8	0.010582	2.6	0.0057319	0.15	0.0003307	3	0.0066138	2.6	0.0057319	0.15	0.0003307	37.50%	0.00%	0.00%
Mobile Machines > 750hp	4.8	0.010582	2.6	0.0057319	0.15	0.0003307	4.8	0.010582	2.6	0.0057319	0.15	0.0003307	0.00%	0.00%	0.00%
	4.8	0.010582	2.6	0.0057319	0.15	0.0003307	4.8	0.010582	2.6	0.0057319	0.15	0.0003307	0.00%	0.00%	0.00%
750hp<GEN ≤1200hp	4.8	0.010582	2.6	0.0057319	0.15	0.0003307	4.8	0.010582	2.6	0.0057319	0.15	0.0003307	0.00%	0.00%	0.00%
GEN>1200 hp	4.8	0.010582	2.6	0.0057319	0.15	0.0003307	4.8	0.010582	2.6	0.0057319	0.15	0.0003307	0.00%	0.00%	0.00%

: Tier 2

: Tier 3

Table A-39. PSR Offroad Load Factors

Used in conjunction with Tier 2-3 emission factors.

Source: mailout MSC99-32, http://www.arb.ca.gov/msei/onroad/downloads/pubs/mo9932.zip (4/2/2009)

Category	Equipment	HP	P/N	Activity (hrs/yr)	Load
Agricultural	Agricultural Mowers	120	P	363	0.43
	Agricultural Tractors	50	P	475	0.70
		120	P	475	0.70
		175	P	475	0.70
		250	N	475	0.70
		500	N	475	0.70
	Balers	50	P	95	0.58
		120	P	95	0.58
	Combines	120	P	150	0.70
		175	P	150	0.70
		250	N	150	0.70
		500	N	150	0.70
	Hydro Power Units	50	P	790	0.48
		120	P	790	0.48
	Irrigation Pumps	50	P	749	0.65
		120	P	749	0.65
		175	P	749	0.65
		250	N	749	0.65
		500	N	749	0.65
	Other Agricultural Equipment	50	P	381	0.51
		120	P	381	0.51
		175	P	381	0.51
		250	N	381	0.51
		500	N	381	0.51
	Sprayers	50	P	90	0.50
		120	P	90	0.50
		175	P	90	0.50
		250	N	90	0.50
		500	N	90	0.50
	Swathers	120	P	110	0.55
		175	P	110	0.55
	Tillers >5 HP	250	N	172	0.78
		500	N	172	0.78
Commercial	Air Compressors	50	P	815	0.48
		120	P	815	0.48
		175	P	815	0.48
		250	N	815	0.48
		500	N	815	0.48
		750	N	815	0.48
		9999	N	815	0.48
	Generator Sets	50	N	338	0.74
		120	N	338	0.74
		175	N	338	0.74
		250	N	338	0.74
		500	N	338	0.74
		750	N	338	0.74
		9999	N	338	0.74
	Pressure Washers	50	P	145	0.30
		120	P	145	0.30
	Pumps	50	P	403	0.74
		120	P	403	0.74

Table A-39. PSR Offroad Load Factors

Used in conjunction with Tier 2-3 emission factors.

Source: mailout MSC99-32, http://www.arb.ca.gov/msei/onroad/downloads/pubs/mo9932.zip (4/2/2009)

Category	Equipment	HP	P/N	Activity (hrs/yr)	Load
		175	P	403	0.74
		250	N	403	0.74
		500	N	403	0.74
		9999	N	403	0.74
	Welders	50	P	643	0.45
		120	P	643	0.45
		175	P	643	0.45
Construction	Bore/Drill Rigs	50	P	726	0.75
		120	P	726	0.75
		175	P	726	0.75
		250	N	726	0.75
		500	N	726	0.75
		750	N	726	0.75
		9999	N	726	0.75
	Concrete/Industrial Saws	50	P	580	0.73
		120	P	580	0.73
		175	P	580	0.73
	Cranes	50	P	1464	0.43
		120	P	1464	0.43
		175	P	1464	0.43
		250	N	1464	0.43
		500	N	1464	0.43
		750	N	1464	0.43
	Crawler Tractors	50	P	936	0.64
		120	P	936	0.64
		175	P	936	0.64
		250	N	936	0.64
		500	N	936	0.64
		750	N	936	0.64
		9999	N	936	0.64
	Crushing/Proc. Equipment	50	P	955	0.78
		120	P	955	0.78
		175	P	955	0.78
		250	N	955	0.78
		500	N	955	0.78
		750	N	955	0.78
		9999	N	955	0.78
	Excavators	50	P	1162	0.57
		120	P	1162	0.57
		175	P	1162	0.57
		250	N	1162	0.57
		500	N	1162	0.57
		750	N	1162	0.57
	Graders	50	P	965	0.61
		120	P	965	0.61
		175	P	965	0.61
		250	N	965	0.61
		500	N	965	0.61
		750	N	965	0.61
	Off-Highway Tractors	120	P	855	0.65
		175	P	855	0.65

Table A-39. PSR Offroad Load Factors

Used in conjunction with Tier 2-3 emission factors.

Source: mailout MSC99-32, http://www.arb.ca.gov/msei/onroad/downloads/pubs/mo9932.zip (4/2/2009)

Category	Equipment	HP	P/N	Activity (hrs/yr)	Load
		250	N	855	0.65
		750	N	855	0.65
		9999	N	855	0.65
	Off-Highway Trucks	175	P	1641	0.57
		250	N	1641	0.57
		500	N	1641	0.57
		750	N	1641	0.57
		9999	N	1641	0.57
	Other Construction Equipment	50	P	606	0.62
		120	P	606	0.62
		175	P	606	0.62
		500	N	606	0.62
	Pavers	50	P	828	0.62
		120	P	828	0.62
		175	P	828	0.62
		250	N	828	0.62
		500	N	828	0.62
	Paving Equipment	50	P	622	0.53
		120	P	622	0.53
		175	P	622	0.53
		250	N	622	0.53
	Rollers	50	P	748	0.56
		120	P	748	0.56
		175	P	748	0.56
		250	N	748	0.56
		500	N	748	0.56
	Rough Terrain Forklifts	50	P	1198	0.60
		120	P	1198	0.60
		175	P	1198	0.60
		250	N	1198	0.60
		500	N	1198	0.60
	Rubber Tired Dozers	175	P	899	0.59
		250	N	899	0.59
		500	N	899	0.59
		750	N	899	0.59
		9999	N	899	0.59
	Rubber Tired Loaders	50	P	1346	0.54
		120	P	1346	0.54
		175	P	1346	0.54
		250	N	1346	0.54
		500	N	1346	0.54
		750	N	1346	0.54
		9999	N	1346	0.54
	Scrapers	120	P	1090	0.72
		175	P	1090	0.72
		250	N	1090	0.72
		500	N	1090	0.72
		750	N	1090	0.72
	Signal Boards	50	P	535	0.78
		120	P	535	0.78
		175	P	535	0.78

Table A-39. PSR Offroad Load Factors

Used in conjunction with Tier 2-3 emission factors.

Source: mailout MSC99-32, http://www.arb.ca.gov/msei/onroad/downloads/pubs/mo9932.zip (4/2/2009)

Category	Equipment	HP	P/N	Activity (hrs/yr)	Load
		250	N	535	0.78
	Skid Steer Loaders	50	P	811	0.55
		120	P	811	0.55
	Surfacing Equipment	50	P	561	0.45
		120	P	561	0.45
		175	P	561	0.45
		250	N	561	0.45
		500	N	561	0.45
		750	N	561	0.45
	Tractors/Loaders/Backhoes	50	P	1135	0.55
		120	P	1135	0.55
		175	P	1135	0.55
		250	N	1135	0.55
	Trenchers	50	P	620	0.75
		120	P	620	0.75
		175	P	620	0.75
		250	N	620	0.75
		500	N	620	0.75
		750	N	620	0.75
Dredging	Compressor (Dredging)	50	P	815	0.48
		120	P	815	0.48
	Crane	750	N	1464	0.43
	Deck/door engine	250	N	142	0.80
	Dredger	175	P	878	0.51
		250	N	878	0.51
		750	N	878	0.51
	Generator (Dredging)	50	P	1011	0.74
		120	P	1011	0.74
		175	P	1011	0.74
		250	N	1011	0.74
		500	N	1011	0.74
		750	N	1011	0.74
		9999	N	1011	0.74
	Hoist/swing/winch	50	P	878	0.51
		120	P	878	0.51
		175	P	878	0.51
		250	N	878	0.51
		500	N	878	0.51
		750	N	878	0.51
		9999	N	878	0.51
	Other (Dredging)	120	P	878	0.51
		175	P	878	0.51
		250	N	878	0.51
		500	N	878	0.51
	Pump (Dredging)	175	P	403	0.74
		250	N	403	0.74
		500	N	403	0.74
		9999	N	403	0.74
Drilling	Compressors (Workover)	120	P	1231	0.60
		175	P	1231	0.60
		250	N	1231	0.60

Table A-39. PSR Offroad Load Factors

Used in conjunction with Tier 2-3 emission factors.

Source: mailout MSC99-32, http://www.arb.ca.gov/msei/onroad/downloads/pubs/mo9932.zip (4/2/2009)

Category	Equipment	HP	P/N	Activity (hrs/yr)	Load
		750	N	1231	0.60
	Generator (Drilling)	120	P	1231	0.60
		175	P	1231	0.60
		250	N	1231	0.60
		750	N	1231	0.60
	Generator (Workover)	120	P	1231	0.60
		175	P	1231	0.60
		250	N	1231	0.60
		750	N	1231	0.60
		9999	N	1231	0.60
	Lift (Drilling)	250	N	1231	0.60
		750	N	1231	0.60
	Other Drilling Equipment	120	P	1231	0.60
		175	P	1231	0.60
		250	N	1231	0.60
		750	N	1231	0.60
		9999	N	1231	0.60
	Other Workover Equipment	120	P	1231	0.60
		175	P	1231	0.60
		250	N	1231	0.60
		750	N	1231	0.60
		9999	N	1231	0.60
	Pump (Drilling)	120	P	1231	0.60
		175	P	1231	0.60
		250	N	1231	0.60
		750	N	1231	0.60
		9999	N	1231	0.60
	Pump (Workover)	120	P	1231	0.60
		175	P	1231	0.60
		250	N	1231	0.60
		750	N	1231	0.60
		9999	N	1231	0.60
	Snubbing	120	P	1231	0.60
	Swivel	120	P	1231	0.60
		175	P	1231	0.60
		250	N	1231	0.60
		750	N	1231	0.60
Ground Support Equipment	A/C Tug Narrow Body	250	N	606.1839847	0.80
	A/C Tug Wide Body	500	N	759.2692308	0.80
	Air Conditioner	175	N	808.1666667	0.75
	Air Start Unit	500	N	332.9655172	0.90
	Baggage Tug	120	N	1623.8	0.55
	Belt Loader	120	N	1037.643678	0.50
	Bobtail	120	N	1867.428571	0.55
	Cargo Loader	120	N	901.7941176	0.50
	Cargo Tractors	120	N	101	0.54
	Catering Truck	250	N	1600	0.52
	Forklift	175	P	731.5	0.30
	Fuel Truck	250	N	3489.166667	0.25
	Generator	175	N	1629.714286	0.78
	Ground Power Unit	175	N	968.4296875	0.75

Table A-39. PSR Offroad Load Factors

Used in conjunction with Tier 2-3 emission factors.

Source: mailout MSC99-32, http://www.arb.ca.gov/msei/onroad/downloads/pubs/mo9932.zip (4/2/2009)

Category	Equipment	HP	P/N	Activity (hrs/yr)	Load
	Hydrant Truck	175	N	224.25	0.70
	Lav Truck	175	N	1306.5	0.25
	Lift	120	N	917.3636364	0.50
	Other	175	N	1645.590909	0.50
	Passenger Stand	120	N	70	0.59
	Service Truck	175	N	1930.75	0.20
	Sweeper	120	N	12	0.51
Industrial	Aerial Lifts	50	P	384	0.46
		120	P	384	0.46
		500	N	384	0.46
		750	N	384	0.46
	Forklifts	50	P	1800	0.30
		120	P	1800	0.30
		175	P	1800	0.30
		250	N	1800	0.30
		500	N	1800	0.30
	Other General Industrial Equipment	50	N	878	0.51
		120	N	878	0.51
		175	N	878	0.51
		250	N	878	0.51
		500	N	878	0.51
		750	N	878	0.51
		9999	N	878	0.51
	Other Material Handling Equipment	50	N	421	0.59
		120	N	421	0.59
		175	N	421	0.59
		250	N	421	0.59
		500	N	421	0.59
	Sweepers/Scrubbers	50	N	1220	0.68
		120	N	1220	0.68
		175	N	1220	0.68
		250	N	1220	0.68
Lawn and Garden	Chippers/Stump Grinders	120	P	465	0.73
		175	P	465	0.73
		250	N	465	0.73
		500	N	465	0.73
		750	N	465	0.73
	Leaf Blowers/Vacuums	120	N	120	0.40
		250	N	120	0.40
	Snowblowers	175	P	400	0.65
		250	N	400	0.65
		500	N	400	0.65
Logging	Fellers/Bunchers	120	P	1276	0.71
		175	P	1276	0.71
		250	N	1276	0.71
		500	N	1276	0.71
		750	N	1276	0.71
	Shredders	175	P	120	0.40
	Skidders	120	P	1442	0.74
		175	P	1442	0.74
		250	N	1442	0.74

Table A-39. PSR Offroad Load Factors

Used in conjunction with Tier 2-3 emission factors.

Source: mailout MSC99-32, http://www.arb.ca.gov/msei/onroad/downloads/pubs/mo9932.zip (4/2/2009)

Category	Equipment	HP	P/N	Activity (hrs/yr)	Load
		500	N	1442	0.74
Military Tactical Support	A/C unit	120	P	300	0.60
		250	N	300	0.60
		500	N	300	0.60
	Aircraft Support	120	P	300	0.60
		175	P	300	0.60
	Cart	120	P	300	0.60
		175	P	300	0.60
		250	N	300	0.60
	Communications	50	P	300	0.60
		120	P	300	0.60
	Compressor (Military)	50	P	300	0.60
		120	P	300	0.60
		175	P	300	0.60
		250	N	300	0.60
		500	N	300	0.60
	Crane	120	P	300	0.60
		175	P	300	0.60
		250	N	300	0.60
	Deicer	120	P	300	0.60
	Generator (Military)	50	P	300	0.60
		120	P	300	0.60
		175	P	300	0.60
		250	N	300	0.60
		500	N	300	0.60
	Hydraulic unit	120	P	300	0.60
	Lift (Military)	120	P	300	0.60
	Light	50	P	300	0.60
	Other tactical support equipment	50	P	300	0.60
		120	P	300	0.60
		175	P	300	0.60
		250	N	300	0.60
		500	N	300	0.60
		750	N	300	0.60
	Pressure Washer	175	P	300	0.60
	Pump (Military)	50	P	300	0.60
		120	P	300	0.60
	Start Cart	120	P	300	0.60
		500	N	300	0.60
	Test Stand	120	P	300	0.60
		175	P	300	0.60
		250	N	300	0.60
		500	N	300	0.60
	Welder	50	P	300	0.60
		120	P	300	0.60
Misc. Portable Equipment	Misc Portable Equipment	120	P	484	0.56
		175	P	484	0.56
		250	N	484	0.56
		500	N	484	0.56
		750	N	484	0.56
		9999	N	484	0.56

Table A-39. PSR Offroad Load Factors

Used in conjunction with Tier 2-3 emission factors.

Source: mailout MSC99-32, http://www.arb.ca.gov/msei/onroad/downloads/pubs/mo9932.zip (4/2/2009)

Category	Equipment	HP	P/N	Activity (hrs/yr)	Load
Transport Refrigeration	Transport Refrigeration Unit	50	N	1341	0.28
		120	P	1341	0.28

Table A-40. Helicopter Emissions Calculation - Transmission Line

Helicopter flight hours based on estimates from similar transmission line construction projects

1 structure/day

- heavy lift helicopter	2	hours per structure
- medium lift helicopter	4	hours per structure
- light lift helicopter	10	hours per structure

NOX lbs/day	VOC/ROG lbs/day	PM lbs/day	CO lbs/day	SOX lbs/day	CO2 lbs/day	NOX (tons)	VOC/ROG (tons)	PM (tons)	CO (tons)	SOX (tons)	CO2 (tons)
39.6506	9.6737	14.8503	39.6506	9.3429	22824.5049	6.4809	3.7810	1.9937	6.4809	1.3483	3293.9644

Transmission Line

12 months **Structures** **140**

Primary Equipment Description	HP Estimate	Fuel Type	Activity Schedule Estimate (Days)	Duration of Use (Hours/ Day)	Work Flight Cycles/ Day	Refuel Flight Cycles/ Day	Total Flight Cycles
							11,538
Light Duty/Crew Helicopter	1200	Jet A	140	10	40	10	8,471
Medium Lift Helicopter	3000		140	4	10	4	2,045
Heavy Lift Helicopter	9000		140	2	5	2	1,023

NOX lbs/day	VOC/ROG lbs/day	PM lbs/day	CO lbs/day	SOX lbs/day	CO2 lbs/day	NOX (tons)	VOC/ROG (tons)	PM (tons)	CO (tons)	SOX (tons)	CO2 (tons)
27.9230	6.8125	10.4579	27.9230	6.5795	16073.5950	2.3652	0.5771	0.8858	2.3652	0.5573	1361.5280
7.8184	1.9075	2.9282	7.8184	1.8423	4500.6066	1.2696	2.7643	0.2568	1.2696	0.3721	909.0206
3.9092	0.9537	1.4641	3.9092	0.9211	2250.3033	2.8461	0.4396	0.8511	2.8461	0.4189	1023.4157

Table A-41. Helicopter Emission Factors - Transmission Line

CO, VOC, NOx, and Sox helicopter emissions are calculated using EDMS 5.1 emission factors.

PM helicopter emissions are calculated using factors provided in *Volume 4, Procedures for Emissions Inventory Preparation, EPA420R-92-009.*

CO2 helicopter emissions are calculated using CCAR reccomended factor 9.57 kg CO2/gallon jet fuel.

Flight cycles based on estimates from Sargent & Lundy and calculated to: 16.43 minutes for heavy lift, 16.43 minutes for medium lift, and 9.92 minutes for light lift helicopters.

Helicopter operating modes, as percentages of total engine run time, are estimated as follows:

Taxi Out	10%
Takeoff	5%
Climbout	10%
Approach/Cruising	65%
Taxi In	10%

Density Jet A .8 kg/L

CO2 emission factor 9.57 kg CO2/gal jet fue 3156.33 g/kg jet fuel @ 15C

Helicopter Model	Actual Engine	Actual Engine HP	Model Engine	Model Engine HP	Operating Mode	Fuel Flow, kg/s	Time in Mode per Cycle, min	Emission Indices, g/kg fuel						Emissions Per Mode, lbs/engine-cycle						Emissions Per Mode, lbs/cycle					
								CO	VOC	NOx	SOx	PM	CO2	CO	VOC	NOx	SOx	PM	CO2	CO	VOC	NOx	SOx	PM	CO2
Heavy Lift Helicopter																									
Boeing 234 UT	Avro Lycoming AL5512	two 4200	T64-GE-413 /	3925	Taxi Out	0.03608	1.64	2.620	19.876	2.620	1.292	2.920	3156.332	0.021	0.156	0.021	0.010	0.023	24.748	0.041	0.312	0.041	0.020	0.046	49.496
Sikorsky S-64F	PW JFTD12A-5A	two 4800	T56-A7 (PM)	4050	Takeoff	0.207921	2.46	11.020	0.356	11.020	1.292	1.780	3156.332	0.747	0.024	0.747	0.088	0.121	213.924	1.494	0.048	1.494	0.175	0.241	427.848
Sikorsky S-64E	PW JFTD12A-4	two 4500			Approach	0.165387	10.68	8.540	0.403	8.540	1.292	2.850	3156.332	1.995	0.094	1.995	0.302	0.666	737.369	3.990	0.188	3.990	0.604	1.332	1474.739
					Taxi In	0.03608	1.64	2.620	19.876	2.620	1.292	2.920	3156.332	0.021	0.156	0.021	0.010	0.023	24.748	0.041	0.312	0.041	0.020	0.046	49.496
Total							16.43													**5.566**	**0.860**	**5.566**	**0.819**	**1.664**	**2001.578**
Medium Lift Helicopter																									
Boeing 107II	GE T58	two 1400	T58-GE-8F /	1400	Taxi Out	0.01826	1.64	1.430	150.010	1.430	1.292	0.750	3156.332	0.006	0.595	0.006	0.005	0.003	12.525	0.011	1.191	0.011	0.010	0.006	25.050
Sikorsky S-61S	GE CT58-140	two 1500	T58-GE-5 (PM)	1500	Takeoff	0.099972	0.82	5.470	0.690	5.470	1.292	0.900	3156.332	0.059	0.007	0.059	0.014	0.010	34.286	0.119	0.015	0.119	0.028	0.020	68.572
Sikorsky S-61L	GE CT58-110	two 1500			Climbout	0.078989	1.64	4.697	1.034	4.697	1.292	0.900	3156.332	0.081	0.018	0.081	0.022	0.015	54.180	0.161	0.035	0.161	0.044	0.031	108.359
Eurocopter 332C/L	Makila 1A1	two 1800			Approach	0.074229	10.68	4.476	1.295	4.476	1.292	0.900	3156.332	0.469	0.136	0.469	0.135	0.094	330.946	0.939	0.272	0.939	0.271	0.189	661.892
Bell 214B	Lycoming LTC4B-8	one 2930			Taxi In	0.01826	1.64	1.430	150.010	1.430	1.292	0.750	3156.332	0.006	0.595	0.006	0.005	0.003	12.525	0.011	1.191	0.011	0.010	0.006	25.050
Total							16.43													**1.242**	**2.703**	**1.242**	**0.364**	**0.251**	**888.923**
Light Duty/Crew Helicopter																									
Sikorsky S-58T	PW PT6T6	one 1875	PW PT6A-42 /	850	Taxi Out	0.012958	0.99	2.160	20.030	2.160	1.292	2.900	3156.332	0.004	0.034	0.004	0.002	0.005	5.365	0.007	0.068	0.007	0.004	0.010	10.730
Hughes 500E	Allison 250-C20B/R	one 450	TPE 331-3 (PM)	575	Takeoff	0.1193	0.50	7.299	0.000	7.299	1.292	1.750	3156.332	0.057	0.000	0.057	0.010	0.014	24.697	0.114	0.000	0.114	0.020	0.027	49.394
					Climbout	0.116844	0.99	7.330	0.000	7.330	1.292	1.470	3156.332	0.112	0.000	0.112	0.020	0.023	48.377	0.225	0.000	0.225	0.040	0.045	96.755
					Approach	0.028586	6.45	4.202	0.001	4.202	1.292	2.400	3156.332	0.102	0.000	0.102	0.031	0.058	76.931	0.205	0.000	0.205	0.063	0.117	153.863
					Taxi In	0.012958	0.99	2.160	20.030	2.160	1.292	2.900	3156.332	0.004	0.034	0.004	0.002	0.005	5.365	0.007	0.068	0.007	0.004	0.010	10.730
Total							9.92													**0.558**	**0.136**	**0.558**	**0.132**	**0.209**	**321.472**

Table A-42. Onroad Emissions Calculation - Transmission Line

Emission factors generated by EMFAC assuming 1990-2011 composite fleet of light, medium, and heavy duty vehicles.

Light Duty Autos and Trucks

Overall Personnel to Work Sites Worker Commute Trips *	Workers	Months	Veh/Day	RT/day (mi)	Miles/Day	Total Miles	NOX (lb/1000mi)	ROG (lb/1000mi)	PM (lb/1000mi)	CO (lb/1000mi)	SOX (lb/1000mi)	CO2 (lb/1000mi)
							Composite Emissions for Fleet of Vehicles					
Maximum Labor Force	462	12	462	60	27,720	7,318,080	0.9046	0.8021	0.0746	8.2070	0.0093	904.6398
Typical Labor Force	375	10	375	60	22,500	4,950,000	0.9046	0.8021	0.0746	8.2070	0.0093	904.6398
* Estimated rideshare factor	1			SubTot Personnel (mi)		12,268,080						

Max Daily 30

Operational Emissions - Light Duty	RT/day (mi)	Vehicle Days	Total Miles	NOX (lb/1000mi)	ROG (lb/1000mi)	PM (lb/1000mi)	CO (lb/1000mi)	SOX (lb/1000mi)	CO2 (lb/1000mi)
SubTot Crew and QA/QC Mobilize (mi)	60	3,985	239,100	0.9046	0.8021	0.0746	8.2070	0.0093	904.6398

TOTAL Light Duty Autos and Trucks (vmt) 12,507,180

Medium to Heavy Duty Trucks Max Daily 30

Operational Emissions - Medium Duty	RT/day (mi)	Vehicle Days	Total Miles	NOX (lb/1000mi)	ROG (lb/1000mi)	PM (lb/1000mi)	CO (lb/1000mi)	SOX (lb/1000mi)	CO2 (lb/1000mi)
				Composite Emissions for Fleet of Vehicles					
Splicing/testing vans, dump trucks under 200hp	60	30	1,800	2.7626	0.7194	0.1151	7.1367	0.0000	1697.8417
Miscellaneous hardware deliveries	60	100	6000	2.7626	0.7194	0.1151	7.1367	0.0000	1697.8417

TOTAL Medium Duty Trucks (vmt) 7,800

Heavy-Heavy Duty Trucks Max Daily 30

Operational Emissions - Heavy Duty	RT/day (mi)	Vehicle Days	Total Miles	NOX (lb/1000mi)	ROG (lb/1000mi)	PM (lb/1000mi)	CO (lb/1000mi)	SOX (lb/1000mi)	CO2 (lb/1000mi)
				Composite Emissions for Fleet of Vehicles					
Local material deliveries and waste removal	60	5,209	312,540	21.1837	1.6122	0.8163	7.4082	0.0408	4163.2653
Port to marshalling yards material deliveries	150	1,140	171,000	21.1837	1.6122	0.8163	7.4082	0.0408	4163.2653
Water transportation	60	20	1,200	21.1837	1.6122	0.8163	7.4082	0.0408	4163.2653
Fuel transportation	60	310	18,600	21.1837	1.6122	0.8163	7.4082	0.0408	4163.2653

TOTAL Heavy-Heavy Duty Trucks (vmt) 503,340

Table A-42. Onroad Emissions Calculation - Transmission Line

Emission factors generated by EMFAC assuming 1990-2011 composite fleet of light, medium, and heavy duty vehicles.

Overall Onroad Emissions

NOX lbs/day	ROG lbs/day	PM lbs/day	CO lbs/day	SOX lbs/day	CO2 lbs/day	NOX (ton)	ROG (ton)	PM (ton)	CO (ton)	SOX (ton)	CO2 (ton)
266.72	60.27	12.38	525.96	0.89	94,387.92	11.00	5.42	0.67	53.22	0.07	6,711.64

Light Duty Autos and Trucks

Overall Personnel to Work Sites / Worker Commute Trips *	Workers	Months	Veh/Day	RT/day (mi)	Miles/Day	Total Miles	NOX lbs/day	ROG lbs/day	PM lbs/day	CO lbs/day	SOX lbs/day	CO2 lbs/day	NOX (ton)	ROG (ton)	PM (ton)	CO (ton)	SOX (ton)	CO2 (ton)
Maximum Labor Force	462	12	462	60	27,720	7,318,080	25.08	22.23	2.07	227.50	0.26	25076.61	3.3101	2.9347	0.2730	30.0299	0.0341	3310.1131
Typical Labor Force	375	10	375	60	22,500	4,950,000	20.35	18.05	1.68	184.66	0.21	20354.39	2.2390	1.9851	0.1847	20.3124	0.0231	2238.9834
* Estimated rideshare factor	1			SubTot Personnel (mi)		12,268,080												

Total Emissions for Vehicles

Max Daily 30

Operational Emissions - Light Duty	RT/day (mi)	Vehicle Days	Total Miles	NOX lbs/day	ROG lbs/day	PM lbs/day	CO lbs/day	SOX lbs/day	CO2 lbs/day	NOX (ton)	ROG (ton)	PM (ton)	CO (ton)	SOX (ton)	CO2 (ton)
SubTot Crew and QA/QC Mobilize (mi)	60	3,985	239,100	1.63	1.44	0.13	14.77	0.02	1628.35	0.1081	0.0959	0.0089	0.9812	0.0011	108.1497

TOTAL Light Duty Autos and Trucks (vmt) 12,507,180

Medium to Heavy Duty Trucks Max Daily 30

Total Emissions for Vehicles

Operational Emissions - Medium Duty	RT/day (mi)	Vehicle Days	Total Miles	NOX lbs/day	ROG lbs/day	PM lbs/day	CO lbs/day	SOX lbs/day	CO2 lbs/day	NOX (ton)	ROG (ton)	PM (ton)	CO (ton)	SOX (ton)	CO2 (ton)
Splicing/testing vans, dump trucks under 200hp	60	30	1,800	4.97	1.29	0.21	12.85	0.00	3056.12	0.0025	0.0006	0.0001	0.0064	0.0000	1.5281
Miscellaneous hardware deliveries	60	100	6000	4.97	1.29	0.21	12.85	0.00	3056.12	0.0083	0.0022	0.0003	0.0214	0.0000	5.0935

TOTAL Medium Duty Trucks (vmt) 7,800

Heavy-Heavy Duty Trucks Max Daily 30

Total Emissions for Vehicles

Operational Emissions - Heavy Duty	RT/day (mi)	Vehicle Days	Total Miles	NOX lbs/day	ROG lbs/day	PM lbs/day	CO lbs/day	SOX lbs/day	CO2 lbs/day	NOX (ton)	ROG (ton)	PM (ton)	CO (ton)	SOX (ton)	CO2 (ton)
Local material deliveries and waste removal	60	5,209	312,540	38.13	2.90	1.47	13.33	0.07	7493.88	3.3104	0.2519	0.1276	1.1577	0.0064	650.5935
Port to marshalling yards material deliveries	150	1,140	171,000	95.33	7.26	3.67	33.34	0.18	18734.69	1.8112	0.1378	0.0698	0.6334	0.0035	355.9592
Water transportation	60	20	1,200	38.13	2.90	1.47	13.33	0.07	7493.88	0.0127	0.0010	0.0005	0.0044	0.0000	2.4980
Fuel transportation	60	310	18,600	38.13	2.90	1.47	13.33	0.07	7493.88	0.1970	0.0150	0.0076	0.0689	0.0004	38.7184

TOTAL Heavy-Heavy Duty Trucks (vmt) 503,340

Table A-42. Onroad Emissions Calculation - Transmission Line

Emission factors generated by EMFAC assuming 1990-2011 composite fleet of light, medium, and heavy duty vehicles.

Light Duty Autos and Trucks

Overall Personnel to Work Sites Worker Commute Trips *	Workers	Months	Veh/Day	RT/day (mi)	Miles/Day	Total Miles
Maximum Labor Force	462	12	462	60	27,720	7,318,080
Typical Labor Force	375	10	375	60	22,500	4,950,000
* Estimated rideshare factor	1				SubTot Personnel (mi)	**12,268,080**

Max Daily 30

Operational Emissions - Light Duty	RT/day (mi)	Vehicle Days	Total Miles
SubTot Crew and QA/QC Mobilize (mi)	60	3,985	239,100

TOTAL Light Duty Autos and Trucks (vmt) 12,507,180

Medium to Heavy Duty Trucks Max Daily 30

Operational Emissions - Medium Duty	RT/day (mi)	Vehicle Days	Total Miles
Splicing/testing vans, dump trucks under 200hp	60	30	1,800
Miscellaneous hardware deliveries	60	100	6000

TOTAL Medium Duty Trucks (vmt) 7,800

Heavy-Heavy Duty Trucks Max Daily 30

Operational Emissions - Heavy Duty	RT/day (mi)	Vehicle Days	Total Miles
Local material deliveries and waste removal	60	5,209	312,540
Port to marshalling yards material deliveries	150	1,140	171,000
Water transportation	60	20	1,200
Fuel transportation	60	310	18,600

TOTAL Heavy-Heavy Duty Trucks (vmt) 503,340

Table A-43. Onroad Vehicle Mix and Schedules - Transmission Line

Source: Equipment mix and schedules from similar projects

Total Vehicle Workdays

Light	Medium	Heavy
3,985.00	-	5,209.00

Transmission Line

12 months

Primary Equipment Description	HP Estimate	Primary Equip Quantity	Activity Schedule Estimate (Days)	Duration of Use (Hours/ Day)	Total Hours of Utilization	Onroad Vehicle Category	Light Duty Fractional Total Vehicle Workdays	Medium Duty Fractional Total Vehicle Workdays	Heavy Duty Fractional Total Vehicle Workdays
					110,212				
1/2 Ton Pick-up Truck, 4X4	200	2	76	8	1216	light	102.0		
1/2 Ton Pick-up Truck, 4X4	200	8	300	4	9600	light	800.0		
1/2 Ton Pick-up Truck, 4X4	200	6	300	4	7200	light	600.0		
1 Ton Crew Cab 4X4	300	1	300	2	600	light	50.0		
30 Ton Boom Truck	300	1	300	2	600	heavy			50.0
Truck, Semi, Tractor	350	1	300	8	2400	heavy			200.0
Mechanic Truck	300	2	300	8	4800	heavy			400.0
Fuel Truck	300	2	300	8	4800	heavy			400.0
1 Ton Crew Cab 4X4	300	2	300	4	2400	light	200.0		
Water Trucks	350	3	300	10	9000	heavy			750.0
Lowboy Trk/Trlr	500	1	70	6	420	heavy			35.0
1 Ton Crew Cab Flat Bed, 4X4	300	9	140	4	5040	light	420.0		
30 Ton Boom Truck	300	2	140	5	1400	heavy			117.0
4000 gallon Water Trucks	350	2	140	8	2240	heavy			187.0
10 cu.yd. Concrete Mixer Trucks	425	8	140	8	8960	heavy			747.0
1 Ton Crew Cab Flat Bed, 4X4	300	2	140	4	1120	light	94.0		
30 Ton Boom Truck	300	2	140	6	1680	heavy			140.0
40' Flat Bed Truck & Trailer	350	2	70	10	1400	heavy			117.0
30 Ton Boom Truck	300	2	140	8	2240	heavy			187.0
3/4 Ton Pick-up Truck, 4X4	300	4	140	4	2240	light	187.0		
1 Ton Crew Cab Flat Bed, 4X4	300	2	140	4	1120	light	94.0		
3/4 Ton Pick-up Truck, 4X4	300	2	140	5	1400	light	117.0		
1 Ton Crew Cab Flat Bed, 4X4	300	2	140	5	1400	light	117.0		
1 Ton Crew Cab Flat Bed, 4X4	300	4	152	8	4864	light	406.0		
Wire Trucks & Trailers	350	6	152	6	5472	heavy			456.0
Dump Truck (Trash)	350	1	152	6	912	heavy			76.0
3/4 Ton Pick-up Truck, 4X4	300	6	152	10	9120	light	760.0		
Man Lifts - Elliott Booms	350	2	152	8	2432	heavy			203.0
30 Ton Manitex	350	9	152	6	8208	heavy			684.0
22 Ton Manitex	350	1	152	8	1216	heavy			102.0
Static / OPGW Truck	350	1	152	2	304	heavy			26.0
Static / OPGW Tensioner	300	1	152	2	304	heavy			26.0
Fuel, Helicopter Support Truck	300	1	152	4	608	heavy			51.0
Low Boy Truck & Trailer	500	1	152	4	608	heavy			51.0
1 Ton Crew Cab 4X4	300	3	76	2	456	light	38.0		
Water Trucks	350	2	76	10	1520	heavy			127.0
Lowboy Trk/Trlr	500	1	76	4	304	heavy			26.0
Mulch Truck	350	1	76	8	608	heavy			51.0

Estimated Deliveries from Port to Marshalling Yard and Miscellaneous Hardware

Material	No. Deliveries	Origin	SD Co R/T Miles	Imp Co R/T Miles
Transmission Lines				
Steel	500	Long Beach	150	60
Conductors	400	Long Beach	150	60
Misc Hardware	100	Local	60	60
Underground Structures				
Conductors	100	Long Beach	150	0
Substations				
Steel	40	Long Beach	150	0
Equipment	100	Local	60	0
Transformers	10	Long Beach	150	0

Table A-44. Onroad Emission Factors - Tranmission Line

Source: EMFAC2007 v.2.3, burden reports for Imperial County.

Composite fleet: 1990 - 2012 for light, medium, and heavy duty vehicle classes

1990-2012 Composite Fleet County-Wide

Imperial County Vehicle Class	2011 Fleet (VMT/1000)	NOX (ton/day)	ROG (ton/day)	PM (ton/day)	CO (ton/day)	SOX (ton/day)	CO2 (ton/day)	NOX (lb/1000mi)	ROG (lb/1000mi)	PM (lb/1000mi)	CO (lb/1000mi)	SOX (lb/1000mi)	CO2 (lb/1000mi)
LDA-TOT	2,285	1.10	0.95	0.08	10.66	0.01	940.00	0.963	0.832	0.070	9.330	0.009	822.757
LDT1-TOT	715	0.33	0.36	0.03	3.20	0.00	360.00	0.923	1.007	0.084	8.951	0.000	1006.993
LDT2-TOT	1,016	0.59	0.39	0.05	4.25	0.01	520.00	1.161	0.768	0.098	8.366	0.020	1023.622
MDV-TOT	484	0.23	0.13	0.02	1.63	0.00	340.00	0.950	0.537	0.083	6.736	0.000	1404.959
LHDT1-TOT	79	0.18	0.03	0.00	0.21	0.00	80.00	4.557	0.759	0.000	5.316	0.000	2025.316
LHDT2-TOT	37	0.12	0.03	0.00	0.17	0.00	30.00	6.486	1.622	0.000	9.189	0.000	1621.622
MHDT-TOT	72	0.50	0.05	0.02	0.49	0.00	110.00	13.889	1.389	0.556	13.611	0.000	3055.556
HHDT-TOT	851	11.46	0.82	0.43	3.63	0.02	1770.00	26.933	1.927	1.011	8.531	0.047	4159.812

1990-2011 Composite Fleet County-Wide

Imperial Composite Vehicle Class	2012 Fleet (VMT/1000)	NOX (ton/day)	ROG (ton/day)	PM (ton/day)	CO (ton/day)	SOX (ton/day)	CO2 (ton/day)	NOX (lb/1000mi)	ROG (lb/1000mi)	PM (lb/1000mi)	CO (lb/1000mi)	SOX (lb/1000mi)	CO2 (lb/1000mi)
Light Duty Autos and Trucks Composite	4,016	2.02	1.70	0.16	18.11	0.02	1820.00	1.006	0.847	0.080	9.019	0.010	906.375
Medium to Heavy Trucks Composite	672	1.03	0.24	0.04	2.50	0.00	560.00	3.065	0.714	0.119	7.440	0.000	1666.667
Heavy-Heavy Duty Trucks Composite	851	11.46	0.82	0.43	3.63	0.02	1770.00	26.933	1.927	1.011	8.531	0.047	4159.812

	LDA-TOT	LDT1-TOT	LDT2-TOT	MDV-TOT	LHDT1-TOT	LHDT2-TOT	MHDT-TOT	HHDT-TOT
Vehicles	59030	19254	26041	12646	1834	939	1337	4914
VMT/1000	2285	715	1016	484	79	37	72	851
Trips	375104	120589	164855	80925	49611	22267	42750	27470
Reactive Organic Gas Emissions								
Run Exh	0.32	0.06	0.07	0.03	0.01	0.01	0.02	0.72
Idle Exh	0	0	0	0	0	0	0	0.09
Start Ex	0.28	0.07	0.08	0.04	0.01	0.01	0.02	0.01
Total Ex	0.59	0.13	0.16	0.07	0.02	0.02	0.04	0.82
Diurnal	0.08	0.03	0.03	0.01	0	0	0	0
Hot Soak	0.08	0.04	0.04	0.01	0	0	0	0
Running	0.15	0.15	0.14	0.04	0.01	0.02	0.02	0
Resting	0.04	0.02	0.02	0.01	0	0	0	0
Total	0.95	0.36	0.39	0.13	0.03	0.03	0.05	0.82
Carbon Monoxide Emissions								
Run Exh	7.67	2.34	3.14	1.2	0.07	0.07	0.21	3.1
Idle Exh	0	0	0	0	0.01	0.01	0.01	0.4
Start Ex	2.99	0.85	1.11	0.43	0.13	0.1	0.27	0.12
Total Ex	10.66	3.2	4.25	1.63	0.21	0.17	0.49	3.63
Oxides of Nitrogen Emissions								
Run Exh	0.91	0.26	0.45	0.17	0.1	0.09	0.44	10.38
Idle Exh	0	0	0	0	0	0	0.01	1.06
Start Ex	0.19	0.07	0.14	0.06	0.08	0.04	0.05	0.02
Total Ex	1.1	0.33	0.59	0.23	0.18	0.12	0.5	11.46
Carbon Dioxide Emissions (000)								
Run Exh	0.91	0.35	0.51	0.33	0.07	0.03	0.11	1.71
Idle Exh	0	0	0	0	0	0	0	0.06
Start Ex	0.03	0.01	0.02	0.01	0	0	0	0
Total Ex	0.94	0.36	0.52	0.34	0.08	0.03	0.11	1.77
Total Particulate Emissions								
Run Exh	0.02	0.01	0.02	0.01	0	0	0.01	0.36
Idle Exh	0	0	0	0	0	0	0	0.01
Start Ex	0	0	0	0	0	0	0	0
Total Ex	0.02	0.01	0.03	0.01	0	0	0.01	0.37
TireWear	0.02	0.01	0.01	0	0	0	0	0.03
BrakeWr	0.03	0.01	0.01	0.01	0	0	0	0.03
Total	0.08	0.03	0.05	0.02	0	0	0.02	0.43
Lead	0	0	0	0	0	0	0	0
SOx	0.01	0	0.01	0	0	0	0	0.02
Fuel Consumption (000 gallons)								
Gasoline	98.11	36.58	54.22	35.05	6.58	2.35	1.13	0.62
Diesel	0.04	0.91	0.04	0.04	1.15	0.88	8.86	158.82

< --- > Title : Mt Signal Solar Farm Projects
Version : Emfac2007 V2.3 Nov 1 2006
Run Date : 2011/09/13 19:50:39
Scen Year: 2012 -- All model years in the range 1990 to 2012 selected
Season : Annual
Area : Imperial County
I/M Stat : COO Basic (2005)
Emissions: Tons Per Day

Table A-45. Fugitive Dust Generating Activity Estimates - Transmission Line

Proposed Activity Sites and Areas	
(Activity Areas)	**Imperial Valley**
Source: Project Description Table B-3, B-7, B-9.	**(acres)**
Access Roads	
Proposed Transmission Line Access Roads	101.8
Construction Staging Areas and Fly Yards	
Staging Yard	5.0
Total Activity Sites and Areas (acres)	106.8
Duration of Activity (months)	**12**
Total Acre-Months	**1,282**
Assume: ROW is 120 ft wide by 7 miles long	

Proposed Access Roads	**Imperial Valley**
(Grading)	**(mi)**
Source: Project Description Table B-3.	
Proposed Transmission Line Access Roads	7

Proposed Towers and Poles	**Average Excavation**	**Imperial Valley**	
(Excavation, Material Unloading)	**(cu.yd per #)**	**(mi)**	
230 kV Structures			
Tangent lattice	35	33	1,155
Dead-end lattice	79	2	158
Larger angle lattice	50	0	0
Tangent tubular steel poles	50	0	0
Dead-end tubular steel poles	95	0	0
Larger angle tubular steel poles	63	0	0
69 kV Structures			
Tubular steel poles	32		0
Wood poles	3		0
			All Links
Avg Rate of Excavation - Total per Link	**(cu.yd/day)**		**(cu.yd)**
Tower and Pole Foundations	250		1,313
Assume 5 towers/mile			

Table A-46. Fugitive Dust Emissions by Activity - Transmission Line

Source: Emission factors from USEPA AP-42 and South Coast Air Quality Management District, where noted.

Proposed Access Road and Trench Restoration grading mileage has been updated to reflect length of project.
Activity, Bulldozing of Overburden, and Excavation information has not been changed.

	PM10 lbs/day	PM2.5 lbs/day	SubTotals of Fugitive Dust Emissions Overall Fugitive Dust Emissions	PM10 (ton)	PM2.5 (ton)
	40.7	8.4	Overall Proposed Proj.	12.3	2.7

Activity Sites and Areas

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

E = Level 2 Factor = tonPM10/ac-month 0.011 tonPM10/acre-month — 22 = activity days/mo

f = 0.21 for PM2.5 0.21 PM2.5 fraction (SCAQMD Methodology for PM 2.5, October 2006)

Control Effectiveness (watering) = 85.0%

Emission Factors		Activity Areas (acre-mo)	Activity Areas (ac-day)	PM10 (lb/day)	PM2.5 (lb/day)	Activity Areas (acre-mo)	Overall PM10 (ton)	Overall PM2.5 (ton)
3.3000	lbPM10 (per acre activity-per mo)	1,282	58	8.74	---	1,282	2.1	---
0.6930	lbPM2.5 (per acre activity-per mo)	1,282	58	---	1.84	1,282	---	0.4

Grading (Proposed Access Roads)

Source: USEPA AP-42, Table 11.9-1, 10/98

E = 0.60 * (0.051)(S^2.0) = lbPM10/VMT

E = 0.031 * (0.040)(S^2.5) = lbPM2.5/VMT

S = mean vehicle speed = 3.0 mph (estimate for grader)

Control Effectiveness (watering) = 85.0%

4 = passes

Emission Factors		(mi/12hr)	(vmt/day)	PM10 (lb/day)	PM2.5 (lb/day)	Grading (miles)	Grading (vmt grader)	Overall PM10 (ton)	Overall PM2.5 (ton)
0.041	lbPM10 (per VMT grader)	36	36	1.487	---	7	28	0.001	---
0.003	lbPM2.5 (per VMT grader)	36	36	---	0.104	7	28	---	0.000

Grading (Bulldozing of Overburden)

Source: USEPA AP-42, Table 11.9-1, 10/98

E = 0.75 * (s^1.5) / (M^1.4) = lbPM10/hr

E = 0.105 * 5.7 * (s^1.2) / (M^1.3) = lbPM2.5/hr

s = silt content = 8.50 percent (average for construction sites, USEPA AP-42 Table 13.2.2-1)

M = moisture content = 12.00 percent (SCAQMD CEQA Handbook Table A9-9-G-1, with watering)

Emission Factors		Doz/Grad/Scrap (hr/day)	PM10 (lb/day)	PM2.5 (lb/day)	Doz/Grad/Scrap (hr)	Overall PM10 (ton)	Overall PM2.5 (ton)
0.573	lbPM10 (per hr bulldozer or grader)	24	13.76	---	2,744	0.8	---
0.309	lbPM2.5 (per hr bulldozer or grader)	24	---	7.41	2,744	---	0.4

Excavation / Trenching (Removal of Overburden)

Source: USEPA AP-42, Table 11.9-2 (dragline operations), 10/98

E = 0.75 * 0.0021 (d^0.7)/(M^0.3) = lbPM10/yd3

E = 0.017 * 0.0021 (d^1.1)/(M^0.3) = lbPM2.5/yd3

d = drop height = 5 ft (estimate)

M = moisture content = 12.00 percent (SCAQMD CEQA Handbook Table A9-9-G-1, with watering)

Emission Factors		Excavation (yd3/day)	PM10 (lb/day)	PM2.5 (lb/day)	Excavation (cu.yd)	Overall PM10 (ton)	Overall PM2.5 (ton)
0.0023	lbPM10 (per yd3 excavated)	250	0.58	---	1,313	0.002	---
0.0001	lbPM2.5 (per yd3 excavated)	250	---	0.02	1,313	---	0.000

Material Unloading/Loading

Source: USEPA AP-42, p. 13.2.4-3, 11/06

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

U = average wind speed = 15.00 mph (upper bound wind, p.13.2.4-4)

M = moisture content = 12.00 percent (SCAQMD CEQA Handbook Table A9-9-G-1, with watering)

lb of material / yd3 = 2600.00 for moist soil

k = 0.35 for PM10 0.35 for PM10

k = 0.053 for PM2.5 0.05 for PM2.5

4 = transfers

Emission Factors			Excavation (yd3/day)	Unloading (yd3/day)	PM10 (lb/day)	PM2.5 (lb/day)	Excavation (cu.yd)	Unloading (cu.yd)	Overall PM10 (ton)	Overall PM2.5 (ton)
0.00049	lbPM10 (per yd3 unloaded)		250	1000	0.49	---	1,313	5,252	0.001	---
0.00007	lbPM2.5 (per yd3 unloaded)		250	1000	---	0.07	1,313	5,252	---	0.000