# Air Quality Technical Report

## Rugged Solar Farm Project

## Major Use Permit 3300-12-007

## Rezone 3600-12-005

## Environmental Review Project Number 3910-120005

## Boulevard, San Diego County, California

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## GLOSSARY OF TERMS AND ACRONYMS

| | |
|---|---|
| APCD | Air Pollution Control District |
| AQMD | Air Quality Management District |
| BACT | Best Available Control Technology |
| CAA | Federal Clean Air Act |
| CAAQS | California Ambient Air Quality Standards |
| CARB | California Air Resources Board |
| CCAA | California Clean Air Act |
| CEQA | California Environmental Quality Act |
| CO | Carbon monoxide |
| EPA | Environmental Protection Agency |
| HAPs | Hazardous air pollutants |
| $\mu g/m^3$ | Micrograms per cubic meter |
| MUP | Major Use Permit |
| NAAQS | National Ambient Air Quality Standards |
| $NO_x/NO_2$ | Nitrogen oxides/nitrogen dioxide |
| $O_3$ | Ozone |
| Pb | Lead |
| $PM_{2.5}$ | Fine particulate matter |
| $PM_{10}$ | Respirable particulate matter |
| ppm | Parts per million |
| RAQS | San Diego County's Regional Air Quality Strategy |
| SANDAG | San Diego Association of Governments |
| SCAQMD | South Coast Air Quality Management District |
| SDAB | San Diego Air Basin |
| SDAPCD | San Diego County Air Pollution Control District |
| SIP | State implementation plan |
| $SO_x/SO_2$ | Sulfur oxides/sulfur dioxide |
| TACs | Toxic air contaminants |
| T-BACT | Toxic best available control technology |
| VOCs | Volatile organic compounds |

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# EXECUTIVE SUMMARY

The proposed Rugged solar farm project (Proposed Project) would produce up to 80 megawatts (MW) of solar energy and would consist of approximately 3,588 concentrator photovoltaic (CPV) trackers on 765 acres in southeastern San Diego County near the unincorporated community of Boulevard, California.

The air quality impact analysis evaluates the potential for significant adverse impacts to the air quality due to construction and operational emissions resulting from the Proposed Project. Construction of the proposed project would result in a temporary addition of pollutants to the local airshed caused by soil disturbance, fugitive dust emissions, and combustion pollutants from on-site construction equipment, as well as from off-site trucks hauling construction materials. The analysis concludes that the daily construction emissions would not exceed the County of San Diego's (County) significance thresholds for criteria pollutants. Air quality impacts resulting from construction would, therefore, be less than significant. Additionally, all operational emissions for criteria pollutants were found to be less than significant.

The following project design features (PDFs) will be implemented as part of the project during construction activities:

**PDF AQ-1** To ensure the construction of the Proposed Project will not result in a significant impact relative to fugitive dust ($PM_{10}$) and to comply with County Code Section 87.428, the following will be implemented:

- The applicants would apply water as necessary to suppress fugitive dust during grubbing, clearing, grading, trenching, and soil compaction and/or apply a nontoxic soil binding agent to help with soil stabilization during construction. These measures will be applied to all active construction areas, unpaved access roads, parking areas, and staging areas as necessary.
- Sweepers and water trucks will be used to control dust and debris at public street access points.
- Internal construction roadways will be stabilized by paving, chip sealing or non-toxic chemicals after rough grading.
- Exposed stockpiles (e.g., dirt, sand) will be covered and/or watered or stabilized with nontoxic soil binders, tarps, fencing or other suppression methods as needed to control emissions.
- Traffic speeds on unpaved roads will be limited to 15 miles per hour (mph).

- All haul and dump trucks entering or leaving the site with soil or fill material will maintain at least 2 feet of freeboard, or cover loads of all haul and dump trucks securely.
- Disturbed areas should be reseeded with native plant hydroseed mix as soon as possible after disturbance, or covered with a non-toxic soil binding agent (Such as EP&A's Envirotac II and Rhinosnot Dust Control, Erosion Control and Soil Stabilization).

**PDF AQ-2** To reduce $NO_x$ and $PM_{10}$ emissions associated with construction worker trips required during Proposed Project construction, the construction manager will implement a construction worker ridership program to encourage workers to carpool to and from the construction site to reduce single-occupancy vehicle trips by a minimum of 30%. The construction manager will log all daily construction worker trips using the San Diego iCommute program (SANDAG 2013) (accessed at http://www.icommutesd.com/) or similar program. The construction manager will notify all construction personnel of the program prior to the start of construction activities and will notify construction personnel of the iCommute program RideMatcher feature, or similar communication method, to ensure personnel can identify potential carpooling program participants. Trip data will be made readily available to County inspectors at the construction trailer on site during construction.

The following project design feature (PDF) will be implemented during project operation:

**PDF AQ-3** To ensure the operation of the Proposed Project will not result in a significant impact relative to fugitive dust ($PM_{10}$), the following will be implemented:

- Enforce a 15-mph speed limit on unpaved surfaces
- Provide any of the following or equally effective trackout/carryout and erosion control measures to minimize transfer of soil or other materials to public roads:
    - track-out grates or gravel beds at each egress point
    - wheel washing at each egress during muddy conditions
    - application of nontoxic, permeable soil binding agent; chemical soil stabilizers; geotextiles; mulching; and/or seeding annually.

Regarding consistency with local plans and policies affecting air quality, the Proposed Project does not propose residential development that would contribute to local population growth and associated vehicle miles traveled on local roadways. As the Proposed Project would not result in growth-inducing uses, project development has been accounted for in the Regional Air Quality Strategy, and the project would be consistent with local air quality plans. Impacts would be considered less than significant.

Impacts to sensitive receptors, including odor impacts, would be less than significant as the proposed solar farm would not be associated with a land use that would generate objectionable odors and construction would be considered short-term and temporary in nature. The potential health effects to nearby sensitive receptors have been analyzed and found to be less than the County significance thresholds. Cumulative impacts resulting from the Proposed Project in combination with other projects within the site vicinity would not be considered cumulatively considerable.

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# 1.0 INTRODUCTION

## 1.1 Purpose of the Report

The purpose of this report is to estimate and evaluate the potential air quality impacts associated with construction and operation of the proposed project. Air quality impacts are evaluated for their significance based on the criteria provided in the County's *Guidelines for Determining Significance – Air Quality* (County of San Diego 2007).

## 1.2 Project Location and Description

**Solar Farm**

The Rugged solar farm would produce up to 80 megawatts (MW) of alternating current (AC) generating capacity and would consist of approximately 3,588 trackers installed in groups or building blocks, with any of the following inverter combinations: two 630 kilowatt (kW) inverters, and either two 680 kW inverters or three 680 kW inverters, and either a 1.5 megavolt amperes (MVA) or 2.0 MVA transformer. Approximately 59 building blocks would be constructed. The project would utilize dual-axis trackers on 765 acres in the unincorporated community of Boulevard, California (see Figures 1 and 2). In addition to the trackers and inverter transformer units, Rugged includes the following primary components, as shown in Figure 3, Rugged Site Plan:

- A collection system linking the trackers to the on-site project substation consisting of (1) 1,000-volt (V) direct current (DC) underground conductors leading to (2) 34.5 kV underground and overhead AC conductors.
- A 60-foot by 125-foot (7,500-square-foot) operations and maintenance (O&M) building. The O&M building would be used for storage, employee operations, and maintenance of equipment.
- A 2-acre, on-site private collector substation site with a fenced pad area of approximately 6,000 square feet and maximum height of 35 feet. The on-site substation would include a 450-square-foot control house.

Upon completion, Rugged would be monitored on site at the O&M annex and off site through a supervisory control and data acquisition (SCADA) system.

Primary access to the Rugged site would be from Ribbonwood Road and McCain Valley Road. One roadway would be constructed off site from McCain ValleyRoad leading to the central subarea if Rough Acres Ranch Road is not constructed per Rough Acres Ranch Major Use

Permit (MUP) 3300-09-019. Access to the northwest subarea would be provided via Ribbonwood Road. The central subarea would also include an access road leading south crossing Tule Creek to provide access to the southern subarea. The eastern subarea would be accessible via an access road leading from McCain Valley Road crossing beneath the Sunrise Powerlink.

The Rugged solar farm would tie into the Tule Wind Energy project (Major Use Permit (MUP) 3300-09-019) gen-tie alignment as adopted by the Board of Supervisors on August 8, 2012. The 138 kV gen-tie for the Tule Wind Energy project would include a 69 kV undersling line to service the Rugged solar farm. Rugged Solar LLC and Tule Wind LLC have a joint-use agreement in place for use of the gen-tie line, associated transmission towers, and access road.

Individual tracker dimensions are approximately 48 feet across by 25 feet tall. Each tracker unit would be mounted on a 28-inch steel mast (steel pole), which would be supported by either (i) extending it into the ground up to 20 feet and encasing it in concrete, (ii) vibrating the mast into the ground up to 20 feet deep, or (iii) attaching it to a concrete foundation sized to be suitable to adequately support the tracker based on wind loading and soil conditions at the site. The preferred method would be to set the mast by vibratory pile driving methods depending upon soil conditions.

In its most vertical position and depending on foundation design, the top of each tracker would not exceed 30 feet above grade, and the lower edge would not be less than 1 foot above ground level. In its horizontal "stow" mode (for high winds), each tracker would have a minimum ground clearance of 13 feet 6 inches.

Power within each building block would be delivered through a 1,000 V DC underground collection system from the trackers to the inverter stations. Each set of inverters would be equipped with a step-up transformer to convert the power from 350 V AC on the "low side" to 34,500 V (34.5 kV) on the "high side." An alternative inverter and transformer configuration may be used, with negligible difference in appearance. It is uncertain if a two 680 kV inverter configuration or a three 680 kV inverter configuration would be utilized. Therefore, the project has been sized to accommodate the larger of the two configurations, which is 10 feet by 40 feet (400 square feet), with an approximate height of 12 feet (including inverter enclosure). The smaller option is 10 feet by 25 feet (250 square feet). The project would require approximately 59 inverter skids for a total of 24,400 square feet, assuming use of the larger 10-foot by 40-foot (400-square-foot) inverter and transformer configuration.

The Rugged solar farm would include the construction of a 60-foot by 100-foot (6,000-square-foot) private on-site collector substation area that would be located within the central portion of the Rugged site. The substation site would be located approximately 0.5 mile west of the O&M

building on the site. The purpose of the substation is to collect the energy received from the overhead and underground collector system and increase the voltage from 34.5 kV to 69 kV. Once the voltage is stepped up to 69 kV, the power would be conveyed through a 35-foot-high dead-end structure (a fully self-supporting steel tower) that connects the on-site collector substation with the Tule gen-tie.

A backup power and storm positioning system would bring the trackers into the horizontal "stow" mode position (Storm Position) in case the electrical power is cut or if there is an approaching storm that could be damaging to the trackers. The backup power and storm positioning system must fulfill two functions:

- To adequately detect a damaging storm and to be able to communicate a Storm Position command to each tracker
- To have enough electrical capacity to power each tracker into the Storm Position in case of the loss of the primary power supply.

The backup power and storm positioning system would consist of one of the following options: (1) a 1.5 MW diesel-powered emergency generator or equivalent located at the substation, (2) an Uninterrupted Power Supply (UPS) battery storage system at each inverter station, or (3) a 20 kW propane generator at each inverter skid (Trojan 2013a, Trojan 2013b). The backup power systems would be appropriately sized to allow the trackers to be moved into the "stow" mode, as described. The UPS system would include approximately 20 8D-GEL batteries enclosed in a 7 foot by 6 foot metal enclosure. In the event of an electrical outage, the emergency generators would be expected to operate no more than 20 minutes to bring all the trackers into the stow mode position.

An O&M area is located at the north-central portion of the Rugged site approximately 0.5 mile east of the on-site private substation. The O&M building would be used for storage, employee operations, and maintenance of equipment. The O&M facility would consist of a 7,500-square-foot building. The building would include administrative and operational offices and meeting facilities, along with material storage and equipment warehouse and lavatory facilities served by a private on-site septic system and groundwater well. The building would be surrounded by a disintegrated granite improved parking area and parking spaces. The building and parking areas would include security lighting designed to minimize light pollution and preserve dark skies, while enhancing safety, security, and functionality.

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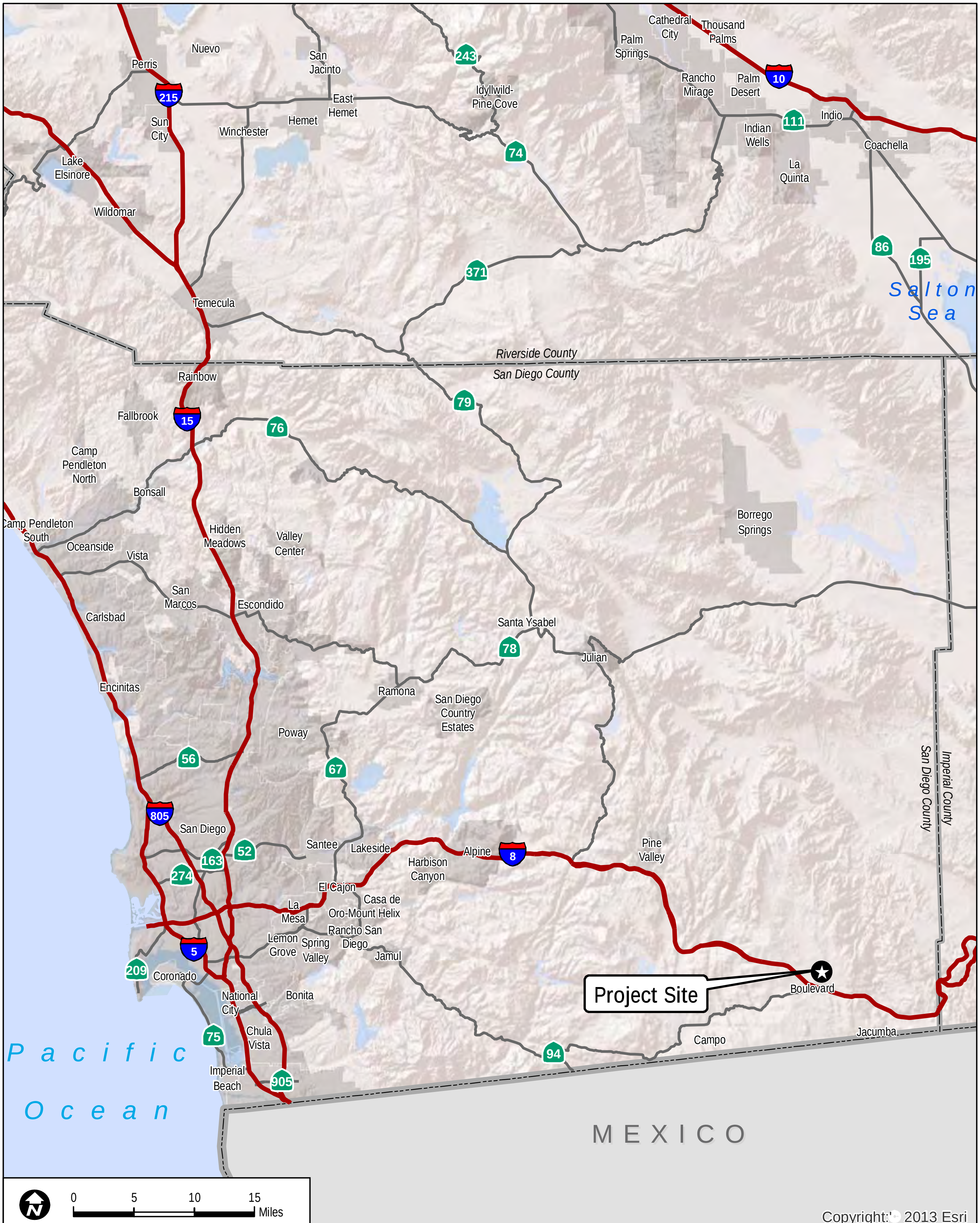


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**FIGURE 1**
## Regional Map

RUGGED AIR QUALITY TECHNICAL REPORT

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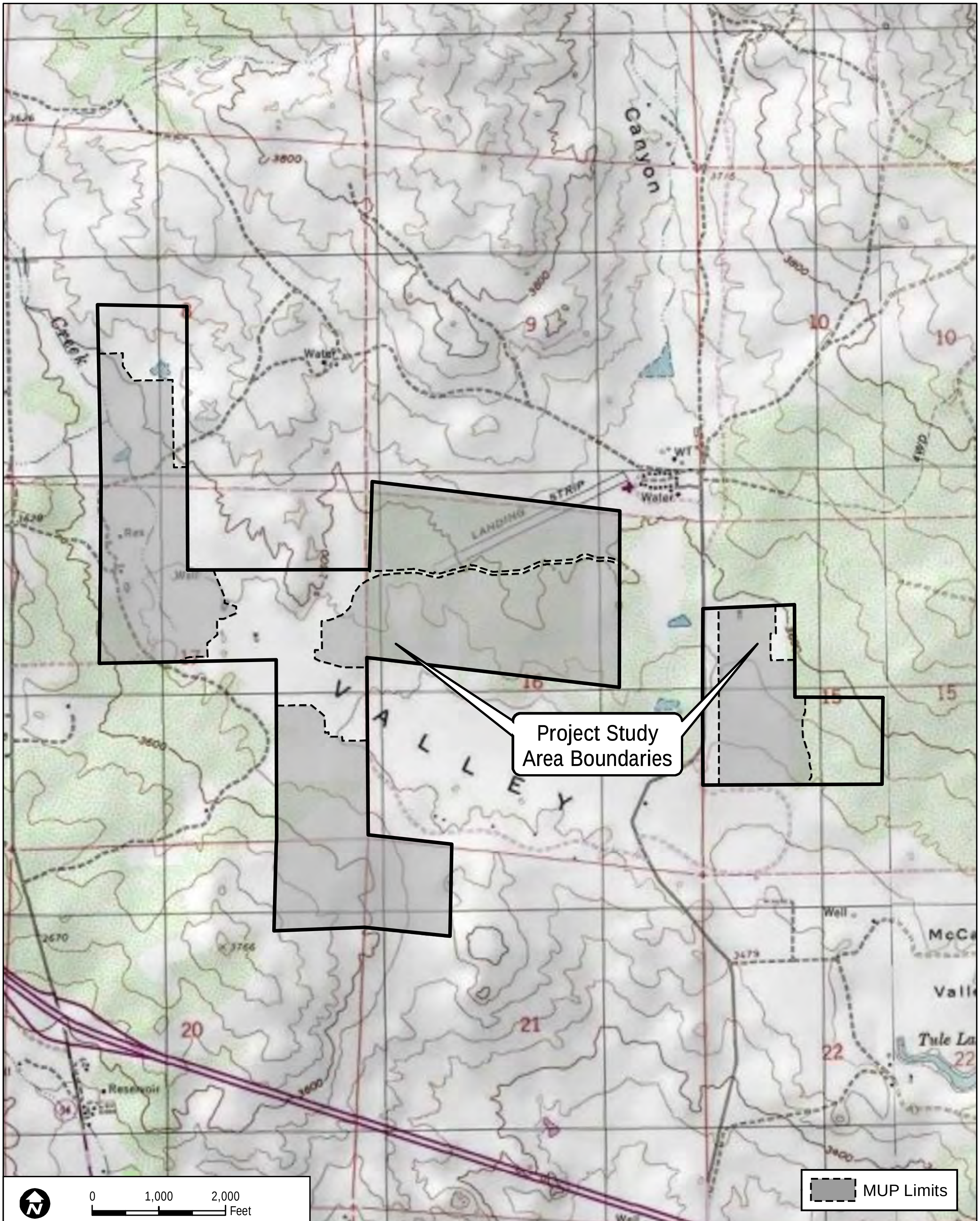


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SOURCE: USGS 7.5-Minute Series Live Oak Springs Quadrangle.

**FIGURE 2**
**Vicinity Map**

RUGGED AIR QUALITY TECHNICAL REPORT

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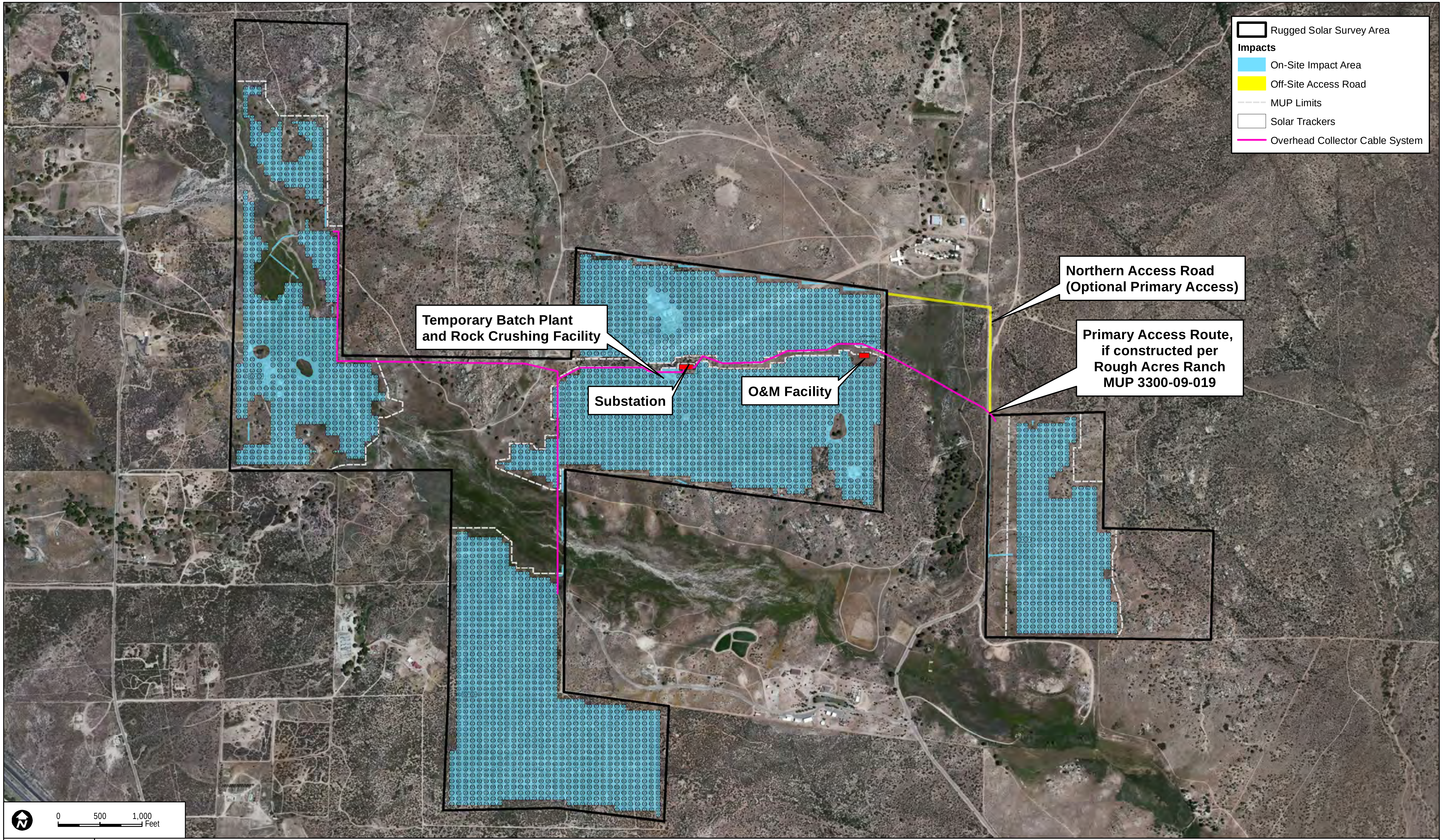


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SOURCE: AECOM 2012; Soitec 2012; SanGIS 2012; Bing Maps

FIGURE 3

**Rugged Solar - Site Plan**

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## Construction

Construction of the Rugged solar farm is anticipated to commence in July 2014 and would require approximately 12 months for completion. Table 1, Rugged Construction Schedule, provides the proposed schedule for Rugged. While the schedule may be modified due to the date of County project approval as well other project approvals/permits, this table illustrates the approximate duration of major project activities. Construction activities would occur between the hours of 7 a.m. and 7 p.m., Monday through Saturday.

**Table 1**
**Rugged Construction Schedule**

| Project Activity | Working Days1 | Start | End |
|---|---|---|---|
| *80 MW* | | | |
| Mobilization | 7 | 7/1/2014 | 7/8/2014 |
| Clear and Grub | 60 | 7/10/2014 | 9/18/2014 |
| Grading/Road Construction | 9 | 9/20/2014 | 9/29/14 |
| Underground Electric | 100 | 10/2/2014 | 1/26/2015 |
| Substation | 35 | 7/17/2014 | 8/26/2014 |
| O&M Building | 60 | 11/28/2014 | 2/5/2015 |
| Tracker Installation | 200 | 8/27/2014 | 4/16/2015 |
| Phase 1 (24 MW) | 60 | 8/27/2014 | 11/4/2014 |
| Phase 2 (16 MW) | 40 | 11/5/2014 | 12/20/2014 |
| Phase 3 (24 MW) | 60 | 12/22/2014 | 2/28/2015 |
| Phase 4 (16 MW) | 40 | 3/2/2014 | 4/16/2015 |
| Punch List and Cleanup | 60 | 4/22/2015 | 6/30/2015 |
| **Total Months (80 MW)** | **12** | | |

1 Working days during construction period = 6 days per week

### *Construction Personnel, Traffic, and Equipment*

Construction would employ up to 146 workers per day during the peak construction period. Depending on the specific stage of construction, an average daily workforce of 60 to 70 workers would be present at the construction site. During the peak of construction, a typical day would include the transportation of trackers, movement of heavy equipment, and transportation of materials. Assuming there would be a percentage of workers that carpool to the site given its remote location; a reduction factor of 30% would reduce vehicle worker trips to approximately 130 trips per day. Trip generation for workers and delivery trucks would vary depending on the phase of construction. It is estimated that approximately 49,773 total trips would be made during the 12-month construction period. Thus, on average approximately 160 trips per day would be generated during project construction, and during the clearing and grubbing phase, construction trips would peak at approximately 392 trips per day for two months.

**Project Design Features**

The following project design features (PDFs) will be implemented as part of the project during construction activities:

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**PDF AQ-2** To reduce $NO_x$ and $PM_{10}$ emissions associated with construction worker trips required during Proposed Project construction, the construction manager will implement a construction worker ridership program to encourage workers to carpool to and from the construction site to reduce single-occupancy vehicle trips by a minimum of 30%. The construction manager will log all daily construction worker trips using the San Diego iCommute program (SANDAG 2013) (accessed at http://www.icommutesd.com/) or similar program. The construction manager will notify all construction personnel of the program prior to the start of construction activities and will notify construction personnel of the iCommute program RideMatcher feature, or similar communication method, to ensure personnel can identify potential carpooling program participants. Trip data will be made readily available to County inspectors at the construction trailer on site during construction.

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- Provide any of the following or equally effective trackout/carryout and erosion control measures to minimize transfer of soil or other materials to public roads:
  - track-out grates or gravel beds at each egress point
  - wheel washing at each egress during muddy conditions
  - application of nontoxic, permeable soil binding agent; chemical soil stabilizers; geotextiles; mulching; and/or seeding annually.

As indicated in PDF AQ-1, the applicants would apply water as necessary to suppress fugitive dust during grubbing, clearing, grading, trenching, and soil compaction and/or apply a nontoxic soil binding agent to help with soil stabilization during construction. Water demands during construction would vary over the first 2 to 3 months (about 60 working days). Based on the estimated water demands for the Proposed Project, up to 48 acre-feet of water would be required during clear, grub, and grading activities. Over the peak water demand operations, an estimated 15.73 acre-feet (an average of approximately 85,400 gallons per day) of additional water would be supplied from off-site sources. Approximately 70% of the water distributed on site for dust control during site preparation activities would be imported from the Padre Municipal Water District, other water purveyors, or off-site wells requiring approximately 15 6,000-gallon water trucks per day for water import. The remaining water demand would be provided from on-site wells at a rate of 173,780 gallons per day. After the initial site preparation, the on-site supply wells will be sufficient to meet the construction water demands.

O&M activities would use on-site well water following construction. Additionally, it is anticipated that the soil stabilizer chosen for the project would need to be reapplied annually during project operations. The project would utilize a soil binding stabilization agent that is nontoxic and permeable. The purpose of the soil stabilizer is to prevent erosion and to reduce fugitive dust.

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# 2.0 EXISTING CONDITIONS

## 2.1 Existing Setting

**San Diego Region**

The weather of the San Diego region, as in most of Southern California, is influenced by the Pacific Ocean and its semi-permanent high-pressure systems that result in dry, warm summers and mild, occasionally wet winters. The average temperature ranges (in degrees Fahrenheit (°F)) from the mid-40s to the high 90s. Most of the region's precipitation falls from November to April with infrequent (approximately 10%) precipitation during the summer. The average seasonal precipitation along the coast is approximately 10 inches; the amount increases with elevation as moist air is lifted over the mountains to the east.

The topography in the San Diego region varies greatly, from beaches on the west to mountains and desert on the east. Along with local meteorology, the topography influences the dispersal and movement of pollutants in the basin. The mountains to the east prohibit dispersal of pollutants in that direction and help trap them in inversion layers.

The interaction of ocean, land, and the Pacific High Pressure Zone maintains clear skies for much of the year and influences the direction of prevailing winds (westerly to northwesterly). Local terrain is often the dominant factor inland, and winds in inland mountainous areas tend to blow through the valleys during the day and down the hills and valleys at night.

**Project Site**

The approximately 765-acre Rugged site is located north of Interstate 8 (I-8) to the east of Ribbonwood Road and primarily west of McCain Valley Road and includes the following APNs: 611-060-04, 611-090-02, 611-090-04, 611-091-03, 611-091-07 (portion), 611-100-07, 612-030-01, and 612-030-19, and a property (APN 611-110-01) located adjacent to and east of McCain Valley Road. The Rugged solar farm includes two separate sites. A majority of the site is located west of McCain Valley Road and includes the central, northwest, and southern subareas. A smaller portion of the site is east of McCain Valley Road and comprises the eastern subarea. The land use category for the Rugged site is Rural Lands with a permitted density of 1 dwelling unit per 80 acres (RL-80). The area is zoned General Rural (S92).

The Rugged site is located in a desert transition zone dominated by chaparral communities, subshrub communities, alkali meadows and seeps, oak woodlands, and wildflower fields. The site is characterized by gently sloping hillsides and shallow valleys, with rock outcrops and a few small hills scattered throughout. Much of the site is part of an active ranching operation, with a series of ranch houses, stables, out buildings, roads, fencing, corrals, stock ponds, and other features typical of a horse and cattle ranch.

A portion of the Rugged site was just recently used as a staging area for construction of San Diego Gas and Electric's (SDG&E's) Sunrise Powerlink Project. The site is located at an elevation of approximately 3,500 to 3,670 feet above mean sea level. The site is located within San Diego County's draft East County Multiple Species Conservation Program Plan Area. The majority of the site is disturbed by extensive grazing activities, but also includes some vegetation of moderate to high value for wildlife species. Although the open area of the site is heavily grazed, a small field of herbaceous wildflower species was identified during the spring blooming period.

## 2.2 Climate and Meteorology

The project site is located within the San Diego Air Basin (SDAB or basin) and is subject to the San Diego Air Pollution Control District (SDAPCD) guidelines and regulations. The SDAB is one of 15 air basins that geographically divide the State of California. The SDAB is currently classified as a federal nonattainment area for ozone ($O_3$) and a state nonattainment area for particulate matter less than or equal to 10 microns ($PM_{10}$), particulate matter less than or equal to 2.5 microns ($PM_{2.5}$), and $O_3$.

The SDAB lies in the southwest corner of California and comprises the entire San Diego region, covering 4,260 square miles, and is an area of high air pollution potential. The basin experiences warm summers, mild winters, infrequent rainfalls, light winds, and moderate humidity. This usually mild climatological pattern is interrupted infrequently by periods of extremely hot weather, winter storms, or Santa Ana winds.

The SDAB experiences frequent temperature inversions. Subsidence inversions occur during the warmer months as descending air associated with the Pacific High Pressure Zone meets cool marine air. The boundary between the two layers of air creates a temperature inversion that traps pollutants. Another type of inversion, a radiation inversion, develops on winter nights when air near the ground cools by heat radiation and air aloft remains warm. The shallow inversion layer formed between these two air masses also can trap pollutants. As the pollutants become more concentrated in the atmosphere, photochemical reactions occur that produce $O_3$, commonly known as smog.

Light daytime winds, predominately from the west, further aggravate the condition by driving air pollutants inland, toward the mountains. During the fall and winter, air quality problems are created due to carbon monoxide (CO) and oxides of nitrogen ($NO_x$) emissions. CO concentrations are generally higher in the morning and late evening. In the morning, CO levels are elevated due to cold temperatures and the large number of motor vehicles traveling. Higher CO levels during the late evenings are a result of stagnant atmospheric conditions trapping CO in the area. Since CO is produced almost entirely from automobiles, the highest CO concentrations in the basin are associated with heavy traffic. Nitrogen dioxide ($NO_2$) levels are also generally higher during fall and winter days.

Under certain conditions, atmospheric oscillation results in the offshore transport of air from the Los Angeles region to San Diego County. This often produces high $O_3$ concentrations, as measured at air pollutant monitoring stations within the County. The transport of air pollutants from Los Angeles to San Diego has also occurred within the stable layer of the elevated subsidence inversion, where high levels of $O_3$ are transported.

**Site-Specific Meteorological Conditions**

The local climate in southeastern San Diego County, which is primarily desert, consists of dry, hot summers (temperatures reaching 120° Fahrenheit (F)) and milder winters (daytime temperature in the 80s). The average summertime high temperature in the project vicinity is approximately 90°F, although record highs have approached 120°F in July. The average wintertime low temperature is approximately 33°F, although record lows have approached 10°F in January. Average precipitation in the local area is approximately 9 inches per year, with the bulk of precipitation falling during January and February.

## 2.3 Regulatory Setting

### 2.3.1 Federal

The federal Clean Air Act, passed in 1970 and last amended in 1990, forms the basis for the national air pollution control effort. The U.S. Environmental Protection Agency (EPA) is responsible for implementing most aspects of the Clean Air Act, including the setting of National Ambient Air Quality Standards (NAAQS) for major air pollutants, hazardous air pollutant standards, approval of state attainment plans, motor vehicle emission standards, stationary source emission standards and permits, acid rain control measures, stratospheric $O_3$ protection, and enforcement provisions. NAAQS are established for "criteria pollutants" under the Clean Air Act, which are $O_3$, CO, $NO_2$, $SO_2$, $PM_{10}$, $PM_{2.5}$, and lead.

The NAAQS describe acceptable air quality conditions designed to protect the health and welfare of the citizens of the nation. The NAAQS (other than for $O_3$, $NO_2$, $SO_2$, $PM_{10}$, $PM_{2.5}$, and those based on annual averages or arithmetic mean) are not to be exceeded more than once per year. NAAQS for $O_3$, $NO_2$, $SO_2$, $PM_{10}$, and $PM_{2.5}$ are based on statistical calculations over 1- to 3-year periods, depending on the pollutant. The Clean Air Act requires the EPA to reassess the NAAQS at least every 5 years to determine whether adopted standards are adequate to protect public health based on current scientific evidence. States with areas that exceed the NAAQS must prepare a State Implementation Plan (SIP) that demonstrates how those areas will attain the standards within mandated time frames.

### 2.3.2 State

The federal Clean Air Act delegates the regulation of air pollution control and the enforcement of the NAAQS to the states. In California, the task of air quality management and regulation has been legislatively granted to the California Air Resources Board (CARB), with subsidiary responsibilities assigned to air quality management districts (AQMDs) and air pollution control districts (APCDs) at the regional and county levels. CARB, which became part of the California Environmental Protection Agency (CalEPA) in 1991, is responsible for ensuring implementation of the California Clean Air Act of 1988, responding to the federal Clean Air Act, and regulating emissions from motor vehicles and consumer products.

CARB has established California Ambient Air Quality Standards (CAAQS), which are generally more restrictive than the NAAQS. The CAAQS describe adverse conditions; that is, pollution levels must be below these standards before a basin can attain the standard. The CAAQS for $O_3$, CO, $SO_2$ (1-hour and 24-hour), $NO_2$, $PM_{10}$, and $PM_{2.5}$ and visibility-reducing particles are values that are not to be exceeded. All others are not to be equaled or exceeded. The NAAQS and CAAQS are presented in Table 1, Ambient Air Quality Standards.

**Table 2**
**Ambient Air Quality Standards**

| Pollutant | Averaging Time | California Standards[1] | National Standards[2] | |
|---|---|---|---|---|
| | | *Concentration*[3] | *Primary*[3,4] | *Secondary*[3,5] |
| $O_3$ | 1-hour | 0.09 ppm (180 $\mu g/m^3$) | — | Same as Primary Standard |
| | 8-hour | 0.070 ppm (137 $\mu g/m^3$) | 0.075 ppm (147 $\mu g/m^3$) | |
| CO | 1-hour | 20 ppm (23 $mg/m^3$) | 35 ppm (40 $mg/m^3$) | — |
| | 8-hour | 9.0 ppm (10 $mg/m^3$) | 9 ppm (10 $mg/m^3$) | |
| $NO_2$[6] | 1-hour | 0.18 ppm (339 $\mu g/m^3$) | 0.100 ppm (188 $\mu g/m^3$) | Same as Primary Standard |
| | Annual Arithmetic Mean | 0.030 ppm (57 $\mu g/m^3$) | 0.053 ppm (100 $\mu g/m^3$) | |
| $SO_2$[7] | 1-hour | 0.25 ppm (655 $\mu g/m^3$) | 0.75 ppm (196 $\mu g/m^3$) | — |
| | 3-hour | — | — | 0.5 ppm (1300 $\mu g/m^3$) |
| | 24-hour | 0.04 ppm (105 $\mu g/m^3$) | 0.14 ppm (for certain areas)[7] | |
| | Annual Arithmetic Mean | — | 0.030 ppm (for certain areas)[7] | — |
| $PM_{10}$[8] | 24-hour | 50 $\mu g/m^3$ | 150 $\mu g/m^3$ | Same as Primary Standard |
| | Annual Arithmetic Mean | 20 $\mu g/m^3$ | — | |
| $PM_{2.5}$[8] | 24-hour | — | 35 $\mu g/m^3$ | Same as Primary Standard |
| | Annual Arithmetic Mean | 12 $\mu g/m^3$ | 12.0 $\mu g/m^3$ | 15.0 $\mu g/m^3$ |

## Table 2
## Ambient Air Quality Standards

| Pollutant | Averaging Time | California Standards[1] | National Standards[2] | |
|---|---|---|---|---|
| | | *Concentration*[3] | *Primary*[3,4] | *Secondary*[3,5] |
| Lead[9,10] | 30-day Average | 1.5 µg/m$^3$ | — | — |
| | Calendar Quarter | — | 1.5 µg/m$^3$ (for certain areas)[10] | Same as Primary Standard |
| | Rolling 3-Month Average | — | 0.15 µg/m$^3$ | |
| Hydrogen sulfide | 1 hour | 0.03 ppm (42 µg/m$^3$) | — | — |
| Vinyl chloride[9] | 24-hour | 0.01 ppm (26 µg/m$^3$) | — | — |
| Sulfates | 24-hour | 25 µg/m3 | — | — |
| Visibility reducing particles[11] | 8-hour (10:00 a.m. to 6:00 p.m. PST) | See footnote 11 | — | — |

ppm= parts per million by volume  µg/m$^3$ = micrograms per cubic meter  mg/m$^3$= milligrams per cubic meter

**Source:** CARB 2013a

1 California standards for ozone, carbon monoxide (except 8-hour Lake Tahoe), sulfur dioxide (1-hour and 24-hour), nitrogen dioxide, and particulate matter ($PM_{10}$, $PM_{2.5}$, and visibility reducing particles), are values that are not to be exceeded. All others are not to be equaled or exceeded. California ambient air quality standards are listed in the Table of Standards in Section 70200 of Title 17 of the California Code of Regulations.

2 National standards (other than $O_3$, $NO_2$, $SO_2$, particulate matter, and those based on annual averages or annual arithmetic mean) are not to be exceeded more than once a year. The $O_3$ standard is attained when the fourth highest 8-hour concentration in a year, averaged over 3 years, is equal to or less than the standard. For $NO_2$ and $SO_2$, the standard is attained when the 3-year average of the 98th and 99th percentile, respectively, of the daily maximum 1-hour average at each monitor within an area does not exceed the standard. For $PM_{10}$, the 24-hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 µg/m$^3$ is equal to or less than one. For $PM_{2.5}$, the 24-hour standard is attained when 98% of the daily concentrations, averaged over 3 years, are equal to or less than the standard.

3 Concentration expressed first in units in which it was promulgated. Equivalent units given in parentheses are based upon a reference temperature of 25°C and a reference pressure of 760 torr.
Most measurements of air quality are to be corrected to a reference temperature of 25°C and a reference pressure of 760 torr; ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.

4 National Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health.

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

6 To attain the 1-hour national standard, the 3-year average of the annual 98th percentile of the 1-hour daily maximum concentrations at each site must not exceed 100 ppb. Note that the national 1-hour standard is in units of parts per billion (ppb). California standards are in units of parts per million (ppm). To directly compare the national 1-hour standard to the California standards, the units can be converted from ppb to ppm. In this case, the national standard of 100 ppb is identical to 0.100 ppm.

7 On June 2, 2010, a new 1-hour $SO_2$ standard was established and the existing 24-hour and annual primary standards were revoked. To attain the 1-hour national standard, the 3-year average of the annual 99th percentile of the 1-hour daily maximum concentrations at each site must not exceed 75 ppb. The 1971 $SO_2$ national standards (24-hour and annual) remain in effect until 1 year after an area is designated for the 2010 standard, except that in areas designated nonattainment for the 1971 standards, the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standards are approved.

8 On December 14, 2012, the national annual $PM_{2.5}$ primary standard was lowered from 15 µg/m$^3$ to 12 µg/m$^3$. The existing national 24-hour PM 2.5 standards (primary and secondary) were retained at 35 µg/m$^3$, as was the annual secondary standard of 15 µg/m$^3$. The existing 24-hour $PM_{10}$ standards (primary and secondary) of 150 µg/m$^3$ also were retained. The form of the annual primary and secondary standards is the annual mean, averaged over 3 years.

9 CARB has identified lead and vinyl chloride as 'toxic air contaminants' with no threshold level of exposure for adverse health effects determined. These actions allow for the implementation of control measures at levels below the ambient concentrations specified for these pollutants.

10 The national standard for lead was revised on October 15, 2008, to a rolling 3-month average. The 1978 lead standard (1.5 µg/m$^3$ as a quarterly average) remains in effect until 1 year after an area is designated for the 2008 standard, except that in areas designated

nonattainment for the 1978 standard, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.

11 In 1989, CARB converted both the general statewide 10-mile visibility standard and the Lake Tahoe 30-mile visibility standard to instrumental equivalents, which are "extinction of 0.23 per kilometer" and "extinction of 0.07 per kilometer" for the statewide and Lake Tahoe Air Basin standards, respectively.

### 2.3.3 Local

**San Diego Air Pollution Control District**

While CARB is responsible for the regulation of mobile emission sources within the state, local AQMDs and APCDs are responsible for enforcing standards and regulating stationary sources. The project is located within the SDAB and is subject to SDAPCD guidelines and regulations. In San Diego County, $O_3$ and particulate matter are the pollutants of main concern, since exceedances of state ambient air quality standards for those pollutants are experienced here in most years. For this reason, the SDAB has been designated as a nonattainment area for the state $PM_{10}$, $PM_{2.5}$, and $O_3$ standards. The SDAB is also a federal $O_3$ nonattainment area and a CO maintenance area (western part of the SDAB only); the project area is a CO attainment area.

The SDAPCD and the San Diego Association of Governments (SANDAG) are responsible for developing and implementing the clean air plan for attainment and maintenance of the ambient air quality standards in the SDAB. The *Regional Air Quality Strategy* (RAQS) for the SDAB was initially adopted in 1991, and is updated on a triennial basis (most recently in 2009). The RAQS outlines SDAPCD's plans and control measures designed to attain the state air quality standards for $O_3$. The RAQS relies on information from CARB and SANDAG, including mobile and area source emissions, as well as information regarding projected growth in San Diego County and the cities in the County, to project future emissions and then determine from that the strategies necessary for the reduction of emissions through regulatory controls. CARB mobile source emission projections and SANDAG growth projections are based on population, vehicle trends, and land use plans developed by San Diego County and the cities in the County as part of the development of their general plans.

The *Eight-Hour Ozone Attainment Plan for San Diego County* indicates that local controls and state programs would allow the region to reach attainment of the federal 8-hour $O_3$ standard by 2009 (SDAPCD 2007). In this plan, SDAPCD relies on the RAQS to demonstrate how the region will comply with the federal $O_3$ standard. The RAQS details how the region will manage and reduce $O_3$ precursors ($NO_x$ and VOCs) by identifying measures and regulations intended to reduce these contaminants. The control measures identified in the RAQS generally focus on stationary sources; however, the emissions inventories and projections in the RAQS address all potential sources, including those under the authority of CARB and the EPA. Incentive programs for reduction of emissions from heavy-duty diesel vehicles, off-road equipment, and school buses are also established in the RAQS.

In December 2005, SDAPCD prepared a report titled *Measures to Reduce Particulate Matter in San Diego County* to address implementation of Senate Bill (SB) 656 in San Diego County (SB 656 required additional controls to reduce ambient concentrations of $PM_{10}$ and $PM_{2.5}$) (SDAPCD 2005). In the report, SDAPCD evaluates the implementation of source-control measures that would reduce particulate matter emissions associated with residential wood combustion; various construction activities including earthmoving, demolition, and grading; bulk material storage and handling; carryout and trackout removal and cleanup methods; inactive disturbed land; disturbed open areas; unpaved parking lots/staging areas; unpaved roads; and windblown dust.

As stated above, the SDAPCD is responsible for planning, implementing, and enforcing federal and state ambient standards in the SDAB. The following rules and regulations would apply to the construction of the proposed project:

1. **SDAPCD Regulation IV: Prohibitions; Rule 51: Nuisance.** Prohibits the discharge, from any source, of such quantities of air contaminants or other materials that cause or have a tendency to cause injury, detriment, nuisance, annoyance to people, and/or the public, or damage to any business or property (SDAPCD 1969).
2. **SDAPCD Regulation IV: Prohibitions; Rule 55: Fugitive Dust.** Regulates fugitive dust emissions from any commercial construction or demolition activity capable of generating fugitive dust emissions, including active operations, open storage piles, and inactive disturbed areas, as well as track-out and carry-out onto paved roads beyond a project site (SDAPCD 2009).
3. **SDAPCD Regulation IV: Prohibitions; Rule 67.0: Architectural Coatings.** Requires manufacturers, distributors, and end users of architectural and industrial maintenance coatings to reduce VOC emissions from the use of these coatings, primarily by placing limits on the VOC content of various coating categories (SDAPCD 2001).

### San Diego County

During construction of the project, the construction contractor would be required to comply with County Code Section 87.428 and implement appropriate dust control measures.

**County Code Section 87.428, Dust Control Measures.** As part of the San Diego County Grading, Clearing, and Watercourses Ordinance, County Code Section 87.428 requires all clearing and grading to be carried out with dust control measures adequate to prevent creation of a nuisance to persons or public or private property. Clearing, grading, or improvement plans shall require that measures such as the following be undertaken to achieve this result: watering, application of surfactants, shrouding, control of vehicle speeds, paving of access areas, or other operational or technological measures to reduce dispersion of dust. These project design measures are to be incorporated into all earth disturbing activities to minimize the amount of particulate matter emissions from construction (County of San Diego 2004).

## 2.4 Background Air Quality

### 2.4.1 Pollutants and Effects

Criteria air pollutants are defined as pollutants for which the federal and state governments have established ambient air quality standards, or criteria, for outdoor concentrations to protect public health. The federal and state standards have been set, with an adequate margin of safety, at levels above which concentrations could be harmful to human health and welfare. These standards are designed to protect the most sensitive persons from illness or discomfort. Pollutants of concern include: $O_3$, $NO_2$, CO, sulfur dioxide ($SO_2$), $PM_{10}$, $PM_{2.5}$, and lead. These pollutants are discussed below.[1] In California, sulfates, vinyl chloride, hydrogen sulfide, and visibility-reducing particles are also regulated as criteria air pollutants.

***Ozone.*** $O_3$ is a colorless gas that is formed in the atmosphere when volatile organic compounds (VOCs), sometimes referred to as reactive organic gases (ROGs), and $NO_x$ react in the presence of ultraviolet sunlight. $O_3$ is not a primary pollutant; it is a secondary pollutant formed by complex interactions of two pollutants directly emitted into the atmosphere. The primary sources of VOCs and $NO_x$, the precursors of $O_3$, are automobile exhaust and industrial sources. Meteorology and terrain play major roles in $O_3$ formation and ideal conditions occur during summer and early autumn, on days with low wind speeds or stagnant air, warm temperatures, and cloudless skies. Short-term exposures (lasting for a few hours) to $O_3$ at levels typically observed in Southern California can result in breathing pattern changes, reduction of breathing capacity, increased susceptibility to infections, inflammation of the lung tissue, and some immunological changes.

***Nitrogen Dioxide.*** Most $NO_2$, like $O_3$, is not directly emitted into the atmosphere but is formed by an atmospheric chemical reaction between nitric oxide (NO) and atmospheric oxygen. NO and $NO_2$ are collectively referred to as $NO_x$ and are major contributors to $O_3$ formation. High concentrations of $NO_2$ can cause breathing difficulties and result in a brownish-red cast to the atmosphere with reduced visibility. There is some indication of a relationship between $NO_2$ and chronic pulmonary fibrosis and some increase in bronchitis in children (2 and 3 years old) has also been observed at concentrations below 0.3 parts per million by volume (ppm).

1 The following descriptions of health effects for each of the criteria air pollutants associated with project construction and operations are based on the EPA's "Six Common Air" Pollutants (EPA 2010) and the CARB "Glossary of Air Pollutant Terms" (CARB 2013b) published information.

***Carbon Monoxide.*** CO is a colorless and odorless gas formed by the incomplete combustion of fossil fuels. CO is emitted almost exclusively from motor vehicles, power plants, refineries, industrial boilers, ships, aircraft, and trains. In urban areas, such as the project location, automobile exhaust accounts for the majority of CO emissions. CO is a non-reactive air pollutant that dissipates relatively quickly; therefore, ambient CO concentrations generally follow the spatial and temporal distributions of vehicular traffic. CO concentrations are influenced by local meteorological conditions; primarily wind speed, topography, and atmospheric stability. CO from motor vehicle exhaust can become locally concentrated when surface-based temperature inversions are combined with calm atmospheric conditions, a typical situation at dusk in urban areas between November and February. The highest levels of CO typically occur during the colder months of the year when inversion conditions are more frequent. In terms of health, CO competes with oxygen, often replacing it in the blood, thus reducing the blood's ability to transport oxygen to vital organs. The results of excess CO exposure can be dizziness, fatigue, and impairment of central nervous system functions.

***Sulfur Dioxide.*** $SO_2$ is a colorless, pungent gas formed primarily by the combustion of sulfur-containing fossil fuels. Main sources of $SO_2$ are coal and oil used in power plants and industries; as such, the highest levels of $SO_2$ are generally found near large industrial complexes. In recent years, $SO_2$ concentrations have been reduced by the increasingly stringent controls placed on stationary source emissions of $SO_2$ and limits on the sulfur content of fuels. $SO_2$ is an irritant gas that attacks the throat and lungs and can cause acute respiratory symptoms and diminished ventilator function in children. $SO_2$ can also yellow plant leaves and erode iron and steel.

***Particulate Matter.*** Particulate matter pollution consists of very small liquid and solid particles floating in the air, which can include smoke, soot, dust, salts, acids, and metals. Particulate matter can form when gases emitted from industries and motor vehicles undergo chemical reactions in the atmosphere. $PM_{2.5}$ and $PM_{10}$ represent fractions of particulate matter. Fine particulate matter, or $PM_{2.5}$, is roughly 1/28 the diameter of a human hair. $PM_{2.5}$ results from fuel combustion (e.g., motor vehicles, power generation, and industrial facilities), residential fireplaces, and wood stoves. In addition, $PM_{2.5}$ can be formed in the atmosphere from gases such as sulfur oxides ($SO_x$), $NO_x$, and VOC. Inhalable or coarse particulate matter, or $PM_{10}$, is about 1/7 the thickness of a human hair. Major sources of $PM_{10}$ include crushing or grinding operations; dust stirred up by vehicles traveling on roads; wood burning stoves and fireplaces; dust from construction, landfills, and agriculture; wildfires and brush/waste burning; industrial sources; windblown dust from open lands; and atmospheric chemical and photochemical reactions.

$PM_{2.5}$ and $PM_{10}$ pose a greater health risk than larger-size particles. When inhaled, these tiny particles can penetrate the human respiratory system's natural defenses and damage the respiratory tract. $PM_{2.5}$ and $PM_{10}$ can increase the number and severity of asthma attacks, cause or aggravate bronchitis and other lung diseases, and reduce the body's ability to fight infections.

Very small particles of substances, such as lead, sulfates, and nitrates, can cause lung damage directly or be absorbed into the blood stream, causing damage elsewhere in the body. Additionally, these substances can transport absorbed gases, such as chlorides or ammonium, into the lungs, also causing injury. Whereas $PM_{10}$ tends to collect in the upper portion of the respiratory system, $PM_{2.5}$ is so tiny that it can penetrate deeper into the lungs and damage lung tissues. Suspended particulates also damage and discolor surfaces on which they settle, as well as produce haze and reduce regional visibility.

***Lead.*** Lead in the atmosphere occurs as particulate matter. Sources of lead include leaded gasoline, the manufacturing of batteries, paint, ink, ceramics, and ammunition and secondary lead smelters. Prior to 1978, mobile emissions were the primary source of atmospheric lead. Between 1978 and 1987, the phase-out of leaded gasoline reduced the overall inventory of airborne lead by nearly 95%. With the phase-out of leaded gasoline, secondary lead smelters, battery recycling, and manufacturing facilities are becoming lead-emission sources of greater concern.

Prolonged exposure to atmospheric lead poses a serious threat to human health. Health effects associated with exposure to lead include gastrointestinal disturbances, anemia, kidney disease, and in severe cases, neuromuscular and neurological dysfunction. Of particular concern are low-level lead exposures during infancy and childhood. Such exposures are associated with decrements in neurobehavioral performance including intelligence quotient performance, psychomotor performance, reaction time, and growth.

***Toxic Air Contaminants.*** A substance is considered toxic if it has the potential to cause adverse health effects in humans, including increasing the risk of cancer upon exposure, or acute and/or chronic noncancer health effects. A toxic substance released into the air is considered a toxic air contaminant (TAC). Examples include certain aromatic and chlorinated hydrocarbons, certain metals, and asbestos. TACs are generated by a number of sources, including stationary sources such as dry cleaners, gas stations, combustion sources, and laboratories; mobile sources such as automobiles; and area sources such as landfills. Adverse health effects associated with exposure to TACs may include carcinogenic (i.e., cancer-causing) and noncarcinogenic effects. Noncarcinogenic effects typically affect one or more target organ systems and may be experienced either on short-term (acute) or long-term (chronic) exposure to a given TAC. CARB has identified diesel engine exhaust particulate matter as the predominant TAC in California. Diesel particulate matter is emitted into the air by diesel-powered mobile vehicles, including heavy-duty diesel trucks, construction equipment, and passenger vehicles. Certain ROGs may also are designated as TACs.

### 2.4.2 SDAB Attainment Designation

An area is designated in attainment when it is in compliance with the NAAQS and/or CAAQS. These standards are set by the EPA or CARB for the maximum level of a given air pollutant that can exist in the outdoor air without unacceptable effects on human health or the public welfare.

The criteria pollutants of primary concern that are considered in this air quality assessment include $O_3$, $NO_2$, CO, $SO_2$, $PM_{10}$, and $PM_{2.5}$. Although there are no ambient standards for VOCs or $NO_x$, they are important as precursors to $O_3$.

The SDAB is designated by EPA as an attainment area for the 1997 8-hour NAAQS for $O_3$ and as a marginal nonattainment area for the 2008 8-hour NAAQS for $O_3$. The SDAB is designated in attainment for all other criteria pollutants under the NAAQS with the exception of $PM_{10}$, which was determined to be unclassifiable. The SDAB is currently designated nonattainment for $O_3$ and particulate matter, $PM_{10}$ and $PM_{2.5}$, under the CAAQS. It is designated attainment for the CAAQS for CO, $NO_2$, $SO_2$, lead, and sulfates. Table 2, SDAB Attainment Classification, summarizes the SDAB's federal and state attainment designations for each of the criteria pollutants.

**Table 3**
**SDAB Attainment Classification**

| Pollutant | Federal Designationa | State Designationb |
|---|---|---|
| $O_3$ (1 hour) | Attainment[1] | Nonattainment |
| $O_3$ (8-hour – 1997)<br>(8-hour – 2008) | Attainment (Maintenance)<br>Nonattainment (Marginal) | Nonattainment |
| CO | Unclassifiable/Attainment[2] | Attainment |
| $PM_{10}$ | Unclassifiable[3] | Nonattainment |
| $PM_{2.5}$ | Attainment | Nonattainment |
| $NO_2$ | Unclassifiable/Attainment | Attainment |
| $SO_2$ | Attainment | Attainment |
| Lead | Attainment | Attainment |
| Sulfates | (no federal standard) | Attainment |
| Hydrogen Sulfide | (no federal standard) | Unclassified |
| Visibility-Reducing Particles | (no federal standard) | Unclassified |

**Sources:** [a]EPA 2013a; [b]CARB 2013c.
**Notes:**
1 The federal 1-hour standard of 0.12 ppm was in effect from 1979 through June 15, 2005. The revoked standard is referenced here because it was employed for such a long period and because this benchmark is addressed in SIPs.
2 The western and central portions of the SDAB are designated attainment, while the eastern portion is designated unclassifiable/attainment.
3 At the time of designation, if the available data does not support a designation of attainment or nonattainment, the area is designated as unclassifiable.

### 2.4.3 Air Quality Monitoring Data

The SDAPCD operates a network of ambient air monitoring stations throughout San Diego County, which measure ambient concentrations of pollutants and determine whether the ambient air quality meets the CAAQS and the NAAQS. The SDAPCD monitors air quality conditions at 10 locations throughout the basin. Due to its proximity to the site and similar geographic and climactic characteristics, the Alpine–Victoria Drive monitoring station concentrations for all pollutants, except $PM_{10}$, CO, and $SO_2$, are considered most representative of the project site. The Chula Vista monitoring station is the nearest location to the project site where CO and $SO_2$ concentrations are monitored, and the El Cajon–Redwood Avenue monitoring station is the nearest location to the project site where $PM_{10}$ concentrations are monitored. Ambient concentrations of pollutants from 2008 through 2010 are presented in Table 3, Ambient Air Quality Data. The number of days exceeding the AAQS is shown in Table 4, Frequency of Air Quality Standard Violations. The federal and state 8-hour and state 1-hour $O_3$ standards were exceeded every year from 2008 to 2012. The state 24-hour $PM_{10}$ standard was exceeded in 2009, and the federal 24-hour $PM_{2.5}$ standard was exceeded in 2009 and 2011. Air quality within the project region was in compliance with both CAAQS and NAAQS for $NO_2$, CO, $PM_{10}$ (NAAQS only), and $SO_2$ during this monitoring period.

**Table 4**
**Ambient Air Quality Data (ppm unless otherwise indicated)**

| Pollutant | Averaging Time | 2008 | 2009 | 2010 | 2011 | 2012 | Most Stringent Ambient Air Quality Standard | Monitoring Station |
|---|---|---|---|---|---|---|---|---|
| $O_3$ | 8-hour | 0.110 | 0.098 | 0.088 | 0.093 | 0.084 | 0.070 | Alpine – Victoria Drive |
| | 1-hour | 0.139 | 0.119 | 0.105 | 0.114 | 0.101 | 0.090 | |
| $PM_{10}$ | Annual | 27.3 μg/m³ | 25.3 μg/m³ | 21.3 μg/m³ | 23.7 μg/m³ | 23.4 μg/m³ | 20 μg/m³ | El Cajon – Redwood Avenue |
| | 24-hour | 41.4 μg/m³ | 57.0 μg/m³ | 42.0 μg/m³ | 41.9 μg/m³ | 47.2 μg/m³ | 50 μg/m³ | |
| $PM_{2.5}$ | Annual[1] | 14.0 μg/m³ | 12.2 μg/m³ | 10.8 μg/m³ | 10.6 μg/m³ | NA | 12 μg/m³ | Alpine – Victoria Drive |
| | 24-hour | 37.3 μg/m³ | 29.7 μg/m³ | 23.4 μg/m³ | 25.5 μg/m³ | 25.5 μg/m³ | 35 μg/m³ | |
| $NO_2$ | Annual | 0.008 | 0.008 | 0.007 | 0.006 | NA | 0.030 | Alpine – Victoria Drive |
| | 1-hour | 0.047 | 0.056 | 0.052 | 0.040 | 0.047 | 0.180 | |
| CO | 8-hour[2] | 1.87 | 1.43 | 1.56 | 1.46 | 1.85 | 9.0 | Chula Vista |
| | 1-hour* | 3.0 | 2.0 | 2.0 | 1.7 | 2.2 | 20 | |
| $SO_2$ | Annual | 0.002 | 0.002 | 0.001 | NA | NA | 0.030 | Chula Vista |
| | 24-hour | 0.004 | 0.003 | 0.002 | NA | NA | 0.040 | |

**Sources:** CARB 2013d; EPA 2013b
Data represent maximum values.
**Notes:**
A new 1-hour NAAQS for $NO_2$ became effective in April 2010. Data reflect compliance with the 1-hour CAAQS.
NA = data not available
* Data were taken from EPA 2013b
1 2009, 2010, 2011, and 2012 data were taken from El Cajon–Redwood Avenue monitoring station
2 2011 and 2012 data were taken from El Cajon–Redwood Avenue monitoring station

**Table 5**
**Frequency of Air Quality Standard Violations**

| Monitoring Site | Year | Number of Days Exceeding Standard | | | | |
|---|---|---|---|---|---|---|
| | | *State 1-Hour $O_3$* | *State 8-Hour $O_3$* | *National 8-Hour $O_3$* | *State 24-hour $PM_{10}$** | *National 24-hour $PM_{2.5}$** |
| Alpine – Victoria Drive | 2008 | 13 | 61 | 31 | — | — |
| | 2009 | 6 | 43 | 22 | — | — |
| | 2010 | 4 | 20 | 12 | — | — |
| | 2011 | 4 | 30 | 10 | — | — |
| | 2012 | 1 | 22 | 7 | — | — |
| El Cajon – Redwood Avenue | 2008 | — | — | — | — | — |
| | 2009 | — | — | — | 6.0 (1) | 3.0 (1) |
| | 2010 | — | — | — | — | — |
| | 2011 | — | — | — | — | 1.0 (1) |
| | 2012 | — | — | — | — | — |

**Source**: CARB 2013d.
* Measurements of $PM_{10}$ and $PM_{2.5}$ are usually collected every 6 days and 3 days, respectively. "Number of days exceeding the standards" is a mathematical estimate of the number of days concentrations would have been greater than the level of the standard had each day been monitored. The numbers in parentheses are the measured number of samples that exceeded the standard.

## 3.0 SIGNIFICANCE CRITERIA AND ANALYSIS METHODOLOGIES

The State of California has developed guidelines to address the significance of air quality impacts based on Appendix G of the California Environmental Quality Act (CEQA) Guidelines, which provides guidance that a project would have a significant environmental impact if it would:

1. Conflict with or obstruct the implementation of the applicable air quality plan;
2. Violate any air quality standard or contribute substantially to an existing or projected air quality violation;
3. Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is in nonattainment under an applicable federal or state ambient air quality standard (including releasing emissions that exceed quantitative thresholds for $O_3$ precursors);
4. Expose sensitive receptors to substantial pollutant concentrations; or
5. Create objectionable odors affecting a substantial number of people.

The following significance thresholds for air quality are based on criteria provided in the County's *Guidelines for Determining Significance – Air Quality* (County of San Diego 2007). The County's guidelines were adapted from Appendix G of the CEQA Guidelines listed above.

A significant impact would result if any of the following would occur:

- The project would conflict with or obstruct the implementation of the County RAQS and/or applicable portions of the SIP.
- The project would result in emissions that would violate any air quality standard or contribute substantially to an existing or projected air quality violation:
    - The project would result in emissions that exceed 250 pounds per day of $NO_x$ or 75 pounds per day of VOCs
    - The project would result in emissions of CO that, when totaled with the ambient concentration, would exceed a 1-hour concentration of 20 ppm or an 8-hour average of 9 ppm
    - The project would result in emissions of $PM_{2.5}$ that exceed 55 pounds per day
    - The project would result in emissions of $PM_{10}$ that exceed 100 pounds per day and increase the ambient $PM_{10}$ concentrations by 5 $\mu g/m^3$ or greater at the maximum exposed individual.

- The project would result in a cumulatively considerable net increase of any criteria pollutant for which the SDAB is in nonattainment under an applicable federal or state ambient air quality standard.
  - The following guidelines for determining significance must be used for determining the cumulatively considerable net increases during the construction phase:
    - A project that has a significant direct impact on air quality with regard to emissions of $PM_{10}$, $PM_{2.5}$, $NO_x$, and/or VOCs would also have a significant cumulatively considerable net increase
    - In the event direct impacts from a proposed project are less than significant, a project may still have a cumulatively considerable impact on air quality if the emissions of concern from the proposed project, in combination with the emissions of concern from other proposed projects or reasonably foreseeable future projects within a proximity relevant to the pollutants of concern, are in excess of the guidelines, including the SDAPCD screening-level thresholds.
  - The following guidelines for determining significance must be used for determining the cumulatively considerable net increase during the operational phase:
    - A project that does not conform to the County's RAQS and/or has a significant direct impact on air quality with regard to operation emissions of $PM_{10}$, $PM_{2.5}$, $NO_x$, and/or VOCs would also have a significant cumulatively considerable net increase
    - Projects that cause road intersections to operate at or below level of service E (analysis required only when the addition of peak-hour trips from the proposed project and the surrounding projects exceeds 2,000) and create a CO hotspot create a cumulatively considerable net increase of CO.
- The project would expose sensitive receptors to substantial pollutant concentrations:
  - The project places sensitive receptors near CO hotspots or creates CO hotspots near sensitive receptors
  - Project implementation would result in exposure to TACs, resulting in a maximum incremental cancer risk greater than one in 1 million without application of Toxics-Best Available Control Technology (T-BACT) or a health hazard index greater than one would be deemed as having a potentially significant impact.
- The project, which is not an agricultural, commercial, or an industrial activity subject to SDAPCD standards, as a result of implementation, would either generate objectionable odors or place sensitive receptors next to existing objectionable odors, which would affect a considerable number of persons or the public.

### SDAPCD

As part of its air quality permitting process, the SDAPCD has established thresholds in Rule 20.2 requiring the preparation of Air Quality Impact Assessments (AQIA) for permitted stationary sources. The SDAPCD sets forth quantitative emission thresholds below which a stationary source would not have a significant impact on ambient air quality. Project-related air quality impacts estimated in this environmental analysis would be considered significant if any of the applicable significance thresholds presented in Table 6, San Diego Air Pollution Control District Air Quality Significance Thresholds, are exceeded.

For CEQA purposes, these screening criteria can be used as numeric methods to demonstrate that a project's total emissions would not result in a significant impact to air quality.

**Table 6**
**San Diego Air Pollution Control District Air Quality Significance Thresholds**

| Construction Emissions | | | |
|---|---|---|---|
| *Pollutant* | *Total Emissions (Pounds per Day)* | | |
| Respirable Particulate Matter ($PM_{10}$) | 100 | | |
| Fine Particulate Matter ($PM_{2.5}$) | 55 | | |
| Oxides of Nitrogen ($NO_x$) | 250 | | |
| Oxides of Sulfur ($SO_x$) | 250 | | |
| Carbon Monoxide (CO) | 550 | | |
| Volatile Organic Compounds (VOC) | 75* | | |
| **Operational Emissions** | | | |
| *Pollutant* | *Total Emissions* | | |
| | *Pounds per Hour* | *Pounds per Day* | *Pounds per Year* |
| Respirable Particulate Matter ($PM_{10}$) | — | 100 | 15 |
| Fine Particulate Matter ($PM_{2.5}$) | — | 55 | 10 |
| Oxides of Nitrogen ($NO_x$) | 25 | 250 | 40 |
| Sulfur Oxides ($SO_x$) | 25 | 250 | 40 |
| Carbon Monoxide (CO) | 100 | 550 | 100 |
| Lead and Lead Compounds | — | 3.2 | 0.6 |
| Volatile Organic Compounds (VOC) | — | 75* | 13.7 |

**Sources:** SDAPCD Rules 1501 (SDAPCD 1995a) and 20.2(d)(2) (SDAPCD 1998)
* VOC threshold based on the threshold of significance for VOCs from the South Coast Air Quality Management District for the Coachella Valley as stated in the San Diego County Guidelines for Determining Significance.

The thresholds listed in Table 6 represent screening-level thresholds that can be used to evaluate whether project-related emissions could cause a significant impact on air quality. Emissions below the screening-level thresholds would not cause a significant impact. In the event that emissions exceed these thresholds, modeling would be required to demonstrate that the project's total air quality impacts result in ground-level concentrations that are below the CAAQS and NAAQS, including appropriate background levels. For nonattainment pollutants, if emissions exceed the thresholds shown in Table 6, the project could have the potential to result in a cumulatively considerable net increase in these pollutants and thus could have a significant impact on the ambient air quality.

With respect to odors, SDAPCD Rule 51 (Public Nuisance) prohibits emission of any material that causes nuisance to a considerable number of persons or endangers the comfort, health, or safety of any person. A project that proposes a use that would produce objectionable odors would be deemed to have a significant odor impact if it would affect a considerable number of off-site receptors.

# 4.0 PROJECT IMPACT ANALYSIS

The significance criteria described in Section 3.0 were used to evaluate impacts associated with the construction and operation of the Proposed Project.

## 4.1 Conformance to the RAQS

### 4.1.1 Guideline for the Determination of Significance

Based on Appendix G of the CEQA Guidelines, and the County *Guidelines for Determining Significance – Air Quality*, the proposed project would have a significant impact if it would:

- Conflict with or obstruct the implementation of the RAQS and/or applicable portions of the State Implementation Plan (SIP).

### 4.1.2 Significance of Impacts Prior to Mitigation

As mentioned in Section 2.3, the SDAPCD and SANDAG are responsible for developing and implementing the clean air plan for attainment and maintenance of the ambient air quality standards in the SDAB. The RAQS was initially adopted in 1991 and is updated on a triennial basis (most recently in 2009). The RAQS outlines SDAPCD's plans and control measures designed to attain the state air quality standards for O3. The RAQS relies on information from CARB and SANDAG, including mobile and area source emissions, as well as information regarding projected growth in San Diego County and the cities in the county, to project future emissions and then determine from that the strategies necessary for the reduction of emissions through regulatory controls. CARB mobile source emission projections and SANDAG growth projections are based on population, vehicle trends, and land use plans developed by San Diego County and the cities in the County as part of the development of their general plans.

The RAQS relies on SANDAG growth projections based on population, vehicle trends, and land use plans developed by the cities and by the County as part of the development of their general plans. As such, projects that propose development that is consistent with the growth anticipated by local plans would be consistent with the RAQS. However, if a project proposes development that is greater than that anticipated in the local plan and SANDAG's growth projections, the project might be in conflict with the RAQS and may contribute to a potentially significant cumulative impact on air quality. The Proposed Project site is currently designated Rural Lands with a permitted density of 1 dwelling unit per 80 acres (RL-80). The area is zoned General Rural (S92). At this density, the current land use designation would generate approximately 86 trips per day.[2] The Proposed Project consists of up to 80 MW of solar energy development and would consist of approximately 3,588 concentrator photovoltaic (CPV) trackers on 765 acres. No residential, commercial or growth-inducing development is proposed. The operation of the project would result in a small increase in local employment and associated trips. The Proposed Project would employ 15 to 20 employees generating up to 40 trips per day without accounting for carpooling. As such, the Proposed Project would consist of a less intense land use than what is currently allowed under the County General Plan.

As the Proposed Project would not contribute to local population growth or substantial employment growth and associated vehicle miles traveled (VMT) on local roadways, the proposed solar development project is considered accounted for in the RAQS, and the project would not conflict with or obstruct the implementation with local air quality plans. Impacts would be considered **less than significant**.

### 4.1.3 Mitigation Measures and Design Considerations

No mitigation measures would be required.

### 4.1.4 Conclusions

The Proposed Project would be in conformance with the RAQS.

## 4.2 Conformance to Federal and State Ambient Air Quality Standards

### 4.2.1 Construction Impacts

#### *4.2.1.1 Guideline for the Determination of Significance*

Based on Appendix G of the CEQA Guidelines, and the County *Guidelines for Determining Significance – Air Quality*, the proposed project would have a significant impact if it would:

- Violate any air quality standard or contribute substantially to an existing or projected air quality violation.

[2] At a density of 1 unit per 80 acres, the development of the 765-acre project site would allow 9 dwelling units. Using a trip generation rate of 9.57 trips per single-family residential unit (ITE 2008), this level of land use would generate 86.13 trips per day.

#### *4.2.1.2 Significance of Impacts Prior to Mitigation*

Construction of the Proposed Project would result in a temporary addition of pollutants to the local airshed caused by soil disturbance, dust emissions, and combustion pollutants from on-site construction equipment, as well as from off-site trucks hauling construction materials to the project site. Construction emissions can vary substantially from day to day, depending on the level of activity, the specific type of operation, and for dust, the prevailing weather conditions. Therefore, such emission levels can be approximately estimated only with a corresponding uncertainty in precise ambient air quality impacts. Fugitive dust emissions would primarily result from site preparation and road construction activities. $NO_x$ and CO emissions would primarily result from the use of construction equipment and motor vehicles.

Emissions from off-road equipment used during the construction phase of the project were estimated using emission rates derived from CARB's OFFROAD model: OFFROAD2007, available online (http://www.arb.ca.gov/msei/offroad/offroad.htm), for CO and $SO_x$, and the 2011 update ("OFFROAD2011"), available online (http://www.arb.ca.gov/msei/categories.htm#offroad_motor_vehicles), for VOC, $NO_x$, and $PM_{10}$ (CARB 2011a).[3] Emissions of all pollutants from on-road trucks and passenger vehicles were estimated using emission factors derived using CARB's motor vehicle emission inventory program, EMFAC2011, available online (http://www.arb.ca.gov/msei/modeling.htm) (CARB 2011b). Fugitive dust emissions during clear and grub activities were estimated using the default emission factor of 20 pounds per acre-day from the URBEMIS 2007, Version 9.2.4, land use and air emission model (Jones & Stokes 2007) because extensive earthmoving would not be conducted. For road construction, fugitive dust emissions were estimated using a "worst-case" emission factor of 38.2 pounds per acre-day, which is recommended in URBEMIS 2007 for grading that involves substantial earthmoving activity. The clear-and-grub operation would involve an estimated 516 acres. Proposed grading for road construction would involve approximately 29,834 cubic yards of balanced cut and fill on an estimated 41.91 acres. Road construction would not require extensive soil hauling throughout the project site.[4] Rather, cut-and-fill activities would primarily consist of excavation using scrapers and bulldozers and localized recompaction of the top 8 inches of soil at the point of cut. The basis for the URBEMIS 2007 fugitive

3 Both the OFFROAD 2007 model and the OFFROAD 2011 update to the 2007 model were utilized in this analysis because the 2011 update accounts for recent revisions to the Airborne Toxic Control Measure governing off-road vehicle fleets. This regulatory update only estimates VOC, $NO_x$, and $PM_{10}$ emissions. Other pollutants are estimated using OFFROAD2007 as they were not affected by the regulatory update.

4 The "low level of detail" factor in URBEMIS 2007 is based on cut and fill for projects involving extensive transport of soil using haul trucks on unpaved roads over large construction sites. This factor would overestimate fugitive dust emissions for the construction activities to be conducted for the proposed project, which would involve localized transport using scrapers and bulldozers.

dust factor also accounts for dust generated by equipment and vehicles traveling on unpaved roads and surfaces at a construction site; thus, a separate calculation has not been performed. The average daily disturbed area would be 8.6 and 4.7 acres, respectively, for the clear–and-grub activities and road construction.

Entrained road dust emissions for vehicles traveling off site on local roads were estimated using calculations in Section 13.2.1 (Paved Roads) of the EPA's *Compilation of Air Pollutant Emission Factors* (EPA 2011). VMT for paved road travel by workers is assumed to be approximately 35 miles based on local workforce from Alpine, El Centro, and surrounding areas,[5] and equipment delivery truck VMT are based on 85-mile one-way routes from Rancho Bernardo where equipment deliveries would originate.[6]

To provide the concrete for the substation, O&M building, and tracker foundations for both the Rugged and Tierra del Sol solar farms, a temporary concrete batch plant would be sited on the project site. The batch plant would involve material transfer and handling processes that would be the sources of fugitive $PM_{10}$ and $PM_{2.5}$ emissions. These material transfer and handling processes would include aggregate and sand delivery to ground sources, aggregate and sand transfer to conveyors, and aggregate and sand transfer to elevated storage. All these processes were assumed to be controlled with water sprays for which an efficiency of 70% was assumed (BAAQMD 2009). Emissions from transfer of cement and cement supplement to storage silos and the truck loading were assumed to be controlled by baghouses; thus, controlled $PM_{10}$ and $PM_{2.5}$ emission factors were used for these sources. The $PM_{10}$ and $PM_{2.5}$ emissions from the processing equipment were calculated using Section 11.12 (Concrete Batching) of EPA's *Compilation of Air Pollutant Emission Factors* (EPA 2006). The annual $PM_{10}$ and $PM_{2.5}$ emissions were calculated using the following equations for each transfer point and material:

$$\text{Process Rate (tons/year)} \times \text{Emission Factor (pound/ton)} \times (1 - \text{Control Efficiency, if applicable}) = \text{pounds/year}$$

The average daily $PM_{10}$ and $PM_{2.5}$ emissions were calculated by dividing the annual emission rate by the number of days of operation in each construction year.

The emissions associated with material hauling trucks used to bring concrete ingredients (e.g., sand, cement, and cement supplement) to the project site were estimated using emission factors derived

5 The average of the distances from Alpine and El Centro is 46 miles. This distance was reduced by 25% to reflect worker commute trips from local housing (temporary or permanent) for an average worker commute distance of 35 miles.

6 VMT = one-way miles × 2 × number of trips.

from EMFAC2011 as described above. Process rates for concrete and the ingredients, truck travel distances, and related information are found in Appendix A. Aggregate would be provided from locations on the Rugged project site. The batch plant would be powered by two diesel-powered generators, each nominally rated at 85 horsepower. The emissions from the two generators were calculated using emission and load factors obtained from the *CalEEMod User's Guide* (Environ 2011) assuming the use of typical off-road engines that would operate in 2014.

The project proponent has stated that the project is scheduled to commence construction in July 2014 and would be completed within approximately 12 months. Construction phases and associated durations were provided by the project proponent and include the following subphases:

- Mobilization (1 week)
- Site clearing, grubbing, and grinding (10 weeks)
- Grading and road construction (9 days)
- Underground electric/communications cable installation (17 weeks)
- Tracker installation (33 weeks)
- Substation construction (6 weeks)
- O&M building construction (10 weeks).

Project completion is anticipated in late June 2015. Details of the construction schedule including heavy construction equipment hours of operation and duration, worker trips, and equipment mix are included in Appendix A.

The equipment mix anticipated for construction activity was based on information provided by the applicant and best engineering judgment. The equipment mix is meant to represent a reasonably conservative estimate of construction activity. To account for dust control measures in the calculations, it was assumed that the active sites would be watered at least three times daily to comply with SDAPCD Rule 55 and PDF AQ-1, resulting in an approximately 61% reduction of particulate matter.

Table 7, Estimated Daily Maximum Construction Emissions, shows the estimated maximum daily construction emissions associated with the construction phase of the Proposed Project. The maximum daily emissions for each pollutant may occur during different phases of construction.

**Table 7**
**Estimated Daily Maximum Construction Emissions (pounds per day)**

| | VOC | $NO_x$ | CO | $SO_x$ | $PM_{10}$ | $PM_{2.5}$ |
|---|---|---|---|---|---|---|
| 2014 | 17.94 | 248.95 | 127.07 | 0.46 | 98.53 | 26.64 |
| 2015 | 14.26 | 177.05 | 107.48 | 0.38 | 26.09 | 9.97 |
| *Maximum Daily Emissions* | *17.94* | *248.95* | *127.07* | *0.46* | *98.53* | *26.64* |
| *Pollutant Threshold* | *75* | *250* | *550* | *250* | *100* | *55* |
| Threshold Exceeded? | No | No | No | No | No | No |

**Sources:** OFFROAD2007 (CARB 2006); OFFROAD2011 (CARB 2011a); EMFAC 2011 (CARB 2011b); EPA 2011. See Appendix A for complete results.

As shown, daily construction emissions would not exceed the thresholds for VOCs, $NO_x$, CO, $SO_x$, $PM_{10}$, or $PM_{2.5}$.

#### *4.2.1.3 Mitigation Measures and Design Considerations*

Impacts would be less than significant, and mitigation would not be required.

#### *4.2.1.4 Conclusions*

The emissions associated with construction would be temporary, lasting approximately 12 months. As shown in Table 7 above, daily construction emissions would not exceed the thresholds for VOCs, $NO_x$, CO, $SO_x$, $PM_{10}$, or $PM_{2.5}$. To ensure $PM_{10}$ emissions remain at a less-than-significant level during site preparation and road construction activities, project design features have been incorporated as part of the project as described in Section 1.2. Construction of the Proposed Project would result in a **less-than-significant impact**.

### 4.2.2 Operational Impacts

#### *4.2.2.1 Guideline for the Determination of Significance*

Based on Appendix G of the CEQA Guidelines, and the County *Guidelines for Determining Significance – Air Quality*, the proposed project would have a significant impact if it would:

- Violate any air quality standard or contribute substantially to an existing or projected air quality violation.

#### *4.2.2.2 Significance of Impacts Prior to Mitigation*

Operations of the project would produce VOC, $NO_x$, CO, $SO_x$, $PM_{10}$, and $PM_{2.5}$ emissions associated with employee vehicles, personnel transport vehicles, washing vehicles (heavy-duty diesel water trucks), and service trucks during operations and maintenance for the solar farm. Area source emissions generated from landscaping and natural gas use are not anticipated, as the O&M building and substation would not require natural gas consumption or landscaping during project operations.

The Proposed Project would marginally impact air quality through O&M vehicles frequenting the site during monitoring, tracker washing, inspection, and repair activities throughout the life of the project. EMFAC2011 was utilized to estimate daily emissions from proposed vehicular sources (see Appendix A). Trip distances were conservatively estimated for the model inputs for all O&M vehicles as follows: employee vehicles were assumed to originate from 35 miles away based on local workforce from Alpine, El Centro, and surrounding areas7; and O&M vehicles for the solar farm were assumed to conduct approximately 10 miles per day of maintenance activities per vehicle, and O&M vehicles would be stored on site.

The solar farm would be equipped with two emergency generators. The diesel-powered generators are each anticipated to be rated at 680 kW. Operational emissions would result from intermittent use of emergency generators for maintenance and testing purposes. Each generator would be run for testing and maintenance approximately 1 hour each week for a total of 50 hours per year. In the event of an electrical outage, the emergency generators would be expected to operate no more than 20 minutes to bring all the trackers into the stow mode position. The generator engines would meet the CARB/EPA standards for Tier 2 engines as required by the CARB Airborne Toxic Control Measure for new and in-use stationary diesel engines. The engines would also be required to use ultra-low-sulfur diesel fuel with a maximum sulfur content of 15 ppm by weight. The estimated emissions from the emergency generator engines are based on compliance with the Tier 2 engine standards and use of ultra-low-sulfur diesel fuel.

Table 8, Estimated Daily Maximum Operational Emissions, presents the maximum daily emissions associated with the operation of the proposed project.

**Table 8**
**Estimated Daily Maximum Operational Emissions (pounds per day)**

| | VOC | $NO_x$ | CO | $SO_x$ | $PM_{10}$ | $PM_{2.5}$ |
|---|---|---|---|---|---|---|
| *Solar Farm* | | | | | | |
| Employee Vehicles | 0.66 | 6.27 | 0.63 | 0.01 | 0.43 | 0.13 |
| Personnel Transport Vehicles | 0.01 | 0.09 | 0.01 | 0.00 | 0.01 | 0.00 |
| Washing Vehicles | 0.01 | 0.04 | 0.17 | 0.00 | 0.01 | 0.00 |
| Satellite Washing Vehicles | 0.01 | 0.09 | 0.01 | 0.00 | 0.01 | 0.00 |

7 The average of the distances from Alpine and El Centro is 46 miles. This distance was reduced by 25% to reflect employee commute trips from local housing for an average employee commute distance of 35 miles.

**Table 8**
**Estimated Daily Maximum Operational Emissions (pounds per day)**

| | VOC | $NO_x$ | CO | $SO_x$ | $PM_{10}$ | $PM_{2.5}$ |
|---|---|---|---|---|---|---|
| *Solar Farm* | | | | | | |
| Service Trucks | 0.00 | 0.05 | 0.01 | 0.00 | 0.00 | 0.00 |
| Emergency Generators | 1.02 | 19.30 | 11.01 | 0.02 | 0.63 | 0.62 |
| *Maximum Daily Emissions* | 1.71 | 25.84 | 11.84 | 0.03 | 1.09 | 0.75 |
| *Pollutant Threshold* | *75* | *250* | *550* | *250* | *100* | *55* |
| Threshold Exceeded? | No | No | No | No | No | No |

**Source:** EMFAC2011 (CARB 2011b). See Appendix A for complete results.

As shown, daily operational emissions would not exceed the thresholds for VOCs, $NO_x$, CO, $SO_x$, $PM_{10}$, or $PM_{2.5}$.

#### *4.2.2.3 Mitigation Measures and Design Considerations*

Impacts would be less than significant, and mitigation would not be required.

#### *4.2.2.4 Conclusions*

As shown in Table 8 above, daily operational emissions would not exceed the thresholds for VOCs, $NO_x$, CO, $SO_x$, $PM_{10}$, or $PM_{2.5}$. As such, operation of the proposed project would result in a **less-than-significant impact**.

## 4.3 Cumulatively Considerable Net Increase of Criteria Pollutants

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 SDAB is listed as nonattainment for the state and federal ambient air quality standards. The proposed project would have a cumulatively considerable impact if project-generated emissions would exceed thresholds for $PM_{10}$, $PM_{2.5}$, $NO_x$, and/or VOCs. If the proposed project does not exceed thresholds and is determined to have less-than-significant project-specific impacts, it 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 established thresholds. However, the project would be considered to have a cumulative impact only if the project's contribution accounts for a significant proportion of the cumulative total emissions.

Background ambient air quality, as measured at the monitoring stations maintained and operated by SDAPCD, measures the concentrations of pollutants from existing sources; therefore, past and present project impacts are included in the background ambient air quality data.

### Geographic Extent

The geographic extent for the analysis of cumulative impacts related to air quality includes the southeastern corner of the SDAB (San Diego County). Furthermore, the primary air quality impacts of the Proposed Project would occur during construction, since the operational impacts would result from limited vehicle trips for operations, maintenance, washing, and inspection, and would be substantially less than construction impacts. Due to the nonattainment status of the SDAB, the primary air pollutants of concern would be $NO_x$ and VOCs, which are ozone precursors, and $PM_{10}$ and $PM_{2.5}$. $NO_x$ and VOC are primarily emitted from motor vehicles and construction equipment, while $PM_{10}$ and $PM_{2.5}$ are emitted primarily as fugitive dust during construction. Because of the nature of ozone as a regional air pollutant, emissions from the entire geographic area for this cumulative impact analysis would tend to be important, although maximum ozone impacts generally occur downwind of the area in which the ozone precursors are released. $PM_{10}$ and $PM_{2.5}$ impacts, on the other hand, would tend to occur locally; thus, projects occurring in the same general area and in the same time period would tend to create cumulative air quality impacts.

### Existing Cumulative Conditions

Air quality management in the geographic area for the cumulative impact assessment is the responsibility of the SDAPCD. Existing levels of development in San Diego County have led to the nonattainment status for ozone with respect to the CAAQS and NAAQS, and for $PM_{10}$ and $PM_{2.5}$ with respect to the CAAQS. The nonattainment status is based on ambient air quality monitoring generally conducted in the urban portions of the County. No monitoring stations exist in the geographic area for the cumulative impact assessment, but air quality would generally be better than that in the urban areas in the western portion of the County due to the lack of major air pollutant sources. The air quality plans prepared by the SDAPCD reflect future growth under local development plans but are intended to reduce emissions countywide to levels that would comply with the NAAQS and CAAQS through implementation of new regulations at the local, state, and federal levels.

The separate guidelines of significance discussed below have been developed to respond to the following question from the state CEQA Guidelines Appendix G:

- The project will result in a cumulatively considerable net increase of any criteria pollutant for which the SDAB is nonattainment under an applicable federal or state ambient air quality standard (including emissions that exceed the significance thresholds for $O_3$ precursors listed in Table 6).

### 4.3.1 Construction Impacts

#### *4.3.1.1 Guidelines for the Determination of Significance*

Cumulatively considerable net increases during the construction phase would typically occur if two or more projects near each other are simultaneously under construction. The following guidelines for determining significance must be used for determining the cumulatively considerable net increases during the construction phase:

- A project that has a significant direct impact on air quality with regard to emissions of $PM_{10}$, $PM_{2.5}$, $NO_x$, and/or VOCs would also have a significant cumulatively considerable net increase.
- In the event direct impacts from a proposed project are less than significant, a project may still have a cumulatively considerable impact on air quality if the emissions of concern from the proposed project, in combination with the emissions of concern from other proposed projects or reasonably foreseeable future projects within a proximity relevant to the pollutants of concern, are in excess of the guidelines identified in Table 6.

#### *4.3.1.2 Significance of Impacts Prior to Mitigation*

As discussed Section 4.2.1, the proposed project would result in a temporary addition of pollutants to the local airshed caused by soil disturbance, fugitive dust emissions and combustion pollutants from on-site construction equipment, as well as from off-site trucks hauling construction materials. As shown in Table 8, emissions of all criteria pollutants, including $PM_{10}$, $PM_{2.5}$, $NO_x$, and/or VOCs, would be below the significance levels. Additionally, construction would be short-term (14 months), during which the majority of pollutants would be emitted and would not result in long-term construction-related emissions. Moreover, emissions of $PM_{10}$, $PM_{2.5}$, $NO_x$, and/or VOCs would be localized to the Proposed Project site during construction. Therefore, construction of the Proposed Project would not result in a cumulatively considerable net increase in criteria pollutants.

Similar to the Proposed Project, construction of cumulative projects simultaneously with the Proposed Project would result in a temporary addition of pollutants to the local airshed caused by soil disturbance and hauling activities, fugitive dust emissions, and combustion pollutants from on-site construction equipment, as well as from off-site trucks hauling construction materials and worker vehicular trips. Fugitive dust ($PM_{10}$ and $PM_{2.5}$) emissions would primarily result from site preparation activities. $NO_x$ and CO emissions would primarily result from the use of construction equipment and motor vehicles, the latter of which would generally be dispersed over a large area where the vehicles are traveling. The extent to which all reasonably foreseeable cumulative projects and the Proposed Project would result in significant cumulative impacts depends on their proximity and construction time schedules. The Proposed Project would be constructed from 2014 to 2015 and would be constructed concurrently with, and in proximity to, other land use and infrastructure development projects (e.g., wind and solar facilities). Additionally, the Proposed Project would be constructed as part of a larger solar development project which would include the Tierra del Sol, LanEast, and LanWest solar farms, collectively referred to as the Soitec Solar Development Project. The LanEast and LanWest solar farms would not be constructed concurrently with the Tierra del Sol solar farm and Rugged solar farm projects, but they would be constructed following the completion of these two projects.

However, the proposed Tierra del Sol solar farm would be constructed concurrently with several phases of the Rugged solar farm project. $PM_{10}$ emissions for the Proposed Project would not exceed the significance threshold, and project design features as described in Section 1.2 have been incorporated as part of project implementation to ensure fugitive dust emissions remain below the significance thresholds at the project level. Additionally, the Proposed Project would be required to comply with SDAPCD Rule 55 and County Code Section 87.428 regarding fugitive dust emissions. Additionally, compliance with the County Grading Ordinance would ensure dust control measures would be provided to reduce $PM_{10}$ and $PM_{2.5}$ emissions that may result during construction. The $NO_x$ emissions from the proposed project were less than significant, and project design features for $NO_x$ emissions would not substantially reduce those emissions from the proposed project. Moreover, when added to the $NO_x$ and $PM_{10}$ emissions associated with the Tierra del Sol solar farm, the cumulative emissions would exceed the $NO_x$ and $PM_{10}$ significance thresholds at various times throughput the construction period. Accordingly, generation of these criteria pollutant emissions, particularly those occurring simultaneously during various construction periods of the Tierra del Sol and Rugged solar farms, would result in a temporary significant cumulative impact to air quality.

#### *4.3.1.3 Mitigation Measures and Design Considerations*

Project impacts would be less than significant; however, in combination with construction emissions from the Rugged solar farm, the cumulative impact would be significant. No additional feasible mitigation measures are available to reduce the cumulative impact to less than significant.

#### *4.3.1.4 Conclusions*

Construction of the proposed project would not result in a cumulatively considerable net increase of $PM_{10}$, $PM_{2.5}$, $NO_x$, or VOCs.

### 4.3.2 Operational Impacts

#### *4.3.2.1 Guidelines for the Determination of Significance*

The guidelines for the consideration of operational cumulatively considerable net increases are treated differently due to the mobile nature of the emissions. The SDAB's RAQS, based on growth projections derived from the allowed general plan densities, are updated every 3 years by SDAPCD and lay out the programs for attaining the CAAQS and NAAQS for $O_3$ precursors. It is assumed that a project that conforms to the County General Plan, and does not have emissions exceeding the screening-level thresholds, will not create a cumulatively considerable net increase to $O_3$ since the emissions were accounted for in the RAQS.

The following guidelines for determining significance must be used for determining the cumulatively considerable net increases during the operational phase:

- A project that does not conform to the RAQS and/or has a significant direct impact on air quality with regard to operational emissions of $PM_{10}$, $PM_{2.5}$, $NO_x$, and/or VOCs would also have a significant cumulatively considerable net increase.
- Projects that cause road intersections to operate at or below a level of service E (analysis only required when the addition of peak-hour trips from the proposed project and the surrounding projects exceeds 2,000) and create a CO hotspot create a cumulatively considerable net increase of CO.

#### *4.3.2.2 Significance of Impacts Prior to Mitigation*

With regard to cumulative impacts associated with $O_3$ precursors, in general, if a project is consistent with the community and general plans, it has been accounted for in the $O_3$ attainment demonstration contained within the RAQS. As such, it would not cause a cumulatively significant impact on the ambient air quality for $O_3$. The Proposed Project site is currently designated Rural Lands with a permitted density of 1 dwelling unit per 80 acres (RL-80). The area is zoned General Rural (S92). The Proposed Project would, therefore, consist of a less intense land use than what is currently allowed under the County General Plan as no residential development is proposed. The Proposed Project would marginally impact air quality through O&M vehicles frequenting the site during monitoring, washing, inspection, and repair activities throughout the life of the project. As the project does not propose residential, commercial, or other growth-inducing uses that would contribute substantially to local population or employment growth and associated VMT on local roadways, the project's contribution to cumulative operational impacts due to motor vehicles would be minimal. No significant area source emissions generated from landscaping or natural gas use are anticipated, as the O&M

building and project substation would not require landscaping or natural gas for operational purposes. Therefore, as the Proposed Project does not represent a substantial increase in projected traffic over current conditions, emissions of $O_3$ precursors (VOCs and $NO_x$) would be well below the screening-level thresholds and would not result in a significant increase of $O_3$ precursors during operation. Thus, the Proposed Project would not result in a cumulatively significant impact on $O_3$ concentrations.

Additionally, consistent with the County's guidelines, analysis of potential CO hotspots would not be required for this project since the Proposed Project does not include uses that would significantly contribute to local population or employment growth or congestion on local roadways. The addition of O&M vehicles would not significantly contribute peak-hour trips in the project area or impact roadway intersections. Therefore, the Proposed Project would not have the potential to create a CO hotspot or a cumulatively considerable net increase of CO.

#### *4.3.2.3 Mitigation Measures and Design Considerations*

Mitigation would not be required.

#### *4.3.2.4 Conclusions*

Operation of the Proposed Project would not result in a cumulatively considerable net increase of $PM_{10}$, $PM_{2.5}$, $NO_x$, or VOCs, nor create a CO hotspot due to cumulative traffic impacts at road intersections.

## 4.4 Impacts to Sensitive Receptors

Air quality varies as a direct function of the amount of pollutants emitted into the atmosphere, the size and topography of the air basin, and the prevailing meteorological conditions. Air quality problems arise when the rate of pollutant emissions exceeds the rate of dispersion. Reduced visibility, eye irritation, and adverse health impacts upon sensitive receptors are the most serious hazards of existing air quality conditions in the area. Some land uses are considered more sensitive to changes in air quality than others, depending on the population groups and the activities involved. Air quality regulators typically define sensitive receptors as schools (preschool–12th grade), hospitals, resident care facilities, day-care centers, or other facilities that may house individuals with health conditions that would be adversely impacted by changes in air quality. However, for the purposes of CEQA analysis in the County, the definition of a sensitive receptor also includes residents. The two primary emissions of concern regarding health effects for land development projects are diesel-fired particulates and CO.

### 4.4.1 Construction Impacts

#### *4.4.1.1 Guidelines for the Determination of Significance*

A significant impact would result if:

- Project implementation will result in exposure to TACs resulting in a maximum incremental cancer risk greater than 1 in 1 million without application of Toxics-Best Available Control Technology (T-BACT) or a health hazard index greater than 1 would be deemed as having a potentially significant impact.

#### *4.4.1.2 Significance of Impacts Prior to Mitigation*

**Construction Equipment and Vehicles**

Project construction would result in emissions of diesel particulate matter (DPM) from heavy-duty construction equipment and trucks operating on the project site (e.g., water trucks). DPM is characterized as a TAC by CARB. The Office of Environmental Health Hazard Assessment (OEHHA) has identified carcinogenic and chronic noncarcinogenic effects from long-term (chronic) exposure, but it has not identified health effects due to short-term (acute) exposure to DPM. The nearest sensitive receptors consist of scattered residences located at various locations near the project site. The nearest sensitive receptor to the project site is located to the west, approximately 350 feet from the southern section of the project site.

Cancer risk is defined as the increase in lifetime probability (chance) of an individual developing cancer due to exposure to a carcinogenic compound, typically expressed as the increased probability in 1 million. The cancer risk from inhalation of a TAC is estimated by calculating the inhalation dose in units of milligrams/kilogram body weight per day based on an ambient concentration in units of micrograms per cubic meter ($\mu g/m^3$), breathing rate, and exposure period, and multiplying the dose by the inhalation cancer potency factor, expressed as (milligrams/kilogram body weight per day)$^{-1}$. Typically, cancer risks for residential receptors and similar sensitive receptors are estimated based on a lifetime (70 years) of continuous exposure; however, for the purposes of this analysis, a 1-year (up to 12 months) exposure scenario, corresponding to the approximate construction period for the solar project, was evaluated because the majority of all project-related DPM would cease following construction activities. It should be noted that construction activity would occur throughout the 765-acre project site; thus, sources of DPM emissions (e.g., heavy-duty construction equipment) would not be concentrated in any one area for the entire construction period.

Cancer risks are typically calculated for all carcinogenic TACs and summed to calculate the overall increase in cancer risk to an individual. The calculation procedure assumes that cancer risk is proportional to concentrations at any level of exposure and that risks from various TACs are additive. This is generally considered a conservative assumption at low doses and is consistent with the current OEHHA-recommended approach.

Noncancer health impact of an inhaled TAC is measured by the hazard quotient, which is the ratio of the ambient concentration of a TAC in units of $\mu g/m^3$ divided by the reference exposure level (REL), also in units of $\mu g/m^3$. The inhalation REL is the concentration at or below which no adverse health effects are anticipated. The REL is typically based on health effects to a particular target organ system, such as the respiratory system, liver, or central nervous system. Hazard quotients are then summed for each target organ system to obtain a hazard index.

To estimate the ambient concentrations of DPM resulting from construction activities at nearby sensitive receptors, a dispersion modeling analysis was performed using the Lakes Environmental SCREEN-View air quality dispersion model, Version 3.5.0 (Lakes Environmental 2011), which uses the EPA's SCREEN3 model.

The DPM emissions from diesel-powered construction equipment and on-site diesel-powered trucks that would be used during construction are provided in Appendix B. The total pounds of DPM emissions from these sources over the entire construction period were converted to pounds per year by dividing the total by 1.2. Because the sources of DPM would occur throughout the project site, a subset of the total construction DPM emissions was calculated based on the average daily acreage over which construction activity would occur during grading. The daily acreage will be variable depending on the activity (e.g., clear and grub, underground trenching, tracker installation. For the purpose of this analysis, the average daily acreage would be 5 acres; thus, a fraction of 5/765 was applied to the total construction DPM emissions. Total emissions of construction-related $PM_{10}$, as a surrogate for DPM, during the overall construction period were calculated and then converted to grams per second for use in the SCREEN3 model. An annualized 1-hour emission rate of $9.86 \times 10^{-5}$ grams per second (g/s) was calculated as follows:

$$1048.36 \text{ lb/year } PM_{10} \text{ during construction}$$

$$1048.36 \text{ lb/year} \times 5/765 \times 453.6 \text{ g/lb} \div 8760 \text{ hours/year} \div 3600 \text{ seconds/hour} = 9.86 \times 10^{-5} \text{ g/second}$$

The emissions from heavy-duty equipment and trucks are represented by a single volume source with an area of 5 acres. The following parameters were utilized in the SCREEN3 model to represent the sources of DPM emissions on the project site:

- Source type: volume
- Source height: 5 meters

- Initial vertical dimension: 1.16 meters (corresponding to a 5-meter release height divided by 4.3 per SCREEN3 guidance)
- Initial lateral dimension: 33.08 meters (corresponding to the side of a 5-acre site divided by 4.3 per SCREEN3 guidance)
- Receptor height: 2.0 meters
- Rural setting
- Simple terrain.

The default regulatory mixing height and anemometer height options were selected for the purposes of modeling. As noted above, the closest home is located within 350 feet (107 meters) of the project site.

The results of the SCREEN3 modeling are provided in Appendix B. SCREEN3 was run under Stability Class D (neutral, daytime condition). This condition is a likely worst-case (i.e., most stable for dispersion) daytime condition during which construction would occur. Accordingly, using the maximum modeled concentration would result in a conservative (i.e., health protective) estimate of the associated health effects. Per EPA guidance (EPA 1992), the maximum modeled 1-hour concentration was then multiplied by 0.1 to simulate the annual average concentration. The modeled annual average concentration at the maximally exposed individual (located 84 meters from the volume source) is shown in Table 9, Summary of Average DPM Concentrations – Construction Equipment and Trucks.

**Table 9**
**Summary of Average DPM Concentrations Construction Equipment and Trucks**

| Receptor | Modeled 1-hour Concentration μg/m$^3$ | Modeled Annual Concentration μg/m$^3$ |
|---|---|---|
| Maximally Exposed Individual – Residential | 0.0939 | 0.0094 |

**Source:** SCREEN3 Model results. See Appendix B for complete results.

The cancer risk calculations were performed by multiplying the predicted annual DPM concentrations from SCREEN3 by the appropriate risk values. The exposure and risk equations that are used to calculate the cancer risk at residential receptors are taken from the OEHHA manual for health risk assessments prepared under the Air Toxics Hot Spots program (OEHHA 2003). As noted, while the nearest sensitive receptor is located approximately 107 meters from the volume source, the maximum exposure would occur at 84 meters from the volume source representing the construction DPM emissions.

The potential exposure pathway for DPM includes inhalation only. Cancer risks were evaluated using the inhalation Cancer Potency Factor published by the OEHHA and CARB (CARB 2012). The cancer risks were calculated using the "derived (adjusted)" approach in the OEHHA risk assessment manual. The cancer potency factor for DPM is 1.1 per milligram per kilogram of body weight per day (1.1 $(mg/kg\text{-}day)^{-1}$). The potential exposure through other pathways (e.g., ingestion) requires substance and site-specific data, and the specific parameters for DPM are not known for these pathways.

The following equations were used to calculate the cancer risk due to inhalation using the modeled DPM concentrations:

Risk = Inhalation potency factor * Dose Inhalation (1)

*where:*

Inhalation potency factor = 1.1 $(mg/kg\text{-}day)^{-1}$ for DPM,

*and:*

Dose Inhalation = $C_{air}$*DBR*A*EF*ED*$10^{-6}$ / AT (2)

*where:*

$C_{air}$ = concentration of DPM in $\mu g/m^3$
DBR = breathing rate in liter per kilogram of body weight per day
A = inhalation absorption factor (1 for DPM)
EF = exposure frequency in days per year
ED = exposure duration in years
AT = averaging time period over which exposure is averaged in days (25,550 days for 70 years)

For the derived (adjusted) cancer risk calculation, the breathing rate is equal to the 80th percentile or 302 liters per kilogram of body weight per day (L/kg-day) per CARB and OEHHA guidance (CARB and OEHHA 2003).

Table 10, Summary of Maximum Modeled Cancer Risks – Construction Equipment and Trucks, shows the maximum modeled annual DPM concentration for the maximally exposed individual and the associated cancer risk. The cancer risk at a sensitive receptor is less than the County significance threshold of 1 in 1 million for cancer impacts.

**Table 10**
**Summary of Maximum Modeled Cancer Risks Construction Equipment and Trucks**

| Receptor | DPM Annual Concentration μg/m3 | Cancer Risk |
|---|---|---|
| Maximally Exposed Individual – Residential | 0. 0094 | 0.04 in 1 million |

**Source**: SCREEN3 Model results. See Appendix B for complete results.

In addition to the potential cancer risk, DPM has chronic (i.e., long-term) noncarcinogenic health impacts. The chronic hazard index was evaluated using the OEHHA/CARB inhalation RELs (CARB 2012). The chronic noncarcinogenic inhalation hazard index for construction activities was calculated by dividing the modeled annual average concentrations of DPM by its REL, which is 5 μg/m$^3$.

Table 11, Summary of Maximum Chronic Hazard Index – Construction Equipment and Trucks, shows the maximum modeled annual DPM concentration for the maximally exposed individual and the associated maximum chronic hazard index. The chronic hazard index at this receptor is less than the County significance threshold of 1.0 for noncarcinogenic health impacts.

**Table 11**
**Summary of Maximum Chronic Hazard Index Construction Equipment and Trucks**

| Receptor | DPM Concentration μg/m3 | Chronic Hazard Index |
|---|---|---|
| Maximally Exposed Individual – Residential | 0. 0094 | 0.0019 |

**Source:** SCREEN3 Model results. See Appendix B for complete results.

In summary, the maximum anticipated cancer risk associated with the Proposed Project is 0.04 in 1 million at maximally exposed sensitive receptors, based on a 1-year exposure scenario. The assessment also finds that the chronic hazard index for noncancer health impacts are well below 1.0 at the maximally exposed individual. As such, the exposure of project-related TAC emission impacts to sensitive receptors during construction of the Proposed Project would be less than significant.

### Batch Plant Generators

In addition to DPM emissions from diesel equipment and vehicles, the two diesel generators at the concrete batch plant would emit DPM when operating to power the batch plant. The nearest sensitive receptor to the batch plant is located to the northeast, approximately 3,165 feet from the batch plant.

Total emissions of engine exhaust $PM_{10}$, as a surrogate for DPM, during the overall construction period (including several additional months to provide concrete for the Tierra del Sol solar farm) were calculated and then converted to grams per second for use in the SCREEN3 model. The concrete batch plant would operate a total of 14 months (1.2 years) for both projects. An annualized 1-hour emission rate of $3.10 \times 10^{-3}$ grams per second (g/s) was calculated as follows:

$$258.82 \text{ lb } PM_{10} \text{ during construction} \div 1.2 \text{ years} = 215.68 \text{ lb/year}$$

$$215.68 \text{ lb/year} \times 453.6 \text{ g/lb} \div 8760 \text{ hours/year} \div 3600 \text{ seconds/hour} = 3.10 \times 10^{-3} \text{ g/second}$$

The following parameters were utilized in the SCREEN3 model to represent the point source for the generator stacks (one stack was used to represent the two generator stacks since they would be close to each other):

- Source type: point
- Stack height: 6 feet (estimated)
- Stack diameter: 2.5 inches (per Caterpillar specification for similar engine-generator)
- Exhaust temperature: 977°F (per Caterpillar specification for similar engine-generator)
- Exhaust flow rate: 509 actual cubic feet per minute (per Caterpillar specification for similar engine-generator)
- Receptor height: 2.0 meters
- Rural setting
- Simple terrain.

The default regulatory mixing height and anemometer height options were selected for the purposes of modeling. As noted above, the closest residence is located within 3,165 feet (965 meters) of the project site.

The results of the SCREEN3 modeling are provided in Appendix B. SCREEN3 was run under Stability Class D (neutral, daytime condition). This condition is a likely worst-case (i.e., most stable for dispersion) daytime condition during which operation of the batch plant generators would occur. Accordingly, using the maximum modeled concentration would result in a conservative (i.e., health protective) estimate of the associated health effects. Per EPA guidance (EPA 1992), the maximum modeled 1-hour concentration was then multiplied by 0.1 to simulate the annual average concentration. The modeled annual average concentration at the maximally exposed individual (located 965 meters from the batch plant) is shown in Table 12, Summary of Average DPM Concentrations – Concrete Batch Plant Generators.

**Table 12**
**Summary of Average DPM Concentrations Concrete Batch Plant Generators**

| Receptor | Modeled 1-hour Concentration μg/m³ | Modeled Annual Concentration μg/m³ |
|---|---|---|
| Maximally Exposed Individual – Residential | 0.4147 | 0.0415 |

**Source:** SCREEN3 Model results. See Appendix B for complete results.

The cancer risk calculations were performed by multiplying the predicted annual DPM concentrations from SCREEN3 by the appropriate risk values as described above for the construction health risk calculations. Table 13, Summary of Maximum Modeled Cancer Risks – Concrete Batch Plant Generators, shows the maximum modeled annual DPM concentration for the maximally exposed individual and the associated cancer risk. The cancer risk at a sensitive receptor is less than the County significance threshold of 1 in 1 million for cancer impacts.

**Table 13**
**Summary of Maximum Modeled Cancer Risks Concrete Batch Plant Generators**

| Receptor | DPM Annual Concentration μg/m³ | Cancer Risk |
|---|---|---|
| Maximally Exposed Individual – Residential | 0.0415 | 0.23 in 1 million |

**Source:** SCREEN3 Model results. See Appendix B for complete results.

While the sensitive receptors for the cancer risk due to construction equipment and trucks and to the batch plant generators are located in proximity to different portions of the project site, if the separate cancer risks were conservatively added together, they would be 0.27 in 1 million, which is less than the County significance threshold of 1 in 1 million for cancer impacts.

In addition to the potential cancer risk, DPM has chronic (i.e., long-term) noncarcinogenic health impacts. The chronic hazard index was calculated as described above for the construction health risk calculations. Table 14, Summary of Maximum Chronic Hazard Index – Concrete Batch Plant Generators, shows the maximum modeled annual DPM concentration for the maximally exposed individual and the associated maximum chronic hazard index. The chronic hazard index at this receptor is less than the County significance threshold of 1.0 for noncarcinogenic health impacts.

**Table 14**
**Summary of Maximum Chronic Hazard Index Concrete Batch Plant Generators**

| Receptor | DPM Concentration μg/m³ | Chronic Hazard Index |
|---|---|---|
| Maximally Exposed Individual – Residential | 0.0415 | 0.008 |

**Source:** SCREEN3 Model results. See Appendix B for complete results.

In summary, the maximum anticipated cancer risk associated with the project is no greater than 0.27 in 1 million at maximally exposed sensitive receptors. The assessment also finds that the chronic hazard index for noncancer health impacts are well below 1.0 at the maximally exposed individual. As such, the exposure of project-related TAC emission impacts to sensitive receptors during construction of the Proposed Project would be less than significant.

#### *4.4.1.3 Mitigation Measures and Design Considerations*

Mitigation would not be required.

#### *4.4.1.4 Conclusions*

Construction of the Proposed Project would not result in significant impacts to sensitive receptors.

### 4.4.2 Operational Impacts

#### *4.4.2.1 Guidelines for the Determination of Significance*

A significant impact would result if:

- The project places sensitive receptors near CO "hotspots" or creates CO "hotspots" near sensitive receptors.
- Project implementation will result in exposure to TACs resulting in a maximum incremental cancer risk greater than 1 in 1 million without application of Toxics-Best Available Control Technology (T-BACT) or a health hazard index greater than one would be deemed as having a potentially significant impact.

The potential for the project to create CO hotspots was discussed previously in Section 4.3.2.2. The project would not result in a significant impact with respect to this threshold.

In addition to impacts from criteria pollutants, project impacts may include emissions of pollutants identified by the state and federal government as TACs or hazardous air pollutants (HAPs). State law has established the framework for California's TAC identification and control program, which is generally more stringent than the federal program and is aimed at HAPs that are a problem in California. The state has formally identified more than 200 substances as TACs, including the federal HAPs, and is adopting appropriate control measures for sources of these TACs. As examples, TACs include acetaldehyde, benzene, 1,3-butadiene, carbon tetrachloride, hexavalent chromium, para-dichlorobenzene, formaldehyde, methylene chloride, perchloroethylene, and diesel particulate matter. Some of the TACs are groups of compounds that contain many individual substances (for example, copper compounds and polycyclic organic matter).

In San Diego County, APCD Rule 1210 implements the public notification and risk reduction requirements of state law, and requires facilities with high potential health risk levels to reduce health risks below significant risk levels (SDAPCD 1995b). In addition, Rule 1200 establishes acceptable risk levels and emission control requirements for new and modified facilities that may emit additional TACs (SDAPCD 1996). Under Rule 1200, permits to operate may not be issued when emissions of TACs result in an incremental cancer risk greater than 1 in 1 million without application of T-BACT, or an incremental cancer risk greater than 10 in 1 million with application of T-BACT, or a health hazard index (chronic and acute) greater than one (SDAPCD 1996). The human health risk analysis is based on the time, duration, and exposures expected. T-BACT will be determined on a case-by-case basis; however, examples of T-BACT include diesel particulate filters, catalytic converters, and selective catalytic reduction technology.

#### *4.4.2.2 Significance of Impacts Prior to Mitigation*

The nearest sensitive receptors consist of scattered residences located along the western and eastern limits of the project site. The nearest sensitive receptor is located to the west, approximately 350 feet from the proposed limits of disturbance. As the project would consist of construction of trackers and associated infrastructure for the procurement and delivery of renewable energy, the Proposed Project, by nature, would not generate a significant amount of TACs in the immediate area. Additionally, the project would not require the extensive use of diesel trucks during operation but would include employee commute vehicles, and limited use of personnel transport vehicles, washing vehicles, and a service truck. The only stationary sources of TACs associated with the project that would be subject to Rule 1200 would be the emergency generators. The emergency generators would emit diesel particulate matter, which CARB has designated as a TAC. They would be operated during routine testing and maintenance, typically for about 1 hour no more often than once a week, and during electrical outages. The emergency generators would be located at the substation, which is nearly 3,000 feet (0.6 mile) from the nearest sensitive receptor. Additionally, the emergency generators would be operated for a limited time, would meet the required emission rates for DPM at the time of installation, and must be demonstrated to meet the requirements of Rule 1200 before the SDAPCD can issue an Authority to Construct. As such, the exposure of project-related TAC emission impacts to sensitive receptors during operation of the Proposed Project would be less than significant.

#### *4.4.2.3 Mitigation Measures and Design Considerations*

Mitigation would not be required.

#### *4.4.2.4 Conclusions*

Operation of the Proposed Project would not result in significant impacts to sensitive receptors.

## 4.5 Odor Impacts

Odors are a form of air pollution that is most obvious to the general public. Odors can present significant problems for both the source and surrounding community. Although offensive odors seldom cause physical harm, they can be annoying and cause concern.

### 4.5.1 Guidelines for the Determination of Significance

Based on Appendix G of the CEQA Guidelines, and the County *Guidelines for Determining Significance – Air Quality*, the proposed project would have a significant impact if:

- The project, which is not an agricultural, commercial, or an industrial activity subject to SDAPCD standards, as a result of implementation, would either generate objectionable odors or place sensitive receptors next to existing objectionable odors, which would affect a considerable number of persons.

The State of California Health and Safety Code, Division 26, Part 4, Chapter 3, Section 41700 and SDAPCD Rule 51, commonly referred to as public nuisance law, prohibits emissions from any source whatsoever in such quantities of air contaminants or other material that cause injury, detriment, nuisance, or annoyance to the public health or damage to property. The potential for an operation to result in odor complaints from a "considerable" number of persons in the area will be considered to be a significant, adverse odor impact.

Projects required to obtain permits from SDAPCD are evaluated by SDAPCD staff for potential odor nuisance, and conditions may be applied (or control equipment required) where necessary to prevent occurrence of public nuisance.

Odor issues are very subjective by the nature of odors themselves and due to the fact that their measurements are difficult to quantify. As a result, this guideline is qualitative, and each project will be reviewed on an individual basis, focusing on the existing and potential surrounding uses and location of sensitive receptors.

### 4.5.2 Significance of Impacts Prior to Mitigation

#### *4.5.2.1 Construction*

Section 6318 of the San Diego County Zoning Ordinance requires that all commercial and industrial uses be operated so as not to emit matter causing unpleasant odors that are perceptible by the average person at or beyond any lot line of the lot containing said uses. Section 6318 goes on to further provide specific dilution standards that must be met "at or beyond any lot line of the lot containing the uses" (County of San Diego 1979). APCD Rule 51 (Public Nuisance) also prohibits emission of any material that causes nuisance to a considerable number of persons or endangers the comfort, health, or safety of any person. A project that proposes a use that would produce objectionable odors would be deemed to have a significant odor impact if it would affect a considerable number of off-site receptors. The nearest sensitive receptors consist of scattered residences located along the western and eastern limits of the project site. The nearest sensitive receptor is located to the west, approximately 350 feet from the proposed limits of disturbance.

Construction of Proposed Project components would result in the emission of diesel fumes and other odors typically associated with construction activities. These compounds would be emitted in varying amounts on the project site depending on where construction activities are occurring. Sensitive receptors located in the vicinity of the construction site may be affected. Odors are highest near the source and would quickly dissipate off site. Any odors associated with construction activities would be temporary and would cease upon project completion.

#### *4.5.2.2 Operations*

Land uses and industrial operations that are associated with odor complaints include agricultural uses, wastewater treatment plants, food processing plants, chemical plants, composting, refineries, landfills, dairies and fiberglass molding. The proposed solar farm development would not be associated with a land use that would generate objectionable odors within the project vicinity. As such, a solar farm development would not generate objectionable odors off-site, nor would significant odors be generated during O&M of the facility. Operations would consist of standard service and personnel vehicles which would visit the site regularly during inspection, maintenance, and washing activities. Thus, the impacts associated with odors would be less than significant.

### 4.5.3 Mitigation Measures and Design Considerations

No mitigation measures or design considerations would be required.

### 4.5.4 Conclusion

Although odor impacts are unlikely, the Proposed Project would be required to comply with the County odor policies enforced by SDAPCD, including Rule 51 in the event a nuisance complaint occurs, and County Code Sections 63.401 and 63.402, which prohibit nuisance odors and identify enforcement measures to reduce odor impacts to nearby receptors. Therefore, impacts associated with objectionable odors would be **less than significant**.

# 5.0 SUMMARY OF RECOMMENDED PROJECT DESIGN FEATURES, IMPACTS, AND MITIGATION MEASURES

All impacts identified under the proposed Rugged solar farm project would be **less than significant**.

The following project design features (PDFs) will be implemented as part of the project during construction activities:

**PDF AQ-1** To ensure the construction of the Proposed Project will not result in a significant impact relative to fugitive dust ($PM_{10}$) and to comply with County Code Section 87.428, the following will be implemented:

- The applicants would apply water as necessary to suppress fugitive dust during grubbing, clearing, grading, trenching, and soil compaction and/or apply a nontoxic soil binding agent to help with soil stabilization during construction. These measures will be applied to all active construction areas, unpaved access roads, parking areas, and staging areas as necessary.
- Sweepers and water trucks will be used to control dust and debris at public street access points.
- Internal construction roadways will be stabilized by paving, chip sealing or non-toxic chemicals after rough grading.
- Exposed stockpiles (e.g., dirt, sand) will be covered and/or watered or stabilized with nontoxic soil binders, tarps, fencing or other suppression methods as needed to control emissions.
- Traffic speeds on unpaved roads will be limited to 15 miles per hour (mph).
- All haul and dump trucks entering or leaving the site with soil or fill material will maintain at least 2 feet of freeboard, or cover loads of all haul and dump trucks securely.
- Disturbed areas should be reseeded with native plant hydroseed mix as soon as possible after disturbance, or covered with a non-toxic soil binding agent (Such as EP&A's Envirotac II and Rhinosnot Dust Control, Erosion Control and Soil Stabilization).

**PDF AQ-2** To reduce NOx and PM10 emissions associated with construction worker trips required during Proposed Project construction, the construction manager will implement a construction worker ridership program to encourage workers to carpool to and from the construction site to reduce single-occupancy vehicle trips by a minimum of 30%. The construction manager will log all daily construction worker trips using the San Diego iCommute program (SANDAG 2013) (accessed at http://www.icommutesd.com/) or similar program. The construction manager will notify all construction personnel of the program prior to the start of construction activities and will notify construction personnel of the iCommute program RideMatcher feature, or similar communication method, to ensure personnel can identify potential carpooling program participants. Trip data will be made readily available to County inspectors at the construction trailer on site during construction.

The following project design feature (PDF) will be implemented during project operation:

**PDF AQ-3** To ensure the operation of the Proposed Project will not result in a significant impact relative to fugitive dust ($PM_{10}$), the following will be implemented:

- Enforce a 15-mph speed limit on unpaved surfaces
- Provide any of the following or equally effective trackout/carryout and erosion control measures to minimize transfer of soil or other materials to public roads:
    - track-out grates or gravel beds at each egress point
    - wheel washing at each egress during muddy conditions
    - application of non-toxic, permeable soil binding agent; chemical soil stabilizers; geotextiles; mulching; and/or seeding annually.

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# APPENDIX A

***Criteria Pollutant Emission Estimates***

## Rugged Solar Farm Project
## Emissions Summary

***CONSTRUCTION***

**ROG**

| | 2014 Emissions (lbs/day) | | | | | | 2015 Emissions (lbs/day) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Activity** | **Jul** | **Aug** | **Sept** | **Oct** | **Nov** | **Dec** | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** |
| **Offroad Emissions** | | | | | | | | | | | | |
| Mobilization and Clean-Up | 0.35 | | | | | | | | | | | |
| Site Clearing/Grubbing/Grinding | 1.94 | 1.94 | 1.94 | | | | | | | | | |
| Grading/Road Construction | | | 4.70 | | | | | | | | | |
| Underground Electric/Communications Cable Installation | | | | 2.42 | 2.42 | 2.42 | 2.40 | | | | | |
| Tracker Installation | | 4.64 | 4.64 | 4.64 | 4.64 | 4.64 | 4.58 | 4.58 | 4.58 | 4.58 | | |
| Substation Construction | 0.91 | 0.91 | | | | | | | | | | |
| O&M Building Construction | | | | | 0.81 | 0.81 | 0.79 | 0.79 | | | | |
| **OFFROAD MONTHLY TOTAL (max daily)** | **2.85** | **6.57** | **9.34** | **7.06** | **7.87** | **7.87** | **7.76** | **5.37** | **4.58** | **4.58** | | |
| **Onroad Emissions** | **4.90** | **6.89** | **7.00** | **5.40** | **5.40** | **5.40** | **4.89** | **4.89** | **4.89** | **5.36** | **2.44** | **0.46** |
| **Concrete Batch Plant** | **1.60** | **1.60** | **1.60** | **1.60** | **1.60** | **1.60** | **1.60** | **1.60** | **1.60** | **1.60** | | |
| **MAX DAILY EMISSIONS** | **9.35** | **15.07** | **17.94** | **14.06** | **14.87** | **14.87** | **14.26** | **11.86** | **11.07** | **11.53** | **2.44** | **0.46** |

**CO**

| | 2014 Emissions (lbs/day) | | | | | | 2015 Emissions (lbs/day) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Activity** | **Jul** | **Aug** | **Sept** | **Oct** | **Nov** | **Dec** | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** |
| **Offroad Emissions** | | | | | | | | | | | | |
| Mobilization and Clean-Up | 3.75 | | | | | | | | | | | |
| Site Clearing/Grubbing/Grinding | 17.67 | 17.67 | 17.67 | | | | | | | | | |
| Grading/Road Construction | | | 34.06 | | | | | | | | | |
| Underground Electric/Communications Cable Installation | | | | 21.12 | 21.12 | 21.12 | 20.84 | | | | | |
| Tracker Installation | | 40.27 | 40.27 | 40.27 | 40.27 | 40.27 | 39.90 | 39.90 | 39.90 | 39.90 | | |
| Substation Construction | 8.34 | 8.34 | | | | | | | | | | |
| O&M Building Construction | | | | | 5.31 | 5.31 | 5.18 | 5.18 | | | | |
| **OFFROAD MONTHLY TOTAL (max daily)** | **26.01** | **57.94** | **74.33** | **61.40** | **66.71** | **66.71** | **65.92** | **45.08** | **39.90** | **39.90** | | |
| **Onroad Emissions** | **26.75** | **43.85** | **44.90** | **37.42** | **37.42** | **37.42** | **33.73** | **33.73** | **33.73** | **38.15** | **13.66** | **4.39** |
| **Concrete Batch Plant** | **7.84** | **7.84** | **7.84** | **7.84** | **7.84** | **7.84** | **7.84** | **7.84** | **7.84** | **7.84** | | |
| **MAX DAILY EMISSIONS** | **60.60** | **109.63** | **127.07** | **106.65** | **111.96** | **111.96** | **107.48** | **86.64** | **81.46** | **85.88** | **13.66** | **4.39** |

**Rugged Solar Farm Project**
**Emissions Summary**

## NOx

| | 2014 Emissions (lbs/day) | | | | | | 2015 Emissions (lbs/day) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Activity** | **Jul** | **Aug** | **Sept** | **Oct** | **Nov** | **Dec** | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** |
| | | | | | | | | | | | | |
| **Offroad Emissions** | | | | | | | | | | | | |
| Mobilization and Clean-Up | 4.22 | | | | | | | | | | | |
| Site Clearing/Grubbing/Grinding | 28.18 | 28.18 | 28.18 | | | | | | | | | |
| Grading/Road Construction | | | 68.47 | | | | | | | | | |
| Underground Electric/Communications Cable Installation | | | | 34.59 | 34.59 | 34.59 | 33.74 | | | | | |
| Tracker Installation | | 63.60 | 63.60 | 63.60 | 63.60 | 63.60 | 61.57 | 61.57 | 61.57 | 61.57 | | |
| Substation Construction | 12.33 | 12.33 | | | | | | | | | | |
| O&M Building Construction | | | | | 10.55 | 10.55 | 10.29 | 10.29 | | | | |
| **OFFROAD MONTHLY TOTAL (max daily)** | **40.51** | **91.78** | **132.07** | **98.19** | **108.74** | **108.74** | **105.59** | **71.85** | **61.57** | **61.57** | | |
| | | | | | | | | | | | | |
| **Onroad Emissions** | **94.42** | **105.36** | **105.46** | **68.94** | **68.94** | **68.94** | **60.03** | **60.03** | **60.03** | **60.48** | **43.50** | **0.44** |
| **Concrete Batch Plant** | **11.42** | **11.42** | **11.42** | **11.42** | **11.42** | **11.42** | **11.42** | **11.42** | **11.42** | **11.42** | | |
| **MAX DAILY EMISSIONS** | **146.35** | **208.56** | **248.95** | **178.55** | **189.10** | **189.10** | **177.05** | **143.31** | **133.02** | **133.46** | **43.50** | **0.44** |

## SOx

| | 2014 Emissions (lbs/day) | | | | | | 2015 Emissions (lbs/day) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Activity** | **Jul** | **Aug** | **Sept** | **Oct** | **Nov** | **Dec** | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** |
| | | | | | | | | | | | | |
| **Offroad Emissions** | | | | | | | | | | | | |
| Mobilization and Clean-Up | 0.01 | | | | | | | | | | | |
| Site Clearing/Grubbing/Grinding | 0.04 | 0.04 | 0.04 | | | | | | | | | |
| Grading/Road Construction | | | 0.08 | | | | | | | | | |
| Underground Electric/Communications Cable Installation | | | | 0.06 | 0.06 | 0.06 | 0.06 | | | | | |
| Tracker Installation | | 0.12 | 0.12 | 0.12 | 0.12 | 0.12 | 0.12 | 0.12 | 0.12 | 0.12 | | |
| Substation Construction | 0.02 | 0.02 | | | | | | | | | | |
| O&M Building Construction | | | | | 0.02 | 0.02 | 0.02 | 0.02 | | | | |
| **OFFROAD MONTHLY TOTAL (max daily)** | **0.06** | **0.16** | **0.20** | **0.18** | **0.19** | **0.19** | **0.19** | **0.14** | **0.12** | **0.12** | | |
| | | | | | | | | | | | | |
| **Onroad Emissions** | **0.20** | **0.24** | **0.24** | **0.17** | **0.17** | **0.17** | **0.17** | **0.17** | **0.17** | **0.18** | **0.11** | **0.01** |
| **Concrete Batch Plant** | **0.01** | **0.01** | **0.01** | **0.01** | **0.01** | **0.01** | **0.01** | **0.01** | **0.01** | **0.01** | | |
| **MAX DAILY EMISSIONS** | **0.27** | **0.42** | **0.46** | **0.36** | **0.38** | **0.38** | **0.38** | **0.32** | **0.31** | **0.32** | **0.11** | **0.01** |

## Rugged Solar Farm Project
## Emissions Summary

### PM10

| | 2014 Emissions (lbs/day) | | | | | | 2015 Emissions (lbs/day) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Activity** | **Jul** | **Aug** | **Sept** | **Oct** | **Nov** | **Dec** | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** |
| | | | | | | | | | | | | |
| **Offroad Emissions** | | | | | | | | | | | | |
| Mobilization and Clean-Up | 0.29 | | | | | | | | | | | |
| Site Clearing/Grubbing/Grinding | 1.32 | 1.32 | 1.32 | | | | | | | | | |
| Grading/Road Construction | | | 3.24 | | | | | | | | | |
| Underground Electric/Communications Cable Installation | | | | 1.70 | 1.70 | 1.70 | 1.70 | | | | | |
| Tracker Installation | | 3.34 | 3.34 | 3.34 | 3.34 | 3.34 | 3.25 | 3.25 | 3.25 | 3.25 | | |
| Substation Construction | 0.63 | 0.63 | | | | | | | | | | |
| O&M Building Construction | | | | | 0.56 | 0.56 | 0.55 | 0.55 | | | | |
| **OFFROAD MONTHLY TOTAL (max daily)** | **1.95** | **4.66** | **6.58** | **5.04** | **5.61** | **5.61** | **5.50** | **3.80** | **3.25** | **3.25** | | |
| | | | | | | | | | | | | |
| **Onroad Emissions** | **3.66** | **4.96** | **5.02** | **3.97** | **3.97** | **3.97** | **3.68** | **3.68** | **3.68** | **3.98** | **2.01** | **0.30** |
| **Fugitive Dust** | **67.08** | **67.08** | **70.02** | | | | | | | | | |
| **Concrete Batch Plant** | **16.91** | **16.91** | **16.91** | **16.91** | **16.91** | **16.91** | **16.91** | **16.91** | **16.91** | **16.91** | | |
| **MAX DAILY EMISSIONS** | **89.60** | **93.61** | **98.53** | **25.93** | **26.49** | **26.49** | **26.09** | **24.39** | **23.84** | **24.14** | **2.01** | **0.30** |

### PM2.5

| | 2014 Emissions (lbs/day) | | | | | | 2015 Emissions (lbs/day) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Activity** | **Jul** | **Aug** | **Sept** | **Oct** | **Nov** | **Dec** | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** |
| | | | | | | | | | | | | |
| **Offroad Emissions** | | | | | | | | | | | | |
| Mobilization and Clean-Up | 0.26 | | | | | | | | | | | |
| Site Clearing/Grubbing/Grinding | 1.21 | 1.21 | 1.21 | | | | | | | | | |
| Grading/Road Construction | | | 2.98 | | | | | | | | | |
| Underground Electric/Communications Cable Installation | | | | 1.56 | 1.56 | 1.56 | 1.53 | | | | | |
| Tracker Installation | | 3.07 | 3.07 | 3.07 | 3.07 | 3.07 | 2.99 | 2.99 | 2.99 | 2.99 | | |
| Substation Construction | 0.58 | 0.58 | | | | | | | | | | |
| O&M Building Construction | | | | | 0.52 | 0.52 | 0.51 | 0.51 | | | | |
| **OFFROAD MONTHLY TOTAL (max daily)** | **1.79** | **4.29** | **6.05** | **4.64** | **5.16** | **5.16** | **5.02** | **3.50** | **2.99** | **2.99** | | |
| | | | | | | | | | | | | |
| **Onroad Emissions** | **2.18** | **2.68** | **2.70** | **1.96** | **1.96** | **1.96** | **1.68** | **1.68** | **1.68** | **1.78** | **1.02** | **0.09** |
| **Fugitive Dust** | **14.01** | **14.01** | **14.62** | | | | | | | | | |
| **Concrete Batch Plant** | **3.26** | **3.26** | **3.26** | **3.26** | **3.26** | **3.26** | **3.26** | **3.26** | **3.26** | **3.26** | | |
| **MAX DAILY EMISSIONS** | **21.24** | **24.24** | **26.64** | **9.86** | **10.38** | **10.38** | **9.97** | **8.44** | **7.94** | **8.03** | **1.02** | **0.09** |

## Rugged Solar Farm Project
## Emissions Summary

### CO2

| Activity | 2014 Emissions (tons/yr) | | 2015 Emissions (tons/yr) |
|---|---|---|---|
| | | | |
| **Offroad Emissions** | | | |
| Mobilization and Clean Up | 2.35 | | — |
| Site Clearing/Grubbing/Grinding | 112.02 | | — |
| Grading/Road Construction | 34.41 | | — |
| Underground Electric/Communications Cable Installation | 200.12 | | 56.44 |
| Tracker Installation | 613.99 | | 512.59 |
| Substation Construction | 35.70 | | — |
| O&M Building Construction | 20.79 | | 22.23 |
| **OFFROAD ANNUAL TOTAL** | **1,019.37** | | **591.26** |
| **Onroad Emissions** | **1,544.18** | | **1,097.20** |
| **Concrete Batch Plant** | **69.37** | | **104.34** |
| **ANNUAL EMISSIONS** | **2,632.91** | | **1,792.80** |

### *OPERATION*

| Vehicle Type | ROG | CO | NOx | SOx | PM10 | PM2.5 |
|---|---|---|---|---|---|---|
| *Solar Farm* | | | | | | |
| Employee Vehicles | 0.66 | 6.27 | 0.63 | 0.01 | 0.43 | 0.13 |
| Personnel Transport Vehicles | 0.01 | 0.09 | 0.01 | 0.00 | 0.01 | 0.00 |
| Washing Vehicles | 0.01 | 0.04 | 0.17 | 0.00 | 0.01 | 0.00 |
| Satellite Washing Vehicles | 0.01 | 0.09 | 0.01 | 0.00 | 0.01 | 0.00 |
| Service Trucks | 0.00 | 0.05 | 0.01 | 0.00 | 0.00 | 0.00 |
| Emergency Generators | 1.02 | 19.30 | 11.01 | 0.02 | 0.63 | 0.62 |
| **Maximum Daily Emissions** | **1.71** | **25.84** | **11.83** | **0.03** | **1.08** | **0.76** |

Notes:
1. Emissions per month reflect worst-case daily emissions accounting for construction phases occurring concurrently.

Concrete Plant PM10 and PM2.5 constants for truck mix emissions

$k\ (PM_{10}) =$ 0.32

$k\ (PM_{2.5}) =$ 0.048 15%

## Rugged Solar Farm Project
## Off Road Equipment Emissions

**2014 EMISSIONS**

| Equipment | # of Units | Hrs/Day | Duration (Days) | Category | 2014 Emissions (lb/day) | | | | | | | 2014 Emissions (tons/year) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | ROG | CO | NOx | SOx | PM10 | PM2.5 | CO2 | ROG | CO | NOx | SOx | PM10 | PM2.5 | CO2 |
| ***Mobilization and Clean-Up*** | | | | | | | | | | | | | | | | | | |
| Tractor/Loader/Backhoes | 5 | 2 | 7 | Off-Road | 0.35 | 3.75 | 4.22 | 0.01 | 0.29 | 0.26 | 671.29 | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 2.35 |
| | | | | **PHASE SUBTOTAL** | **0.35** | **3.75** | **4.22** | **0.01** | **0.29** | **0.26** | **671.29** | **0.00** | **0.01** | **0.01** | **0.00** | **0.00** | **0.00** | **2.35** |
| ***Site Clearing/Grubbing/Grinding*** | | | | | | | | | | | | | | | | | | |
| Crawler Tractors | 2 | 8 | 60 | Off-Road | 1.35 | 9.21 | 19.46 | 0.02 | 0.94 | 0.86 | 1822.00 | 0.04 | 0.28 | 0.58 | 0.00 | 0.03 | 0.03 | 54.66 |
| Excavators | 2 | 8 | 60 | Off-Road | 0.59 | 8.46 | 8.72 | 0.02 | 0.38 | 0.35 | 1912.02 | 0.02 | 0.25 | 0.26 | 0.00 | 0.01 | 0.01 | 57.36 |
| | | | | **PHASE SUBTOTAL** | **1.94** | **17.67** | **28.18** | **0.04** | **1.32** | **1.21** | **3734.02** | **0.06** | **0.53** | **0.85** | **0.00** | **0.04** | **0.04** | **112.02** |
| ***Grading/Road Construction*** | | | | | | | | | | | | | | | | | | |
| Tractor/Loader/Backhoes | 3 | 8 | 9 | Off-Road | 0.85 | 9.00 | 10.14 | 0.02 | 0.69 | 0.63 | 1611.10 | 0.00 | 0.04 | 0.05 | 0.00 | 0.00 | 0.00 | 7.25 |
| Crawler Tractors | 2 | 8 | 9 | Off-Road | 1.35 | 9.21 | 19.46 | 0.02 | 0.94 | 0.86 | 1822.00 | 0.01 | 0.04 | 0.09 | 0.00 | 0.00 | 0.00 | 8.20 |
| Scrapers | 2 | 8 | 9 | Off-Road | 2.51 | 15.85 | 38.87 | 0.04 | 1.61 | 1.48 | 4212.75 | 0.01 | 0.07 | 0.17 | 0.00 | 0.01 | 0.01 | 18.96 |
| | | | | **PHASE SUBTOTAL** | **4.70** | **34.06** | **68.47** | **0.08** | **3.24** | **2.98** | **7645.85** | **0.02** | **0.15** | **0.31** | **0.00** | **0.01** | **0.01** | **34.41** |
| ***Underground Electric/Communications Cable Installation*** | | | | | | | | | | | | | | | | | | |
| Bore/Drill Rigs | 1 | 8 | 78 | Off-Road | 0.36 | 3.98 | 6.57 | 0.01 | 0.25 | 0.23 | 1293.28 | 0.01 | 0.16 | 0.26 | 0.00 | 0.01 | 0.01 | 50.44 |
| Cranes | 1 | 8 | 78 | Off-Road | 0.60 | 3.54 | 8.42 | 0.01 | 0.40 | 0.37 | 999.10 | 0.02 | 0.14 | 0.33 | 0.00 | 0.02 | 0.01 | 38.96 |
| Excavators | 1 | 8 | 78 | Off-Road | 0.30 | 4.23 | 4.36 | 0.01 | 0.19 | 0.17 | 956.01 | 0.01 | 0.16 | 0.17 | 0.00 | 0.01 | 0.01 | 37.28 |
| Forklifts | 1 | 8 | 78 | Off-Road | 0.21 | 1.77 | 2.13 | 0.00 | 0.16 | 0.15 | 434.78 | 0.01 | 0.07 | 0.08 | 0.00 | 0.01 | 0.01 | 16.96 |
| Crawler Tractors | 1 | 8 | 78 | Off-Road | 0.67 | 4.61 | 9.73 | 0.01 | 0.47 | 0.43 | 911.00 | 0.03 | 0.18 | 0.38 | 0.00 | 0.02 | 0.02 | 35.53 |
| Tractor/Loader/Backhoes | 1 | 8 | 78 | Off-Road | 0.28 | 3.00 | 3.38 | 0.01 | 0.23 | 0.21 | 537.03 | 0.01 | 0.12 | 0.13 | 0.00 | 0.01 | 0.01 | 20.94 |
| | | | | **PHASE SUBTOTAL** | **2.42** | **21.12** | **34.59** | **0.06** | **1.70** | **1.56** | **5131.20** | **0.09** | **0.82** | **1.35** | **0.00** | **0.07** | **0.06** | **200.12** |
| ***Tracker Installation*** | | | | | | | | | | | | | | | | | | |
| Skid Steer Loader | 1 | 6 | 109 | Off-Road | 0.09 | 1.36 | 1.30 | 0.00 | 0.08 | 0.07 | 181.50 | 0.01 | 0.07 | 0.07 | 0.00 | 0.00 | 0.00 | 9.89 |
| Bore/Drill Rigs | 4 | 8 | 109 | Off-Road | 1.45 | 15.92 | 26.28 | 0.05 | 0.99 | 0.91 | 5173.12 | 0.08 | 0.87 | 1.43 | 0.00 | 0.05 | 0.05 | 281.94 |
| Cranes | 2 | 8 | 109 | Off-Road | 1.20 | 7.08 | 16.84 | 0.02 | 0.80 | 0.74 | 1998.19 | 0.07 | 0.39 | 0.92 | 0.00 | 0.04 | 0.04 | 108.90 |
| Module Suction Lifters | 6 | 8 | 109 | Off-Road | 1.26 | 10.61 | 12.79 | 0.03 | 0.98 | 0.90 | 2608.65 | 0.07 | 0.58 | 0.70 | 0.00 | 0.05 | 0.05 | 142.17 |
| Forklifts | 3 | 8 | 109 | Off-Road | 0.63 | 5.31 | 6.40 | 0.01 | 0.49 | 0.45 | 1304.33 | 0.03 | 0.29 | 0.35 | 0.00 | 0.03 | 0.02 | 71.09 |
| | | | | **PHASE SUBTOTAL** | **4.64** | **40.27** | **63.60** | **0.12** | **3.34** | **3.07** | **11265.79** | **0.25** | **2.19** | **3.47** | **0.01** | **0.18** | **0.17** | **613.99** |
| ***Substation Construction*** | | | | | | | | | | | | | | | | | | |
| Cranes | 1 | 6 | 35 | Off-Road | 0.45 | 2.66 | 6.31 | 0.01 | 0.30 | 0.28 | 749.32 | 0.01 | 0.05 | 0.11 | 0.00 | 0.01 | 0.00 | 13.11 |
| Aerial Lifts | 1 | 4 | 35 | Off-Road | 0.03 | 0.74 | 0.62 | 0.00 | 0.03 | 0.03 | 138.76 | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 2.43 |
| Excavators | 1 | 6 | 35 | Off-Road | 0.22 | 3.17 | 3.27 | 0.01 | 0.14 | 0.13 | 717.01 | 0.00 | 0.06 | 0.06 | 0.00 | 0.00 | 0.00 | 12.55 |
| Forklifts | 1 | 8 | 35 | Off-Road | 0.21 | 1.77 | 2.13 | 0.00 | 0.16 | 0.15 | 434.78 | 0.00 | 0.03 | 0.04 | 0.00 | 0.00 | 0.00 | 7.61 |
| | | | | **PHASE SUBTOTAL** | **0.91** | **8.34** | **12.33** | **0.02** | **0.63** | **0.58** | **2,039.87** | **0.02** | **0.15** | **0.22** | **0.00** | **0.01** | **0.01** | **35.70** |
| ***O&M Building Construction*** | | | | | | | | | | | | | | | | | | |
| Cranes | 1 | 8 | 29 | Off-Road | 0.60 | 3.54 | 8.42 | 0.01 | 0.40 | 0.37 | 999.10 | 0.01 | 0.05 | 0.12 | 0.00 | 0.01 | 0.01 | 14.49 |
| Forklifts | 1 | 8 | 29 | Off-Road | 0.21 | 1.77 | 2.13 | 0.00 | 0.16 | 0.15 | 434.78 | 0.00 | 0.03 | 0.03 | 0.00 | 0.00 | 0.00 | 6.30 |
| | | | | **PHASE SUBTOTAL** | **0.81** | **5.31** | **10.55** | **0.02** | **0.56** | **0.52** | **1433.87** | **0.01** | **0.08** | **0.15** | **0.00** | **0.01** | **0.01** | **20.79** |
| | | | | | | | | | | | **2014 TOTALS** | **0.46** | **3.94** | **6.35** | **0.01** | **0.32** | **0.30** | **1019.37** |

## 2015 EMISSIONS

| Equipment | # of Units | Hrs/Day | Duration (Days) | Category | 2015 Emissions (lb/day) | | | | | | | 2015 Emissions (tons/year) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | ROG | CO | NOx | SOx | PM10 | PM2.5 | CO2 | ROG | CO | NOx | SOx | PM10 | PM2.5 | CO2 |
| ***Underground Electric/Communications Cable Installation*** | | | | | | | | | | | | | | | | | | |
| Bore/Drill Rigs | 1 | 8 | 22 | Off-Road | 0.36 | 3.97 | 6.35 | 0.01 | 0.24 | 0.22 | 1293.25 | 0.00 | 0.04 | 0.07 | 0.00 | 0.00 | 0.00 | 14.23 |
| Cranes | 1 | 8 | 22 | Off-Road | 0.59 | 3.42 | 8.24 | 0.01 | 0.39 | 0.36 | 999.10 | 0.01 | 0.04 | 0.09 | 0.00 | 0.00 | 0.00 | 10.99 |
| Excavators | 1 | 8 | 22 | Off-Road | 0.29 | 4.19 | 4.20 | 0.01 | 0.18 | 0.17 | 956.01 | 0.00 | 0.05 | 0.05 | 0.00 | 0.00 | 0.00 | 10.52 |
| Forklifts | 1 | 8 | 22 | Off-Road | 0.20 | 1.76 | 2.05 | 0.00 | 0.16 | 0.14 | 434.78 | 0.00 | 0.02 | 0.02 | 0.00 | 0.00 | 0.00 | 4.78 |
| Crawler Tractors | 1 | 8 | 22 | Off-Road | 0.67 | 4.51 | 9.61 | 0.01 | 0.47 | 0.43 | 911.00 | 0.01 | 0.05 | 0.11 | 0.00 | 0.01 | 0.00 | 10.02 |
| Tractor/Loader/Backhoes | 1 | 8 | 22 | Off-Road | 0.28 | 2.98 | 3.29 | 0.01 | 0.22 | 0.20 | 537.03 | 0.00 | 0.03 | 0.04 | 0.00 | 0.00 | 0.00 | 5.91 |
| | | | | **PHASE SUBTOTAL** | **2.40** | **20.84** | **33.74** | **0.06** | **1.66** | **1.53** | **5131.16** | **0.03** | **0.23** | **0.37** | **0.00** | **0.02** | **0.02** | **56.44** |
| ***Tracker Installation*** | | | | | | | | | | | | | | | | | | |
| Skid Steer Loader | 1 | 6 | 91 | Off-Road | 0.09 | 1.33 | 1.24 | 0.00 | 0.07 | 0.07 | 181.50 | 0.00 | 0.06 | 0.06 | 0.00 | 0.00 | 0.00 | 8.26 |
| Bore/Drill Rigs | 4 | 8 | 91 | Off-Road | 1.45 | 15.89 | 25.41 | 0.05 | 0.96 | 0.88 | 5173.00 | 0.07 | 0.72 | 1.16 | 0.00 | 0.04 | 0.04 | 235.37 |
| Cranes | 2 | 8 | 91 | Off-Road | 1.17 | 6.85 | 16.47 | 0.02 | 0.79 | 0.72 | 1998.19 | 0.05 | 0.31 | 0.75 | 0.00 | 0.04 | 0.03 | 90.92 |
| Module Suction Lifters | 6 | 8 | 91 | Off-Road | 1.25 | 10.56 | 12.29 | 0.03 | 0.96 | 0.88 | 2608.66 | 0.06 | 0.48 | 0.56 | 0.00 | 0.04 | 0.04 | 118.69 |
| Forklifts | 3 | 8 | 91 | Off-Road | 0.61 | 5.27 | 6.15 | 0.01 | 0.47 | 0.43 | 1304.33 | 0.03 | 0.24 | 0.28 | 0.00 | 0.02 | 0.02 | 59.35 |
| | | | | **PHASE SUBTOTAL** | **4.58** | **39.90** | **61.57** | **0.12** | **3.25** | **2.99** | **11265.67** | **0.21** | **1.82** | **2.80** | **0.01** | **0.15** | **0.14** | **512.59** |
| ***O&M Building Construction*** | | | | | | | | | | | | | | | | | | |
| Cranes | 1 | 8 | 31 | Off-Road | 0.59 | 3.42 | 8.24 | 0.01 | 0.39 | 0.36 | 999.10 | 0.01 | 0.05 | 0.13 | 0.00 | 0.01 | 0.01 | 15.49 |
| Forklifts | 1 | 8 | 31 | Off-Road | 0.20 | 1.76 | 2.05 | 0.00 | 0.16 | 0.14 | 434.78 | 0.00 | 0.03 | 0.03 | 0.00 | 0.00 | 0.00 | 6.74 |
| | | | | **PHASE SUBTOTAL** | **0.79** | **5.18** | **10.29** | **0.02** | **0.55** | **0.51** | **1433.87** | **0.01** | **0.08** | **0.16** | **0.00** | **0.01** | **0.01** | **22.23** |
| | | | | | | | | | | | **2015 TOTALS** | **0.25** | **2.12** | **3.33** | **0.01** | **0.17** | **0.16** | **591.26** |

Source (Equipment Specs): Soitec. 2013 Tierra del Sol Solar Farm - Construction Schedule and Equipment. January 2013.
1. Assumed module suction lifter and tracker lift beam would generate comparable emissions to forklift
2. Assumed bore/drill rig would generate comparable emissions to truck-mounted auger used during pole installation

| | | |
|---|---|---|
| Equipment PM10 | 994.93 | pounds |
| Water and Dump Trucks | 53.43 | pounds |
| Total DPM | 1048.36 | pounds |
| Time Period | 12 | months |
| | 1.0 | years |
| | 1048.36 | pounds/yr |
| | 6.85 | pounds (for 5 acres) |
| | 9.86E-05 | g/sec |

## Rugged Solar Farm Project
## Off-Road Equipment Emission Rates

| Equipment | Category | 2014 Emission Rates (lb/hr) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | ROG | CO | NOx | SOx | PM10 | PM2.5[1] | CO2 |
| ***Mobilization/Site Clearing/Grubbing/Grinding/Grading*** | | | | | | | | |
| Tractor/Loader/Backhoes | Off-Road | 0.035 | 0.375 | 0.422 | 0.001 | 0.029 | 0.026 | 67.129 |
| Crawler Tractors | Off-Road | 0.084 | 0.576 | 1.216 | 0.001 | 0.059 | 0.054 | 113.875 |
| Excavators | Off-Road | 0.037 | 0.529 | 0.545 | 0.001 | 0.024 | 0.022 | 119.501 |
| Scrapers | Off-Road | 0.157 | 0.990 | 2.429 | 0.003 | 0.101 | 0.093 | 263.297 |
| ***Underground Electric/Communications Cable Installation*** | | | | | | | | |
| Bore/Drill Rigs | Off-Road | 0.045 | 0.497 | 0.821 | 0.002 | 0.031 | 0.029 | 161.660 |
| Cranes | Off-Road | 0.075 | 0.443 | 1.052 | 0.001 | 0.050 | 0.046 | 124.887 |
| Excavators | Off-Road | 0.037 | 0.529 | 0.545 | 0.001 | 0.024 | 0.022 | 119.501 |
| Forklifts | Off-Road | 0.026 | 0.221 | 0.267 | 0.001 | 0.020 | 0.019 | 54.347 |
| Crawler Tractors | Off-Road | 0.084 | 0.576 | 1.216 | 0.001 | 0.059 | 0.054 | 113.875 |
| Tractor/Loader/Backhoes | Off-Road | 0.035 | 0.375 | 0.422 | 0.001 | 0.029 | 0.026 | 67.129 |
| ***Tracker Installation*** | | | | | | | | |
| Skid Steer Loaders | Off-Road | 0.016 | 0.226 | 0.217 | 0.000 | 0.013 | 0.012 | 30.249 |
| Bore/Drill Rigs | Off-Road | 0.045 | 0.497 | 0.821 | 0.002 | 0.031 | 0.029 | 161.660 |
| Cranes | Off-Road | 0.075 | 0.443 | 1.052 | 0.001 | 0.050 | 0.046 | 124.887 |
| Module Suction Lifters[1] | Off-Road | 0.026 | 0.221 | 0.267 | 0.001 | 0.020 | 0.019 | 54.347 |
| Forklifts | Off-Road | 0.026 | 0.221 | 0.267 | 0.001 | 0.020 | 0.019 | 54.347 |
| ***Substation Construction*** | | | | | | | | |
| Cranes | Off-Road | 0.075 | 0.443 | 1.052 | 0.001 | 0.050 | 0.046 | 124.887 |
| Aerial Lifts | Off-Road | 0.008 | 0.186 | 0.155 | 0.000 | 0.007 | 0.006 | 34.691 |
| Excavators | Off-Road | 0.037 | 0.529 | 0.545 | 0.001 | 0.024 | 0.022 | 119.501 |
| Forklifts | Off-Road | 0.026 | 0.221 | 0.267 | 0.001 | 0.020 | 0.019 | 54.347 |
| ***O&M Building Construction*** | | | | | | | | |
| Cranes | Off-Road | 0.075 | 0.443 | 1.052 | 0.001 | 0.050 | 0.046 | 124.887 |
| Forklifts | Off-Road | 0.026 | 0.221 | 0.267 | 0.001 | 0.020 | 0.019 | 54.347 |

Source (Emission Factors): OFFROAD2011 - ROG, NOx, PM10; OFFROAD2007 - CO, SOx, CO2.

PM2.5 fraction = 92% of PM10 (http://www.arb.ca.gov/ei/speciate/pmsize_07242008.xls for "diesel vehicle exhaust")

## Rugged Solar Farm Project
## Fugitive Dust Emissions

| Phase | Max. Daily Disturbance (acres) | PM10 Emissions (lb/day)[1,2,3] | PM2.5 Emissions (lb/day)[4] |
|---|---|---|---|
| | | | |
| Site Clearing/Grubbing/Grinding | 8.6 | 67.08 | 14.01 |
| Grading/Road Construction | 4.7 | 70.02 | 14.62 |

1. Utilizes emission factor of 20.0 pounds PM10 per acre per day per SMAQMD Road Construction Emissions Model Version 7.1.3.
2. Utilizes emission factor of 38.2 pounds PM10 per acre per day ("worst case conditions"), per URBEMIS2007 Software User's Guide, Appendix A, Table A-4.
3. 3x daily watering results in a 61% decrease in particulate matter, per URBEMIS default.
4. PM2.5 emissions are 20.88% of PM10 emissions for construction dust, per URBEMIS default.

## Rugged Solar Farm Project
## Paved Road Fugitive Dust Emission Factors

| Vehicle Type | sL ($g/m^2$) | Average Weight (tons) | PM10 Emission Factor (lb/VMT) | PM2.5 Emission Factor (lb/VMT) |
|---|---|---|---|---|
| | | | | |
| Employee Vehicles and Delivery Trucks | 0.027 | 2.4 | 0.00020 | 0.000049 |

1. Emission factors from AP-42, Section 13.2.1 (Paved Roads).
   $E = k * (sL)^{0.91} * (W)^{1.02}$
2. Silt loading from California Air Resources Board, Areawide Source Methodologies, Section 7.9, Entrained Paved Road Dust, Paved Road Travel (July 1997).
   http://www.arb.ca.gov/ei/areasrc/fullpdf/full7-9.pdf.
   Silt loading is for freeways, major, and collector roads in San Diego County.

## Rugged Solar Farm Project
## On-Road Motor Vehicle Emissions

### 2014 EMISSIONS

| Vehicle Type | Trips/Day | No. of Units | Distance (mi) | Duration (days) | Category | 2014 Emissions (lb/day) | | | | | | | 2014 Emissions (lbs/month) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | ROG | CO | NOx | SOx | PM10 | PM2.5 | CO2 | ROG | CO | NOx | SOx | PM10 | PM2.5 | CO2 |
| ***July*** | | | | | | | | | | | | | | | | | | | |
| Worker Vehicles[1] | 43 | | 35 | 18 | On-Road | 0.79 | 7.58 | 0.76 | 0.01 | 0.46 | 0.14 | 1,357.64 | 14.24 | 136.48 | 13.65 | 0.25 | 8.36 | 2.57 | 24,437.44 |
| Delivery Trucks[2] | 30 | | 85 | 18 | On-Road | 2.20 | 10.25 | 50.07 | 0.10 | 1.95 | 1.15 | 10,257.58 | 39.53 | 184.47 | 901.23 | 1.76 | 35.07 | 20.66 | 184,636.40 |
| Water Trucks (on-site)[3] | | 2 | 120 | 18 | On-Road | 0.21 | 0.96 | 4.71 | 0.01 | 0.14 | 0.10 | 965.42 | 3.72 | 17.36 | 84.82 | 0.17 | 2.43 | 1.73 | 17,377.54 |
| Water Trucks (off-site)[4] | 30 | | 58 | 18 | On-Road | 1.50 | 6.99 | 34.16 | 0.07 | 0.98 | 0.70 | 6,999.29 | 26.97 | 125.88 | 614.96 | 1.20 | 17.64 | 12.55 | 125,987.19 |
| Dump Trucks[5] | | 4 | 60 | 26 | On-Road | 0.21 | 0.96 | 4.71 | 0.01 | 0.14 | 0.10 | 965.42 | 5.37 | 25.08 | 122.52 | 0.24 | 3.51 | 2.50 | 25,100.90 |
| ***August*** | | | | | | | | | | | | | | | | | | | |
| Worker Vehicles[1] | 130 | 4 | 35 | 26 | On-Road | 2.37 | 22.75 | 2.28 | 0.04 | 1.39 | 0.43 | 4,072.91 | 61.71 | 591.43 | 59.15 | 1.07 | 36.21 | 11.14 | 105,895.59 |
| Delivery Trucks[2] | 30 | | 85 | 26 | On-Road | 2.20 | 10.25 | 50.07 | 0.10 | 1.95 | 1.15 | 10,257.58 | 57.10 | 266.46 | 1301.78 | 2.54 | 50.66 | 29.84 | 266,697.02 |
| Water Trucks (on-site)[3] | | 2 | 120 | 26 | On-Road | 0.21 | 0.96 | 4.71 | 0.01 | 0.14 | 0.10 | 965.42 | 5.37 | 25.08 | 122.52 | 0.24 | 3.51 | 2.50 | 25,100.90 |
| Water Trucks (off-site)[4] | 30 | | 58 | 26 | On-Road | 1.50 | 6.99 | 34.16 | 0.07 | 0.98 | 0.70 | 6,999.29 | 38.96 | 181.82 | 888.27 | 1.74 | 25.48 | 18.13 | 181,981.50 |
| Concrete Material Trucks[6] | 8 | | 55 | 26 | On-Road | 0.38 | 1.77 | 8.64 | 0.02 | 0.34 | 0.20 | 1,769.93 | 9.85 | 45.98 | 224.62 | 0.44 | 8.74 | 5.15 | 46,018.31 |
| Concrete Trucks[7] | 8 | | 5 | 26 | On-Road | 0.03 | 0.16 | 0.79 | 0.00 | 0.03 | 0.02 | 160.90 | 0.90 | 4.18 | 20.42 | 0.04 | 0.79 | 0.47 | 4,183.48 |
| Dump Trucks[5] | | 4 | 60 | 26 | On-Road | 0.21 | 0.96 | 4.71 | 0.01 | 0.14 | 0.10 | 965.42 | 5.37 | 25.08 | 122.52 | 0.24 | 3.51 | 2.50 | 25,100.90 |
| ***September*** | | | | | | | | | | | | | | | | | | | |
| Worker Vehicles[1] | 130 | 4 | 35 | 26 | On-Road | 2.37 | 22.75 | 2.28 | 0.04 | 1.39 | 0.43 | 4,072.91 | 61.71 | 591.43 | 59.15 | 1.07 | 36.21 | 11.14 | 105,895.59 |
| Delivery Trucks[2] | 30 | | 85 | 26 | On-Road | 2.20 | 10.25 | 50.07 | 0.10 | 1.95 | 1.15 | 10,257.58 | 57.10 | 266.46 | 1301.78 | 2.54 | 50.66 | 29.84 | 266,697.02 |
| Commissioning Trips[8] | 6 | | 35 | 26 | On-Road | 0.11 | 1.05 | 0.10 | 0.00 | 0.06 | 0.02 | 187.69 | 2.84 | 27.25 | 2.73 | 0.05 | 1.67 | 0.51 | 4,879.98 |
| Water Trucks (on-site)[3] | | 2 | 120 | 26 | On-Road | 0.21 | 0.96 | 4.71 | 0.01 | 0.14 | 0.10 | 965.42 | 5.37 | 25.08 | 122.52 | 0.24 | 3.51 | 2.50 | 25,100.90 |
| Water Trucks (off-site)[4] | 30 | | 58 | 26 | On-Road | 1.50 | 6.99 | 34.16 | 0.07 | 0.98 | 0.70 | 6,999.29 | 38.96 | 181.82 | 888.27 | 1.74 | 25.48 | 18.13 | 181,981.50 |
| Concrete Material Trucks[6] | 8 | | 55 | 26 | On-Road | 0.38 | 1.77 | 8.64 | 0.02 | 0.34 | 0.20 | 1,769.93 | 9.85 | 45.98 | 224.62 | 0.44 | 8.74 | 5.15 | 46,018.31 |
| Concrete Trucks[7] | 8 | | 5 | 26 | On-Road | 0.03 | 0.16 | 0.79 | 0.00 | 0.03 | 0.02 | 160.90 | 0.90 | 4.18 | 20.42 | 0.04 | 0.79 | 0.47 | 4,183.48 |
| Dump Trucks[5] | | 4 | 60 | 26 | On-Road | 0.21 | 0.96 | 4.71 | 0.01 | 0.14 | 0.10 | 965.42 | 5.37 | 25.08 | 122.52 | 0.24 | 3.51 | 2.50 | 25,100.90 |
| ***October*** | | | | | | | | | | | | | | | | | | | |
| Worker Vehicles[1] | 130 | 4 | 35 | 26 | On-Road | 2.37 | 22.75 | 2.28 | 0.04 | 1.39 | 0.43 | 4,072.91 | 61.71 | 591.43 | 59.15 | 1.07 | 36.21 | 11.14 | 105,895.59 |
| Delivery Trucks[2] | 30 | | 85 | 26 | On-Road | 2.20 | 10.25 | 50.07 | 0.10 | 1.95 | 1.15 | 10,257.58 | 57.10 | 266.46 | 1301.78 | 2.54 | 50.66 | 29.84 | 266,697.02 |
| Commissioning Trips[8] | 6 | | 35 | 26 | On-Road | 0.11 | 1.05 | 0.10 | 0.00 | 0.06 | 0.02 | 187.69 | 2.84 | 27.25 | 2.73 | 0.05 | 1.67 | 0.51 | 4,879.98 |
| Water Trucks (on-site)[3] | | 2 | 60 | 26 | On-Road | 0.10 | 0.48 | 2.36 | 0.00 | 0.07 | 0.05 | 482.71 | 2.69 | 12.54 | 61.26 | 0.12 | 1.76 | 1.25 | 12,550.45 |
| Concrete Material Trucks[6] | 8 | | 55 | 26 | On-Road | 0.38 | 1.77 | 8.64 | 0.02 | 0.34 | 0.20 | 1,769.93 | 9.85 | 45.98 | 224.62 | 0.44 | 8.74 | 5.15 | 46,018.31 |
| Concrete Trucks[7] | 8 | | 5 | 26 | On-Road | 0.03 | 0.16 | 0.79 | 0.00 | 0.03 | 0.02 | 160.90 | 0.90 | 4.18 | 20.42 | 0.04 | 0.79 | 0.47 | 4,183.48 |
| Dump Trucks[5] | | 4 | 60 | 26 | On-Road | 0.21 | 0.96 | 4.71 | 0.01 | 0.14 | 0.10 | 965.42 | 5.37 | 25.08 | 122.52 | 0.24 | 3.51 | 2.50 | 25,100.90 |
| ***November*** | | | | | | | | | | | | | | | | | | | |
| Worker Vehicles[1] | 130 | 4 | 35 | 26 | On-Road | 2.37 | 22.75 | 2.28 | 0.04 | 1.39 | 0.43 | 4,072.91 | 61.71 | 591.43 | 59.15 | 1.07 | 36.21 | 11.14 | 105,895.59 |
| Delivery Trucks[2] | 30 | | 85 | 26 | On-Road | 2.20 | 10.25 | 50.07 | 0.10 | 1.95 | 1.15 | 10,257.58 | 57.10 | 266.46 | 1301.78 | 2.54 | 50.66 | 29.84 | 266,697.02 |
| Commissioning Trips[8] | 6 | | 35 | 26 | On-Road | 0.11 | 1.05 | 0.10 | 0.00 | 0.06 | 0.02 | 187.69 | 2.84 | 27.25 | 2.73 | 0.05 | 1.67 | 0.51 | 4,879.98 |
| Water Trucks (on-site)[3] | | 2 | 60 | 26 | On-Road | 0.10 | 0.48 | 2.36 | 0.00 | 0.07 | 0.05 | 482.71 | 2.69 | 12.54 | 61.26 | 0.12 | 1.76 | 1.25 | 12,550.45 |
| Concrete Material Trucks[6] | 8 | | 55 | 26 | On-Road | 0.38 | 1.77 | 8.64 | 0.02 | 0.34 | 0.20 | 1,769.93 | 9.85 | 45.98 | 224.62 | 0.44 | 8.74 | 5.15 | 46,018.31 |
| Concrete Trucks[7] | 8 | | 5 | 26 | On-Road | 0.03 | 0.16 | 0.79 | 0.00 | 0.03 | 0.02 | 160.90 | 0.90 | 4.18 | 20.42 | 0.04 | 0.79 | 0.47 | 4,183.48 |
| Dump Trucks[5] | | 4 | 60 | 26 | On-Road | 0.21 | 0.96 | 4.71 | 0.01 | 0.14 | 0.10 | 965.42 | 5.37 | 25.08 | 122.52 | 0.24 | 3.51 | 2.50 | 25,100.90 |
| ***December*** | | | | | | | | | | | | | | | | | | | |
| Worker Vehicles[1] | 130 | 4 | 35 | 26 | On-Road | 2.37 | 22.75 | 2.28 | 0.04 | 1.39 | 0.43 | 4,072.91 | 61.71 | 591.43 | 59.15 | 1.07 | 36.21 | 11.14 | 105,895.59 |
| Delivery Trucks[2] | 30 | | 85 | 26 | On-Road | 2.20 | 10.25 | 50.07 | 0.10 | 1.95 | 1.15 | 10,257.58 | 57.10 | 266.46 | 1301.78 | 2.54 | 50.66 | 29.84 | 266,697.02 |
| Commissioning Trips[8] | 6 | | 35 | 26 | On-Road | 0.11 | 1.05 | 0.10 | 0.00 | 0.06 | 0.02 | 187.69 | 2.84 | 27.25 | 2.73 | 0.05 | 1.67 | 0.51 | 4,879.98 |
| Water Trucks (on-site)[3] | | 2 | 60 | 26 | On-Road | 0.10 | 0.48 | 2.36 | 0.00 | 0.07 | 0.05 | 482.71 | 2.69 | 12.54 | 61.26 | 0.12 | 1.76 | 1.25 | 12,550.45 |
| Concrete Material Trucks[6] | 8 | | 55 | 26 | On-Road | 0.38 | 1.77 | 8.64 | 0.02 | 0.34 | 0.20 | 1,769.93 | 9.85 | 45.98 | 224.62 | 0.44 | 8.74 | 5.15 | 46,018.31 |
| Concrete Trucks[7] | 8 | | 5 | 26 | On-Road | 0.03 | 0.16 | 0.79 | 0.00 | 0.03 | 0.02 | 160.90 | 0.90 | 4.18 | 20.42 | 0.04 | 0.79 | 0.47 | 4,183.48 |
| Dump Trucks[5] | | 4 | 60 | 26 | On-Road | 0.21 | 0.96 | 4.71 | 0.01 | 0.14 | 0.10 | 965.42 | 5.37 | 25.08 | 122.52 | 0.24 | 3.51 | 2.50 | 25,100.90 |
| | | | | | | | | | | | | **TOTAL 2014** | **872.58** | **5715.33** | **12595.94** | **29.77** | **636.55** | **332.57** | **3,088,352.02** |

**Rugged Solar Farm Project**
**On-Road Motor Vehicle Emissions**

## 2015 EMISSIONS

| Vehicle Type | Trips/Day | No. of Units | Distance (mi) | Duration (days) | Category | 2015 Emissions (lb/day) | | | | | | | 2015 Emissions (lbs/month) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | ROG | CO | NOx | SOx | PM10 | PM2.5 | CO2 | ROG | CO | NOx | SOx | PM10 | PM2.5 | CO2 |
| ***January*** | | | | | | | | | | | | | | | | | | | |
| Worker Vehicles[1] | 130 | | 35.0 | 26 | On-Road | 2.14 | 20.37 | 2.04 | 0.04 | 1.39 | 0.43 | 4,066.21 | 55.75 | 529.65 | 53.09 | 1.06 | 36.10 | 11.08 | 105,721.51 |
| Delivery Trucks[2] | 30 | | 85.0 | 26 | On-Road | 1.98 | 9.27 | 43.06 | 0.10 | 1.71 | 0.93 | 10,249.24 | 51.44 | 241.02 | 1119.44 | 2.54 | 44.49 | 24.17 | 266,480.31 |
| Commissioning Trips[8] | 6 | | 35.0 | 26 | On-Road | 0.10 | 0.94 | 0.09 | 0.00 | 0.06 | 0.02 | 187.67 | 2.57 | 24.45 | 2.45 | 0.05 | 1.67 | 0.51 | 4,879.45 |
| Water Trucks (on-site)[3] | | 2 | 60.0 | 26 | On-Road | 0.09 | 0.44 | 2.03 | 0.00 | 0.06 | 0.04 | 482.32 | 2.42 | 11.34 | 52.68 | 0.12 | 1.47 | 0.98 | 12,540.25 |
| Concrete Material Trucks[6] | 8 | | 55.0 | 26 | On-Road | 0.34 | 1.60 | 7.43 | 0.02 | 0.30 | 0.16 | 1,768.50 | 8.88 | 41.59 | 193.16 | 0.44 | 7.68 | 4.17 | 45,980.92 |
| Concrete Trucks[7] | 8 | | 5.0 | 26 | On-Road | 0.03 | 0.15 | 0.68 | 0.00 | 0.03 | 0.01 | 160.77 | 0.81 | 3.78 | 17.56 | 0.04 | 0.70 | 0.38 | 4,180.08 |
| Dump Trucks[5] | | 4 | 60.0 | 26 | On-Road | 0.21 | 0.96 | 4.71 | 0.01 | 0.14 | 0.10 | 965.42 | 4.84 | 22.68 | 105.36 | 0.24 | 2.93 | 1.97 | 25,080.50 |
| ***February*** | | | | | | | | | | | | | | | | | | | |
| Worker Vehicles[1] | 130 | | 35.0 | 26 | On-Road | 2.14 | 20.37 | 2.04 | 0.04 | 1.39 | 0.43 | 4,066.21 | 55.75 | 529.65 | 53.09 | 1.06 | 36.10 | 11.08 | 105,721.51 |
| Delivery Trucks[2] | 30 | | 85.0 | 26 | On-Road | 1.98 | 9.27 | 43.06 | 0.10 | 1.71 | 0.93 | 10,249.24 | 51.44 | 241.02 | 1119.44 | 2.54 | 44.49 | 24.17 | 266,480.31 |
| Commissioning Trips[8] | 6 | | 35.0 | 26 | On-Road | 0.10 | 0.94 | 0.09 | 0.00 | 0.06 | 0.02 | 187.67 | 2.57 | 24.45 | 2.45 | 0.05 | 1.67 | 0.51 | 4,879.45 |
| Water Trucks (on-site)[3] | | 2 | 60.0 | 26 | On-Road | 0.09 | 0.44 | 2.03 | 0.00 | 0.06 | 0.04 | 482.32 | 2.42 | 11.34 | 52.68 | 0.12 | 1.47 | 0.98 | 12,540.25 |
| Concrete Material Trucks[6] | 8 | | 55.0 | 26 | On-Road | 0.34 | 1.60 | 7.43 | 0.02 | 0.30 | 0.16 | 1,768.50 | 8.88 | 41.59 | 193.16 | 0.44 | 7.68 | 4.17 | 45,980.92 |
| Concrete Trucks[7] | 8 | | 5.0 | 26 | On-Road | 0.03 | 0.15 | 0.68 | 0.00 | 0.03 | 0.01 | 160.77 | 0.81 | 3.78 | 17.56 | 0.04 | 0.70 | 0.38 | 4,180.08 |
| Dump Trucks[5] | | 4 | 60.0 | 26 | On-Road | 0.21 | 0.96 | 4.71 | 0.01 | 0.14 | 0.10 | 965.42 | 4.84 | 22.68 | 105.36 | 0.24 | 2.93 | 1.97 | 25,080.50 |
| ***March*** | | | | | | | | | | | | | | | | | | | |
| Worker Vehicles[1] | 130 | | 35.0 | 26 | On-Road | 2.14 | 20.37 | 2.04 | 0.04 | 1.39 | 0.43 | 4,066.21 | 55.75 | 529.65 | 53.09 | 1.06 | 36.10 | 11.08 | 105,721.51 |
| Delivery Trucks[2] | 30 | | 85.0 | 26 | On-Road | 1.98 | 9.27 | 43.06 | 0.10 | 1.71 | 0.93 | 10,249.24 | 51.44 | 241.02 | 1119.44 | 2.54 | 44.49 | 24.17 | 266,480.31 |
| Commissioning Trips[8] | 6 | | 35.0 | 26 | On-Road | 0.10 | 0.94 | 0.09 | 0.00 | 0.06 | 0.02 | 187.67 | 2.57 | 24.45 | 2.45 | 0.05 | 1.67 | 0.51 | 4,879.45 |
| Water Trucks (on-site)[3] | | 2 | 60.0 | 26 | On-Road | 0.09 | 0.44 | 2.03 | 0.00 | 0.06 | 0.04 | 482.32 | 2.42 | 11.34 | 52.68 | 0.12 | 1.47 | 0.98 | 12,540.25 |
| Concrete Material Trucks[6] | 8 | | 55.0 | 26 | On-Road | 0.34 | 1.60 | 7.43 | 0.02 | 0.30 | 0.16 | 1,768.50 | 8.88 | 41.59 | 193.16 | 0.44 | 7.68 | 4.17 | 45,980.92 |
| Concrete Trucks[7] | 8 | | 5.0 | 26 | On-Road | 0.03 | 0.15 | 0.68 | 0.00 | 0.03 | 0.01 | 160.77 | 0.81 | 3.78 | 17.56 | 0.04 | 0.70 | 0.38 | 4,180.08 |
| Dump Trucks[5] | | 4 | 60.0 | 26 | On-Road | 0.21 | 0.96 | 4.71 | 0.01 | 0.14 | 0.10 | 965.42 | 4.84 | 22.68 | 105.36 | 0.24 | 2.93 | 1.97 | 25,080.50 |
| ***April*** | | | | | | | | | | | | | | | | | | | |
| Worker Vehicles[1] | 158 | | 35.0 | 26 | On-Road | 2.61 | 24.79 | 2.49 | 0.05 | 1.69 | 0.52 | 4,948.27 | 67.85 | 644.54 | 64.61 | 1.30 | 43.93 | 13.48 | 128,654.94 |
| Delivery Trucks[2] | 30 | | 85.0 | 26 | On-Road | 1.98 | 9.27 | 43.06 | 0.10 | 1.71 | 0.93 | 10,249.24 | 51.44 | 241.02 | 1119.44 | 2.54 | 44.49 | 24.17 | 266,480.31 |
| Commissioning Trips[8] | 6 | | 35.0 | 26 | On-Road | 0.10 | 0.94 | 0.09 | 0.00 | 0.06 | 0.02 | 187.67 | 2.57 | 24.45 | 2.45 | 0.05 | 1.67 | 0.51 | 4,879.45 |
| Water Trucks (on-site)[3] | | 2 | 60.0 | 26 | On-Road | 0.09 | 0.44 | 2.03 | 0.00 | 0.06 | 0.04 | 482.32 | 2.42 | 11.34 | 52.68 | 0.12 | 1.47 | 0.98 | 12,540.25 |
| Concrete Material Trucks[6] | 8 | | 55.0 | 26 | On-Road | 0.34 | 1.60 | 7.43 | 0.02 | 0.30 | 0.16 | 1,768.50 | 8.88 | 41.59 | 193.16 | 0.44 | 7.68 | 4.17 | 45,980.92 |
| Concrete Trucks[7] | 8 | | 5.0 | 26 | On-Road | 0.03 | 0.15 | 0.68 | 0.00 | 0.03 | 0.01 | 160.77 | 0.81 | 3.78 | 17.56 | 0.04 | 0.70 | 0.38 | 4,180.08 |
| Dump Trucks[5] | | 4 | 60.0 | 26 | On-Road | 0.21 | 0.96 | 4.71 | 0.01 | 0.14 | 0.10 | 965.42 | 4.84 | 22.68 | 105.36 | 0.24 | 2.93 | 1.97 | 25,080.50 |
| ***May*** | | | | | | | | | | | | | | | | | | | |
| Worker Vehicles[1] | 28 | | 35.0 | 26 | On-Road | 0.46 | 4.39 | 0.44 | 0.01 | 0.30 | 0.09 | 875.80 | 12.01 | 114.08 | 11.44 | 0.23 | 7.78 | 2.39 | 22,770.79 |
| Delivery Trucks[2] | 30 | | 85.0 | 26 | On-Road | 1.98 | 9.27 | 43.06 | 0.10 | 1.71 | 0.93 | 10,249.24 | 51.44 | 241.02 | 1119.44 | 2.54 | 44.49 | 24.17 | 266,480.31 |
| ***June*** | | | | | | | | | | | | | | | | | | | |
| Worker Vehicles[1] | 28 | | 35.0 | 26 | On-Road | 0.46 | 4.39 | 0.44 | 0.01 | 0.30 | 0.09 | 875.80 | 12.01 | 114.08 | 11.44 | 0.23 | 7.78 | 2.39 | 22,770.79 |
| | | | | | | | | | | | | **TOTAL 2015** | **594.38** | **4,082.08** | **7,328.81** | **21.20** | **448.01** | **204.38** | **2,194,407.39** |

1. Trips per day - assumes 30% decrease in worker trips due to carpooling
   Employee commute distance of 35 miles is assumed based on local workforce from Alpine and Boulevard
2. Materials delivery coming from Rancho Bernardo, San Diego
3. Assumes on-site water trucks will be operating at 15 mph for 8 hours per day during site preparation (120 mi/day), and 4 hours per day following site preparation activities (60 mi/day)
9. Assumes 85,416 gallons/day of water is imported from Jacumba Community Services District (approx. 11 miles) during October, November, and December for site preparation (clear and grub)
5. Assumes dump trucks will be operating at 15 mph for 4 hours per day = 60 mi/day
6. Assumes concrete material (sand, cement, etc) trucks will be travelling 55 miles
7. Assumes concrete trucks will be travelling 5 miles
8. Employee commute/commissioning distance of 35 miles is assumed based on local workforce from Alpine and Boulevard

**Rugged Solar Farm Project**
**EMFAC2011 Modeling Results and Emission Factor Calculations**

### LDA

| CALYR | VMT/1000 | VEH TECH | POLLUTANT | PROCESS | EMISSIONS | BASIS |
|---|---|---|---|---|---|---|
| **2014** | | | | | | |
| 2014 | 43614 | GAS | ROG | Total | 10.173 | Day |
| 2014 | 190 | DSL | ROG | Total | 0.009 | Day |
| 2014 | 43614 | GAS | NOx | Total Ex | 8.915 | Day |
| 2014 | 190 | DSL | NOx | Total Ex | 0.133 | Day |
| 2014 | 43614 | GAS | CO | Total Ex | 97.134 | Day |
| 2014 | 190 | DSL | CO | Total Ex | 0.051 | Day |
| 2014 | 43614 | GAS | SOx | Total Ex | 0.178 | Day |
| 2014 | 190 | DSL | SOx | Total Ex | 0.001 | Day |
| 2014 | 43614 | GAS | PM10 | Total | 2.271 | Day |
| 2014 | 190 | DSL | PM10 | Total | 0.016 | Day |
| 2014 | 43614 | GAS | PM2.5 | Total | 0.962 | Day |
| 2014 | 190 | DSL | PM2.5 | Total | 0.010 | Day |
| 2014 | 43614 | GAS | CO2 | Total Ex | 17646.734 | Day |
| 2014 | 190 | DSL | CO2 | Total Ex | 78.503 | Day |
| **2015** | | | | | | |
| 2015 | 44100 | GAS | ROG | Total | 9.172 | Day |
| 2015 | 194 | DSL | ROG | Total | 0.008 | Day |
| 2015 | 44100 | GAS | NOx | Total Ex | 8.145 | Day |
| 2015 | 194 | DSL | NOx | Total Ex | 0.123 | Day |
| 2015 | 44100 | GAS | CO | Total Ex | 87.928 | Day |
| 2015 | 194 | DSL | CO | Total Ex | 0.046 | Day |
| 2015 | 44100 | GAS | SOx | Total Ex | 0.180 | Day |
| 2015 | 194 | DSL | SOx | Total Ex | 0.001 | Day |
| 2015 | 44100 | GAS | PM10 | Total | 2.287 | Day |
| 2015 | 194 | DSL | PM10 | Total | 0.015 | Day |
| 2015 | 44100 | GAS | PM2.5 | Total | 0.966 | Day |
| 2015 | 194 | DSL | PM2.5 | Total | 0.009 | Day |
| 2015 | 44100 | GAS | CO2 | Total Ex | 17836.977 | Day |
| 2015 | 194 | DSL | CO2 | Total Ex | 80.267 | Day |

### LDT1

| CALYR | VMT/1000 | VEH TECH | POLLUTANT | PROCESS | EMISSIONS | BASIS |
|---|---|---|---|---|---|---|
| **2014** | | | | | | |
| 2014 | 6327 | GAS | ROG | Total | 3.052 | Day |
| 2014 | 7 | DSL | ROG | Total | 0.001 | Day |
| 2014 | 6327 | GAS | NOx | Total Ex | 2.478 | Day |
| 2014 | 7 | DSL | NOx | Total Ex | 0.006 | Day |
| 2014 | 6327 | GAS | CO | Total Ex | 26.716 | Day |
| 2014 | 7 | DSL | CO | Total Ex | 0.003 | Day |
| 2014 | 6327 | GAS | SOx | Total Ex | 0.030 | Day |
| 2014 | 7 | DSL | SOx | Total Ex | 0.000 | Day |
| 2014 | 6327 | GAS | PM10 | Total | 0.346 | Day |
| 2014 | 7 | DSL | PM10 | Total | 0.001 | Day |
| 2014 | 6327 | GAS | PM2.5 | Total | 0.155 | Day |
| 2014 | 7 | DSL | PM2.5 | Total | 0.001 | Day |
| 2014 | 6327 | GAS | CO2 | Total Ex | 2951.180 | Day |
| 2014 | 7 | DSL | CO2 | Total Ex | 2.890 | Day |
| **2015** | | | | | | |
| 2015 | 6386 | GAS | ROG | Total | 2.849 | Day |
| 2015 | 7 | DSL | ROG | Total | 0.001 | Day |
| 2015 | 6386 | GAS | NOx | Total Ex | 2.276 | Day |
| 2015 | 7 | DSL | NOx | Total Ex | 0.005 | Day |
| 2015 | 6386 | GAS | CO | Total Ex | 24.337 | Day |
| 2015 | 7 | DSL | CO | Total Ex | 0.002 | Day |
| 2015 | 6386 | GAS | SOx | Total Ex | 0.030 | Day |
| 2015 | 7 | DSL | SOx | Total Ex | 0.000 | Day |
| 2015 | 6386 | GAS | PM10 | Total | 0.347 | Day |
| 2015 | 7 | DSL | PM10 | Total | 0.001 | Day |
| 2015 | 6386 | GAS | PM2.5 | Total | 0.154 | Day |
| 2015 | 7 | DSL | PM2.5 | Total | 0.001 | Day |
| 2015 | 6386 | GAS | CO2 | Total Ex | 2981.868 | Day |
| 2015 | 7 | DSL | CO2 | Total Ex | 3.010 | Day |

### LDT2

| CALYR | VMT/1000 | VEH TECH | POLLUTANT | PROCESS | EMISSIONS | BASIS |
|---|---|---|---|---|---|---|
| **2014** | | | | | | |
| 2014 | 16522 | GAS | ROG | Total | 4.125 | Day |
| 2014 | 7 | DSL | ROG | Total | 0.000 | Day |
| 2014 | 16522 | GAS | NOx | Total Ex | 5.104 | Day |
| 2014 | 7 | DSL | NOx | Total Ex | 0.006 | Day |
| 2014 | 16522 | GAS | CO | Total Ex | 42.486 | Day |
| 2014 | 7 | DSL | CO | Total Ex | 0.002 | Day |
| 2014 | 16522 | GAS | SOx | Total Ex | 0.092 | Day |
| 2014 | 7 | DSL | SOx | Total Ex | 0.000 | Day |
| 2014 | 16522 | GAS | PM10 | Total | 0.858 | Day |
| 2014 | 7 | DSL | PM10 | Total | 0.001 | Day |
| 2014 | 16522 | GAS | PM2.5 | Total | 0.363 | Day |
| 2014 | 7 | DSL | PM2.5 | Total | 0.000 | Day |
| 2014 | 16522 | GAS | CO2 | Total Ex | 9110.407 | Day |
| 2014 | 7 | DSL | CO2 | Total Ex | 2.967 | Day |
| **2015** | | | | | | |
| 2015 | 16700 | GAS | ROG | Total | 3.851 | Day |
| 2015 | 7 | DSL | ROG | Total | 0.000 | Day |
| 2015 | 16700 | GAS | NOx | Total Ex | 4.568 | Day |
| 2015 | 7 | DSL | NOx | Total Ex | 0.005 | Day |
| 2015 | 16700 | GAS | CO | Total Ex | 38.554 | Day |
| 2015 | 7 | DSL | CO | Total Ex | 0.002 | Day |
| 2015 | 16700 | GAS | SOx | Total Ex | 0.093 | Day |
| 2015 | 7 | DSL | SOx | Total Ex | 0.000 | Day |
| 2015 | 16700 | GAS | PM10 | Total | 0.865 | Day |
| 2015 | 7 | DSL | PM10 | Total | 0.001 | Day |
| 2015 | 16700 | GAS | PM2.5 | Total | 0.365 | Day |
| 2015 | 7 | DSL | PM2.5 | Total | 0.000 | Day |
| 2015 | 16700 | GAS | CO2 | Total Ex | 9209.495 | Day |
| 2015 | 7 | DSL | CO2 | Total Ex | 2.978 | Day |

### HHDT

| CALYR | VMT/1000 | VEH TECH | POLLUTANT | PROCESS | EMISSIONS | BASIS |
|---|---|---|---|---|---|---|
| **2014** | | | | | | |
| 2014 | 1718 | DSL | ROG | Total | 0.740 | Day |
| 2014 | 1718 | DSL | NOx | Total Ex | 16.866 | Day |
| 2014 | 1718 | DSL | CO | Total Ex | 3.452 | Day |
| 2014 | 1718 | DSL | SOx | Total Ex | 0.033 | Day |
| 2014 | 1718 | DSL | PM10 | Total | 0.484 | Day |
| 2014 | 1718 | DSL | PM2.5 | Total | 0.344 | Day |
| 2014 | 1718 | DSL | CO2 | Total Ex | 3455.453 | Day |
| **2015** | | | | | | |
| 2015 | 1796 | DSL | ROG | Total | 0.697 | Day |
| 2015 | 1796 | DSL | NOx | Total Ex | 15.163 | Day |
| 2015 | 1796 | DSL | CO | Total Ex | 3.265 | Day |
| 2015 | 1796 | DSL | SOx | Total Ex | 0.034 | Day |
| 2015 | 1796 | DSL | PM10 | Total | 0.422 | Day |
| 2015 | 1796 | DSL | PM2.5 | Total | 0.283 | Day |
| 2015 | 1796 | DSL | CO2 | Total Ex | 3609.401 | Day |

### 2014 Emission Factors

| Reactive Organic Gases | | LDA | LDT1 | LDT2 | LDA+LDT1+LDT2 Total | HHDT |
|---|---|---|---|---|---|---|
| | | | | | (Worker Trucks) | (Delivery Trucks) |
| VMT | 1000 mi/day | 43,804 | 6,334 | 16,529 | 66,667 | 1,718 |
| ROG | tons/day | 10.18 | 3.05 | 4.13 | 17.36 | 0.74 |
| | g/mi | 0.21 | 0.44 | 0.23 | 0.24 | 0.39 |

| Oxides of Nitrogen | | LDA | LDT1 | LDT2 | LDA+LDT1+LDT2 Total | HHDT |
|---|---|---|---|---|---|---|
| | | | | | (Worker Trucks) | (Delivery Trucks) |
| VMT | 1000 mi/day | 43,804 | 6,334 | 16,529 | 66,667 | 1,718 |
| NOx | tons/day | 9.05 | 2.48 | 5.11 | 16.64 | 16.87 |
| | g/mi | 0.19 | 0.36 | 0.28 | 0.23 | 8.91 |

| Carbon Monoxide | | LDA | LDT1 | LDT2 | LDA+LDT1+LDT2 Total | HHDT |
|---|---|---|---|---|---|---|
| | | | | | (Worker Trucks) | (Delivery Trucks) |
| VMT | 1000 mi/day | 43,804 | 6,334 | 16,529 | 66,667 | 1,718 |
| CO | tons/day | 97.19 | 26.72 | 42.49 | 166.39 | 3.45 |
| | g/mi | 2.01 | 3.83 | 2.33 | 2.26 | 1.82 |

| Sulfur Oxides | | LDA | LDT1 | LDT2 | LDA+LDT1+LDT2 Total | HHDT |
|---|---|---|---|---|---|---|
| | | | | | (Worker Trucks) | (Delivery Trucks) |
| VMT | 1000 mi/day | 43,804 | 6,334 | 16,529 | 66,667 | 1,718 |
| SOx | tons/day | 0.18 | 0.03 | 0.09 | 0.30 | 0.03 |
| | g/mi | 0.00 | 0.00 | 0.01 | 0.00 | 0.02 |

| Particulate Matter (PM10) | | LDA | LDT1 | LDT2 | LDA+LDT1+LDT2 Total | HHDT |
|---|---|---|---|---|---|---|
| | | | | | (Worker Trucks) | (Delivery Trucks) |
| VMT | 1000 mi/day | 43,804 | 6,334 | 16,529 | 66,667 | 1,718 |
| PM10 | tons/day | 2.29 | 0.35 | 0.86 | 3.49 | 0.48 |
| | g/mi | 0.05 | 0.05 | 0.05 | 0.05 | 0.26 |

| Particulate Matter (PM2.5) | | LDA | LDT1 | LDT2 | LDA+LDT1+LDT2 Total | HHDT |
|---|---|---|---|---|---|---|
| | | | | | (Worker Trucks) | (Delivery Trucks) |
| VMT | 1000 mi/day | 43,804 | 6,334 | 16,529 | 66,667 | 1,718 |
| PM2.5 | tons/day | 0.97 | 0.16 | 0.36 | 1.49 | 0.34 |
| | g/mi | 0.02 | 0.02 | 0.02 | 0.02 | 0.18 |

| Carbon Dioxide | | LDA | LDT1 | LDT2 | LDA+LDT1+LDT2 Total | HHDT |
|---|---|---|---|---|---|---|
| | | | | | (Worker Trucks) | (Delivery Trucks) |
| VMT | 1000 mi/day | 43,804 | 6,334 | 16,529 | 66,667 | 1,718 |
| CO2 | tons/day | 17,725.24 | 2,954.07 | 9,113.37 | 29,792.68 | 3,455.45 |
| | g/mi | 367.10 | 423.10 | 500.18 | 405.41 | 1,824.64 |

### 2015 Emission Factors

| Reactive Organic Gases | | LDA | LDT1 | LDT2 | LDA+LDT1+LDT2 Total | HHDT |
|---|---|---|---|---|---|---|
| | | | | | (Worker Trucks) | (Delivery Trucks) |
| VMT | 1000 mi/day | 44,294 | 6,393 | 16,707 | 67,394 | 1796 |
| ROG | tons/day | 9.18 | 2.85 | 3.85 | 15.88 | 0.70 |
| | g/mi | 0.19 | 0.40 | 0.21 | 0.21 | 0.35 |

| Oxides of Nitrogen | | LDA | LDT1 | LDT2 | LDA+LDT1+LDT2 Total | HHDT |
|---|---|---|---|---|---|---|
| | | | | | (Worker Trucks) | (Delivery Trucks) |
| VMT | 1000 mi/day | 44,294 | 6,393 | 16,707 | 67,394 | 1796 |
| NOx | tons/day | 8.27 | 2.28 | 4.57 | 15.12 | 15.16 |
| | g/mi | 0.17 | 0.32 | 0.25 | 0.20 | 7.66 |

| Carbon Monoxide | | LDA | LDT1 | LDT2 | LDA+LDT1+LDT2 Total | HHDT |
|---|---|---|---|---|---|---|
| | | | | | (Worker Trucks) | (Delivery Trucks) |
| VMT | 1000 mi/day | 44,294 | 6,393 | 16,707 | 67,394 | 1796 |
| CO | tons/day | 87.97 | 24.34 | 38.56 | 150.87 | 3.26 |
| | g/mi | 1.80 | 3.45 | 2.09 | 2.03 | 1.65 |

| Sulfur Oxides | | LDA | LDT1 | LDT2 | LDA+LDT1+LDT2 Total | HHDT |
|---|---|---|---|---|---|---|
| | | | | | (Worker Trucks) | (Delivery Trucks) |
| VMT | 1000 mi/day | 44,294 | 6,393 | 16,707 | 67,394 | 1796 |
| SOx | tons/day | 0.18 | 0.03 | 0.09 | 0.30 | 0.03 |
| | g/mi | 0.00 | 0.00 | 0.01 | 0.00 | 0.02 |

| Particulate Matter (PM10) | | LDA | LDT1 | LDT2 | LDA+LDT1+LDT2 Total | HHDT |
|---|---|---|---|---|---|---|
| | | | | | (Worker Trucks) | (Delivery Trucks) |
| VMT | 1000 mi/day | 44,294 | 6,393 | 16,707 | 67,394 | 1796 |
| PM10 | tons/day | 2.30 | 0.35 | 0.87 | 3.52 | 0.42 |
| | g/mi | 0.05 | 0.05 | 0.05 | 0.05 | 0.21 |

| Particulate Matter (PM2.5) | | LDA | LDT1 | LDT2 | LDA+LDT1+LDT2 Total | HHDT |
|---|---|---|---|---|---|---|
| | | | | | (Worker Trucks) | (Delivery Trucks) |
| VMT | 1000 mi/day | 44,294 | 6,393 | 16,707 | 67,394 | 1796 |
| PM2.5 | tons/day | 0.97 | 0.16 | 0.37 | 1.50 | 0.28 |
| | g/mi | 0.02 | 0.02 | 0.02 | 0.02 | 0.14 |

| Carbon Dioxide | | LDA | LDT1 | LDT2 | LDA+LDT1+LDT2 Total | HHDT |
|---|---|---|---|---|---|---|
| | | | | | (Worker Trucks) | (Delivery Trucks) |
| VMT | 1000 mi/day | 44,294 | 6,393 | 16,707 | 67,394 | 1796 |
| CO2 | tons/day | 17,917.24 | 2,984.88 | 9,212.47 | 30,114.59 | 3,609.40 |
| | g/mi | 366.96 | 423.56 | 500.23 | 405.37 | 1,823.16 |

Source: EMFAC2011 online results for San Diego County
1. "Total Exhaust" emissions used for all pollutants, except ROG, PM10, and PM2.5. ROG iscalculated using the "Total" emissions. PM10 and PM2.5 emissions are calculated using "Total" emissions, which include exhaust, brake wear (BW) and tire wear (TW).

**Rugged Solar Farm Project**
**Diesel Engine-Generator Emissions**

| | | |
|---|---|---|
| No. of Units | 2 | |
| Engine Rating | 680 | kW |
| | 960 | HP |
| Operating Schedule (per unit)* | 1.0 | hr/day |
| | 50 | hr/year |

| | VOC | NOx | CO | SOx | $PM_{10}$ | $PM_{2.5}$ | $CO_2$ |
|---|---|---|---|---|---|---|---|
| gm/BHP-hr | 0.24 | 4.56 | 2.60 | 0.005 | 0.15 | 0.15 | 526.18 |
| Data Source | 1,2 | 1,2 | 1 | 3 | 1 | 1,4 | 5 |
| Pounds/hour | 1.02 | 19.30 | 11.01 | 0.02 | 0.63 | 0.62 | 2,227 |
| Pounds/day | 1.02 | 19.30 | 11.01 | 0.02 | 0.63 | 0.62 | 2,227 |
| Pounds/year | 50.79 | 965.08 | 550.26 | 1.06 | 31.75 | 30.99 | 111,360 |
| Metric tons/year | | | | | | | 50.5 |

Notes:
*Assumed 50 hours per year for testing and maintenance.
Sources:
1. Current ARB and USEPA engine standards for Tier 2 equipment, except SOx and CO2.
2. Fraction of NOx and ROG based on Table B-26 in California Air Resources Board. 2008. The Carl Moyer Program Guidelines, Part IV of IV (Appendices). April. http://www.arb.ca.gov/msprog/moyer/guidelines/cmp_guidelines_part4.pdf
3. Based on 15 ppm (0.0015%) sulfur by weight.
4. PM2.5 fraction = 97.6% of PM10 (http://www.arb.ca.gov/ei/speciate/pmsize_07242008.xls for "stationary IC engine - diesel")
5. AP-42, Section 3.4, Table 3.4-1.

**Rugged Solar Farm Project**

**Operational Emissions[1]**

| | Trips/day | Days/Year | # of Units | Distance (mi) | Vehicle Type | | 2015 Emissions (lbs/day) ROG | CO | NOx | SOx | PM10 | PM2.5 | CO2 | tons/year[4] CO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Solar Farm*** | | | | | | | | | | | | | | |
| Employee Vehicles[2] | 40 | 264 | | 35 | LDA/LDT | | 0.66 | 6.27 | 0.63 | 0.01 | 0.43 | 0.13 | 1,251.14 | 165.15 |
| Personnel Transport Vehicles[3] | | 264 | 2 | 10 | LDT2 | | 0.01 | 0.09 | 0.01 | 0.00 | 0.01 | 0.00 | 22.06 | 2.91 |
| Washing Vehicles[3] | | 36 | 1 | 10 | HHDT | | 0.01 | 0.04 | 0.17 | 0.00 | 0.01 | 0.00 | 40.19 | 0.72 |
| Satellite Washing Vehicles[3] | | 36 | 2 | 10 | LDT2 | | 0.01 | 0.09 | 0.01 | 0.00 | 0.01 | 0.00 | 22.06 | 0.40 |
| Service Trucks[3] | | 264 | 1 | 10 | LDT2 | | 0.00 | 0.05 | 0.01 | 0.00 | 0.00 | 0.00 | 11.03 | 1.46 |
| Emergency Generators | | N/A | 2 | | N/A | | 1.02 | 19.30 | 11.01 | 0.02 | 0.63 | 0.62 | 2,227.20 | 55.68 |
| | | | | | | | | | | | | | **Total** | **226.32** |

1. Operational Emissions would result primarily from mobile sources including all operation and maintenance vehicles. It was assumed operation of the O&M building and Substation would not result in area source emissions generated from natural gas or landscaping.
2. Employees for O&M would be coming from Alpine, El Centro, and surrounding areas
3. For the purposes of modeling, it was assumed O&M vehicles would travel 10 miles per day
4. Assumed 22 work days per month for 12 months = 264 days/year for worker vehicles

Assumed washing would occur every 6-8 weeks or 9 washings per year, 4 days/wash = 36 days/year for washing vehicles

| | ROG | CO | NOx | SOx | PM10 | PM2.5 |
|---|---|---|---|---|---|---|
| Total | 1.71 | 25.84 | 11.83 | 0.03 | 1.08 | 0.76 |

**Rugged Solar Farm Project**
**GHG Emissions Summary**

| | $CO_2$ (tons/yr) | $CO_2E$ (Mtons/yr) |
|---|---|---|
| ***CONSTRUCTION*** | | |
| **2014** | | |
| Off-Road Diesel | 1,019.37 | 933.22 |
| Diesel Trucks | 1,257.46 | 1,142.01 |
| Passenger Vehicles | 286.72 | 273.80 |
| **Total for 2014** | 2,563.54 | **2,349.03** |
| | | |
| **2015** | | |
| Off-Road Diesel | 591.26 | 541.29 |
| Diesel Trucks | 841.76 | 764.48 |
| Passenger Vehicles | 255.44 | 243.93 |
| **Total for 2015** | 1,688.46 | **1,549.70** |
| *Annualized Construction Emissions* | | *129.96* |
| | | |
| ***OPERATION*** | | |
| Light-Duty Vehicles | 169.91 | 162.26 |
| Heavy-Duty Diesel Trucks | 0.72 | 0.66 |
| Emergency Generators | 55.68 | 50.97 |
| Gas-Insulated Switchgear | 4.48 | 4.07 |
| Electrical Generation | | 363.45 |
| Water Supply | | 2.83 |
| Wastewater | | 0.38 |
| Total Operational | 226.32 | **584.62** |

**Rugged Solar Farm Project**
**$CO_2$-to-$CO_2$ Equivalent Factors**

| | Source | Units | $CO_2$ | $CH_4$ | $N_2O$ | $CO_2E/CO_2$ |
|---|---|---|---|---|---|---|
| Global Warming Potential | | | 1 | 21 | 310 | |
| Diesel Equipment | 1 | kg/gal | 10.15 | 0.00058 | 0.00026 | 1.009 |
| Diesel Trucks | 2 | g/mi | 1,450.00 | 0.0051 | 0.0048 | 1.001 |
| Passenger Vehicles | 3 | | | | | 1.053 |
| Helicopters | 4 | g/gal | 8,320.00 | 7.04 | 0.11 | 1.022 |
| Electrical Generation | 5 | lb/MWh | 550.18 | 0.0302 | 0.0081 | 1.006 |

Serving Utility: SDG&E

1. California Climate Action Registry. 2009. *General Reporting Protocol: Reporting Entity-Wide Greenhouse Gas Emissions*, Version 3.1, Tables C.6 and C.7.
2. California Climate Action Registry. 2009. *General Reporting Protocol: Reporting Entity-Wide Greenhouse Gas Emissions*, Version 3.1, Tables C.3 and C.4.
3. US EPA, Office of Transportation and Air Quality. 2005. *Greenhouse Gas Emissions from a Typical Passenger Vehicle* (EPA420-F-05-004), p. 4.
4. California Climate Action Registry. 2009. *General Reporting Protocol: Reporting Entity-Wide Greenhouse Gas Emissions*, Version 3.1, Tables C.3 and C.6.
5. San Diego Gas & Electric. 2010. Annual Entity Emissions: Electric Power Generation/Electric Utility Sector. http://www.climateregistry.org/CarrotDocs/35/2009/2008_SDGE_PUP(March 26).xls adjusted to reflect an increase in renewables from 10% in 2009 to 33% in 2020 and California Climate Action Registry. 2009. *General Reporting Protocol: Reporting Entity-Wide Greenhouse Gas Emissions*, Version 3.1, Table C.2.

**Rugged Solar Farm Project**
**Greenhouse Gas Emissions from Project Electrical Demand**

| Land Use | Units | Electrical Demand Factor[1] (kW-hr/unit/yr) | Electric Demand (kW-hr/yr) | $CO_2E$ Emission Factor[2] (lbs $CO_2E$/kW-hr) | Annual $CO_2E$ Emissions (Mtons $CO_2E$/yr) |
|---|---|---|---|---|---|
| Miscellaneous (O&M Bldg.) | 7.50 ksf | 9,720 | 72,900 | 0.553 | 18.30 |
| Trackers/Inverters/Other | | | 1,375,203 | 0.553 | 345.16 |
| Total | | | 1,448,103 | | 363.45 |

Utility Region: SDG&E

Sources:

1. Itron, Inc. 2006. *California Commercial End-Use Survey*. Prepared for California Energy Commission, CEC-400-2006-005. March
2. San Diego Gas & Electric. 2010. Annual Entity Emissions: Electric Power Generation/Electric Utility Sector. http://www.climateregistry.org/CarrotDocs/35/2009/2008_SDGE_PUP(March 26).xls adjusted to reflect an increase in renewables from 10% in 2009 to 33% in 2020 and California Climate Action Registry. 2009. *General Reporting Protocol: Reporting Entity-Wide Greenhouse Gas Emissions,* Version 3.1, Table C.2.

Notes:

$CO_2E$ Carbon dioxide equivalent

## Electrical Usage Rate

| Land Use Type | Units | Usage Rate |
|---|---|---|
| Residential | kw-hr/unit/yr | 5,626.50 |
| Food Store | kw-hr/sq ft/yr | 53.30 |
| Restaurant | kw-hr/sq ft/yr | 47.45 |
| Hospital | kw-hr/sq ft/yr | 21.70 |
| Retail | kw-hr/sq ft/yr | 13.55 |
| College/University | kw-hr/sq ft/yr | 11.55 |
| High School | kw-hr/sq ft/yr | 10.50 |
| Elementary School | kw-hr/sq ft/yr | 5.90 |
| Office | kw-hr/sq ft/yr | 12.95 |
| Hotel/Motel | kw-hr/sq ft/yr | 9.95 |
| Warehouse | kw-hr/sq ft/yr | 4.35 |
| Miscellaneous | kw-hr/sq ft/yr | 10.50 |

Source: SCAQMD, *CEQA Air Quality Handbook* , Table A9-11-A
Average for Southern California Edison and Los Angeles Dept.
of Water and Power

**Rugged Solar Farm Project**
**Other Operational Electricity Usage**

| Equipment (per tracker) | Electrical Draw (watts) | Notes | Daily Operating Hours | Annual Electricity Usage (kWh) |
|---|---|---|---|---|
| Tracker Control Unit | 50 | Control unit uses energy during sunlight hours only. | 12 | 219 |
| Tracker Motor | 250 | Tracker motor runs for 1 minute every hour | 12 | 18 |
| Air Drying Unit | 192 | Air drying unit runs 1 hour per day and 10 hours every 3 weeks | | 103 |
| Total per Tracker | | | | 341 |
| Number of Trackers | 3,588 | | | |
| **Total Annual Electricity Usage** | | | | **1,222,109** |

| Equipment (per Building Block) | Electrical Draw (watts) | Notes | Daily Operating Hours | Annual Energy Usage (kWh) |
|---|---|---|---|---|
| Field Communications | 300 | Operates during sunlight hours | 12 | 1,314 |
| Inverters | 100 | Operates at night | 12 | 438 |
| PV Box Ventilation | 173 | Operates during sunlight hours | 12 | 758 |
| Total per Building Block | | | | 2,510 |
| Number of Building Blocks | 61 | | | |
| **Total Annual Electricity Usage** | | | | **153,094** |
| **Grand Total Annual Elecricity** | | | | **1,375,203** |

**Rugged Solar Farm Project**
**Gas-Insulated Switchgear**

| | | |
|---|---|---|
| $SF_6$ Capacity [1] | lbs | 75 |
| Leakage Rate [2] | %/year | 0.5% |
| Annual Leakage | lbs $SF_6$/year | 0.375 |
| GWP $SF_6$ | | 23,900 |
| Annual Emissions | tons $CO_2$E/year | 4.48 |
| | MT $CO_2$E/year | 4.07 |

1. Per estimate by CARB staff (pers. communication 3/6/13).
2. Typical upper-bound leakage rate for new devices.
   NEMA Guideline - 0.1%/year
   IEC Specification - 0.5%/year

Notes:

| | |
|---|---|
| $CO_2$E | Carbon dioxide equivalent |
| MT | metric tons (= 2,204.623 lbs) |

**Rugged Solar Farm Project**
**Greenhouse Gas Emissions from Project Water Supply**

| Land Use | Units | Acre-Feet per Year[1] | Electrical Demand Factor[2] (kW-hr/AF) | Electric Demand (kW-hr/yr) | $CO_2E$ Emission Factor[3] (lbs $CO_2E$/kW-hr) | Annual $CO_2E$ Emissions (Mtons $CO_2E$/yr) |
|---|---|---|---|---|---|---|
| N/A | N/A | 5.33 | 2,117 | 11,284 | 0.553 | 2.83 |

Sources:
1. Chapter 2.9, Hydrology and Water Quality, Soitec Solar Development Program EIR.
2. California Energy Commission. 2006. *Refining Estimates of Water Related Energy Use in California.*
   (Northern California factor for water supply and conveyance for local (non-SWP) water)
   http://www.energy.ca.gov/2006publications/CEC-500-2006-118/CEC-500-2006-118.PDF
3. San Diego Gas & Electric. 2010. Annual Entity Emissions: Electric Power Generation/Electric Utility Sector.
   http://www.climateregistry.org/CarrotDocs/35/2009/2008_SDGE_PUP(March 26).xls
   and California Climate Action Registry. 2009. *General Reporting Protocol: Reporting Entity-Wide Greenhouse Gas Emissions*
   Version 3.1, Table C.2.

Notes:

| | |
|---|---|
| $CO_2E$ | Carbon dioxide equivalent |
| kW-hr | kilowatt-hour |
| Mtons | metric tons (= 2,204.62 lbs) |

**Rugged Solar Farm Project**
**Greenhouse Gas Emissions from Project Wastewater Treatment**

| Gallons/Day | Liters/Day | Liter/Year | $CH_4$ Emission Factor[2] (MT/liter) | Annual $CH_4$ Emissions (Mton $CH_4$/yr) | Annual $CO_2E$ Emissions (Mtons $CO_2E$/yr) |
|---|---|---|---|---|---|
| 300 | 1,136 | 299,772 | 6.00E-08 | 0.018 | 0.38 |

Sources:
1. Daily wastewater generation from County of San Diego. 2010. Design Manual for Onsite Wastewater Treatment Systems, p. 38. (15 gal/person for day workers at offices per shift, 20 employees)
2. $CH_4$ emission factor from Environ. 2011. CalEEMod User's Guide, p. 33.

Notes:

| | |
|---|---|
| $CH_4$ | methane |
| $CO_2E$ | Carbon dioxide equivalent |
| Mtons | metric tons (= 2,204.62 lbs) |

# APPENDIX B

## *SCREEN 3 Model Results and Cancer Risk Calculations*

08/08/13
14:58:48

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 96043 ***

C:\Lakes\Screen View\Projects\Rugged Batch Plant Generators.scr

SIMPLE TERRAIN INPUTS:

```
   SOURCE TYPE            =        POINT
   EMISSION RATE (G/S)    =     0.310000E-02
   STACK HEIGHT (M)       =       1.8288
   STK INSIDE DIAM (M)    =       0.0634
   STK EXIT VELOCITY (M/S)=      76.0965
   STK GAS EXIT TEMP (K)  =     798.1500
   AMBIENT AIR TEMP (K)   =     293.0000
   RECEPTOR HEIGHT (M)    =       2.0000
   URBAN/RURAL OPTION     =        RURAL
   BUILDING HEIGHT (M)    =       0.0000
   MIN HORIZ BLDG DIM (M) =       0.0000
   MAX HORIZ BLDG DIM (M) =       0.0000
```

THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

STACK EXIT VELOCITY WAS CALCULATED FROM
VOLUME FLOW RATE = 0.24022102 (M**3/S)

BUOY. FLUX = 0.475 M**4/S**3; MOM. FLUX = 2.136 M**4/S**2.

*** STABILITY CLASS 4 ONLY ***

**********************************
*** SCREEN AUTOMATED DISTANCES ***
**********************************

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

| DIST (M) | CONC (UG/M**3) | STAB | U10M (M/S) | USTK (M/S) | MIX HT (M) | PLUME HT (M) | SIGMA Y (M) | SIGMA Z (M) | DWASH |
|---|---|---|---|---|---|---|---|---|---|
| 965. | 0.4147 | 4 | 1.0 | 1.0 | 320.0 | 16.30 | 66.06 | 31.44 | NO |
| 1000. | 0.3930 | 4 | 1.0 | 1.0 | 320.0 | 16.30 | 68.25 | 32.36 | NO |
| 1100. | 0.3442 | 4 | 1.0 | 1.0 | 320.0 | 16.30 | 74.43 | 34.37 | NO |
| 1200. | 0.3046 | 4 | 1.0 | 1.0 | 320.0 | 16.30 | 80.55 | 36.33 | NO |
| 1300. | 0.2718 | 4 | 1.0 | 1.0 | 320.0 | 16.30 | 86.62 | 38.23 | NO |
| 1400. | 0.2444 | 4 | 1.0 | 1.0 | 320.0 | 16.30 | 92.64 | 40.07 | NO |
| 1500. | 0.2213 | 4 | 1.0 | 1.0 | 320.0 | 16.30 | 98.63 | 41.87 | NO |

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 965. M:

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 965. | 0.4147 | 4 | 1.0 | 1.0 | 320.0 | 16.30 | 66.06 | 31.44 | NO |

DWASH= MEANS NO CALC MADE (CONC = 0.0)
DWASH=NO MEANS NO BUILDING DOWNWASH USED
DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

```
     ***************************************
     *** SUMMARY OF SCREEN MODEL RESULTS ***
     ***************************************

 CALCULATION         MAX CONC    DIST TO   TERRAIN
  PROCEDURE         (UG/M**3)    MAX (M)    HT (M)
 --------------    -----------   -------   -------
SIMPLE TERRAIN     0.4147           965.        0.

***************************************************
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
***************************************************
```

08/07/13
16:22:30

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 96043 ***

C:\Lakes\Screen View\Projects\TDS construction.scr

SIMPLE TERRAIN INPUTS:

| | | |
|---|---|---|
| SOURCE TYPE | = | VOLUME |
| EMISSION RATE (G/S) | = | 0.985568E-04 |
| SOURCE HEIGHT (M) | = | 5.0000 |
| INIT. LATERAL DIMEN (M) | = | 33.0800 |
| INIT. VERTICAL DIMEN (M) | = | 1.1600 |
| RECEPTOR HEIGHT (M) | = | 2.0000 |
| URBAN/RURAL OPTION | = | RURAL |

THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

BUOY. FLUX = 0.000 M**4/S**3; MOM. FLUX = 0.000 M**4/S**2.

*** STABILITY CLASS 4 ONLY ***

**********************************
*** SCREEN AUTOMATED DISTANCES ***
**********************************

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

| DIST (M) | CONC (UG/M**3) | STAB | U10M (M/S) | USTK (M/S) | MIX HT (M) | PLUME HT (M) | SIGMA Y (M) | SIGMA Z (M) | DWASH |
|---|---|---|---|---|---|---|---|---|---|
| 100. | 0.9392E-01 | 4 | 1.0 | 1.0 | 320.0 | 5.00 | 39.75 | 5.46 | NO |
| 200. | 0.6233E-01 | 4 | 1.0 | 1.0 | 320.0 | 5.00 | 46.26 | 9.24 | NO |
| 300. | 0.4312E-01 | 4 | 1.0 | 1.0 | 320.0 | 5.00 | 52.69 | 12.63 | NO |
| 400. | 0.3180E-01 | 4 | 1.0 | 1.0 | 320.0 | 5.00 | 59.03 | 15.78 | NO |
| 500. | 0.2455E-01 | 4 | 1.0 | 1.0 | 320.0 | 5.00 | 65.30 | 18.79 | NO |
| 600. | 0.1962E-01 | 4 | 1.0 | 1.0 | 320.0 | 5.00 | 71.51 | 21.69 | NO |
| 700. | 0.1610E-01 | 4 | 1.0 | 1.0 | 320.0 | 5.00 | 77.67 | 24.50 | NO |
| 800. | 0.1349E-01 | 4 | 1.0 | 1.0 | 320.0 | 5.00 | 83.77 | 27.23 | NO |
| 900. | 0.1149E-01 | 4 | 1.0 | 1.0 | 320.0 | 5.00 | 89.82 | 29.91 | NO |
| 1000. | 0.1002E-01 | 4 | 1.0 | 1.0 | 320.0 | 5.00 | 95.83 | 32.21 | NO |

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 100. M:

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 100. | 0.9392E-01 | 4 | 1.0 | 1.0 | 320.0 | 5.00 | 39.75 | 5.46 | NO |

DWASH= MEANS NO CALC MADE (CONC = 0.0)
DWASH=NO MEANS NO BUILDING DOWNWASH USED
DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

```
**********************************
*** SCREEN DISCRETE DISTANCES ***
**********************************

*** TERRAIN HEIGHT OF    0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

  DIST     CONC             U10M   USTK  MIX HT   PLUME   SIGMA   SIGMA
   (M)   (UG/M**3)   STAB  (M/S)  (M/S)    (M)   HT (M)   Y (M)   Z (M)  DWASH
-------  ----------  ----  -----  -----  ------  ------  ------  ------  -----
   107.  0.9172E-01    4     1.0    1.0   320.0    5.00   40.19    5.72    NO

 DWASH=   MEANS NO CALC MADE (CONC = 0.0)
 DWASH=NO MEANS NO BUILDING DOWNWASH USED
 DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
 DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
 DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

      ***************************************
      *** SUMMARY OF SCREEN MODEL RESULTS ***
      ***************************************

 CALCULATION        MAX CONC    DIST TO   TERRAIN
  PROCEDURE        (UG/M**3)    MAX (M)    HT (M)
--------------    -----------   -------   -------
SIMPLE TERRAIN     0.9392E-01      100.        0.


***************************************************
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
***************************************************
```

**Rugged Construction Equipment and Trucks**
**Cancer Risk Calculations**

| | | | 1 Year Exposure Adult |
|---|---|---|---|
| CPF | Cancer Potency Factor | $(mg/kg\text{-}day)^{-1}$ | 1.1 |
| $C_{air}$ | Concentration | $\mu g/m^3$ | 0.0094 |
| DBR | Daily Breathing Rate | L/kg-day | 302 |
| A | Absorption Factor | unitless | 1 |
| EF | Exposure Frequency | days | 350 |
| ED | Exposure Duration | years | 1 |
| AT | Averaging Time | days | 25,550 |
| | Dosage - Inhalation | | 3.9E-08 |
| | Cancer Risk | | 4.3E-08 |

Cancer Risk = CPF*Dosage

Dose Inhalation = $C_{air}$*DBR*A*EF*ED*$10^{-6}$ / AT