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PROGRAM ENVIRONMENTAL IMPACT REPORT

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# WESTLANDS SOLAR PARK MASTER PLAN AND WSP GEN-TIE CORRIDORS PLAN

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STATE CLEARINGHOUSE NO. 2013031043

## WESTLANDS WATER DISTRICT

OCTOBER 2017

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**Prepared by**

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**September 2017**

# *WESTLANDS SOLAR PARK AND GEN-TIE CORRIDORS PROGRAM-LEVEL AIR QUALITY ASSESSMENT KINGS COUNTY, CALIFORNIA*

## September 2017

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# INTRODUCTION

This report assesses the air quality impacts associated with implementation of the Westlands Solar Park (WSP) Master Plan. The WSP Master Plan Area ("Plan Area") is located in an unincorporated portion of Kings County, California, east of Interstate 5, between Avenal Cutoff Road and State Route 41, approximately 9 miles southwest of Lemoore, Ca.. The WSP Plan Area covers approximately 21,000 acres. The WSP consists of 12 subareas or solar development sites, each of which is planned to be occupied by a separate and distinct solar generating facility (SGF) to be constructed independently by third party solar development companies. The WSP Master Plan is intended to provide the overall planning framework within which each independent SGF will be developed, and the WSP EIR is intended to provide only programmatic or plan level environmental review for the Master Plan under CEQA. Prior to development, each SGF project will be required to obtain its own Conditional Use Permits (CUPs) and other entitlements from Kings County. During the County's review of each SGF application, it will undertake project-specific environmental review under CEQA, which will include a construction-level air quality assessment. The required permit applications for the San Joaquin Valley Air Pollution Control District (SJVAPCD) also will be submitted at the project entitlement stage for each SGF.

For purposes of evaluating the plan-level environmental impacts associated with implementation of the WSP Master Plan, the Plan Area was divided into twelve (12) subareas or potential development sites for hypothetical SGFs. For purposes of analysis, assumptions were made regarding the size and construction schedule for each SGF. The first SGF is assumed to begin construction in 2016, and the final ($12^{th}$) SGF is assumed to begin construction in late 2029.

Related to the WSP Master Plan are two generation-interconnection tie-lines (gen-ties), each approximately 11.5 miles long, connecting the WSP Plan Area to the Gates Substation. These gen-tie corridors are also in the initial planning stages, and therefore the WSP EIR provides only programmatic environmental review for these gen-tie corridors under CEQA. The gen-tie corridors are listed below:

- WSP-North to Gates Gen-Tie
- WSP-South to Gates Gen-Tie

The development assumptions also included supporting electrical facilities such as switching stations and substations, which would be constructed or upgraded as needed in conjunction with WSP development and gen-tie line construction. These facilities are anticipated to include two (2) 230kV switchyards within the WSP plan area, and upgrades to the existing PG&E substation at Gates.

The potential impacts of WSP solar and gen-tie projects on the local and regional air quality during construction and operation are assessed in this report. Development projects of this type in the San Joaquin Valley are most likely to cause air quality impacts from emissions generated during construction and indirect emissions from vehicles used to transport site employees and for vehicles dedicated for onsite maintenance uses. The San Joaquin Valley Air Pollution Control District (SJVAPCD) has published the Guide for Assessing and Mitigating Air Quality Impacts

(GAMAQI, Final Draft, March 2015) that was used to conduct this air quality analysis.[1] This report describes existing air quality conditions, construction period air quality impacts, operational air quality impacts (at both a local and regional scale), and identifies mitigation measures necessary to reduce or eliminate air quality impacts identified as significant.

# SETTING

## TOPOGRAPHIC CONSIDERATIONS

The WSP and related gen-tie corridors are located in the southwestern portion of the San Joaquin Valley Air Basin. The California Air Resources Board (CARB) defines the boundaries of the basin by the San Joaquin Valley within the Sierra Nevada Mountains to the east, the Coast Ranges in the west, and the Tehachapi mountains in the south. The valley is basically flat with a slight downward gradient to the northwest. The valley opens to the ocean at the Carquinez Strait where the San Joaquin-Sacramento Delta empties into San Francisco Bay. The San Joaquin Valley, thus, could be considered a "bowl" with the primary opening to the north. The surrounding topographic features restrict air movement through and out of the basin and, as a result, impede the dispersion of air pollutants from the basin. Wind flow is usually down the valley from the north, but the Tehachapi Mountains block or restrict the southward progression of airflow. The Sierra Nevada is a substantial barrier from the usual winds that have a general westerly flow. The topographical features result in weak airflow. The flow is further restricted vertically by inversion layers that are common in the San Joaquin Valley air basin throughout the year. An inversion layer is created when a mass of warm dry air sits over cooler air near the ground, preventing vertical dispersion of pollutants from the air mass below. During the summer, the San Joaquin Valley experiences daytime temperature inversions at elevations from 1,500 to 3,000 feet above the valley floor. Airflow is considerably restricted since mountain ranges surrounding the valley are generally above the inversion. These inversions lead to a buildup of ozone and ozone precursor pollutants. During the fall and winter months, strong surface-based inversions occur from 500 to 1,000 feet above the valley floor (SJVAPCD 1998). Wintertime inversions trap very stable air near the surface and lead primarily to a buildup of particulate matter air pollutants. Very light winds are also characteristic with these wintertime surface-based inversions.

## AIR BASIN CHARACTERISTICS

The climate of the project area is characterized by hot dry summers and cool, mild winters. Clear days are common from spring through fall. Daytime temperatures in the summer often approach or exceed 100 degrees, with lows in the 60s. In the winter, daytime temperatures are usually in the 50s, with lows around 35 degrees. Radiation fog is common in the winter, and may persist for days. Partly to mostly cloudy days are common in winter, as most precipitation received in the Valley falls from November through April.

Winds are predominantly up-valley (flowing from the north) in all seasons, but more so in the summer and spring months (CARB 1984). In this flow, winds are usually from the north end of

[1] SJVAPCD. 2015. Guide for Assessing and Mitigating Air Quality Impacts. Revised March 2015.

the Valley and flow in a south-southeasterly direction, through Tehachapi Pass, into the Southeast Desert Air Basin. Annually, up-valley wind flow (i.e., northwest flow with marine air) is most common, occurring about 40% of the time. This type of flow is usually trapped below marine and subsidence inversions, restricting outflow through the Sierra Nevada and Tehachapi Mountains. The occurrence of this wind flow is almost 70% of the time in summer, but less than 20% of the time in winter. Winter and fall are characterized by mostly light and variable wind flow. Pacific storm systems do bring southerly flows to the valley during late fall and winter. Light and variable winds, less than 10 miles per hour (mph), are common in the colder months.

Superimposed on this seasonal regime is the diurnal wind cycle. In the Valley, this cycle takes the form of a combination of a modified sea breeze-land breeze and mountain-valley regimes. The sea breeze-land breeze regime typically has a modified sea breeze flowing into the Valley from the north during the late day and evening and then a land breeze flowing out of the Valley late at night and early in the morning. The mountain-valley regime has an upslope (mountain) flow during the day and a down slope (valley) flow at night. These effects create a complexity of regional wind flow and pollutant transport within the Valley.

The pollution potential of the San Joaquin Valley is very high. The San Joaquin Valley has one of the most severe air pollution problems in the State and the Country. Surrounding elevated terrain in conjunction with temperature inversions frequently restrict lateral and vertical dilution of pollutants. Abundant sunshine and warm temperatures in late spring, summer, and early fall are ideal conditions for the formation of ozone, where the Valley frequently experiences unhealthy air pollution days. Low wind speeds, combined with low inversion layers in the winter, create a climate conducive to high respirable particulate matter ($PM_{10}$) concentrations and elevated carbon monoxide (CO) levels.

## REGULATORY SETTING

The Federal and California Clean Air Acts have established ambient air quality standards for different pollutants. National ambient air quality standards (NAAQS) were established by the Federal Clean Air Act of 1970 (amended in 1977 and 1990) for six "criteria" pollutants. These criteria pollutants now include carbon monoxide (CO), ozone ($O_3$), nitrogen dioxide ($NO_2$), respirable particulate matter with a diameter less than 10 microns ($PM_{10}$), sulfur dioxide ($S0_2$), and lead (Pb). In 1997, the Environmental Protection Agency (EPA) added fine particulate matter ($PM_{2.5}$) as a criteria pollutant. The air pollutants for which standards have been established are considered the most prevalent air pollutants that are known to be hazardous to human health. California ambient air quality standards (CAAQS) include the NAAQS pollutants and also hydrogen sulfide, sulfates, vinyl chloride, and visibility reducing particles. These additional CAAQS pollutants tend to have unique sources and are not typically examined in environmental air quality assessments. In addition, lead concentrations have decreased dramatically since it was removed from motor vehicle fuels.

### Federal Regulations

At the federal level, the United States Environmental Protection Agency (US EPA) administers and enforces air quality regulations. Federal air quality regulations were developed primarily from implementation of the Federal Clean Air Act. If an area does not meet NAAQS over a set period (three years), EPA designates it as a "nonattainment" area for that particular pollutant. EPA requires states that have areas that do not comply with the national standards to prepare and submit air quality plans showing how the standards would be met. If the states cannot show how the standards would be met, then they must show progress toward meeting the standards. These plans are referred to as the State Implementation Plan (SIP). Under severe cases, EPA may impose a federal plan to make progress in meeting the federal standards.

EPA also has programs for identifying and regulating hazardous air pollutants. The Clean Air Act requires EPA to set standards for these pollutants and sharply reduce emissions of controlled chemicals. Industries were classified as major sources if they emitted certain amounts of hazardous air pollutants. The US EPA also sets standards to control emissions of hazardous air pollutants through mobile source control programs. These include programs that reformulated gasoline, national low emissions vehicle standards, Tier 2 motor vehicle emission standards, gasoline sulfur control requirements, and heavy-duty engine standards.

The San Joaquin Valley Air Basin is subject to major air quality planning programs required by the federal Clean Air Act (CAA) (1977, last amended in 1990, 42 United States Code [USC] 7401 *et seq.*) to address ozone, particulate matter air pollution, and carbon monoxide. The CAA requires that regional planning and air pollution control agencies prepare a regional Air Quality Plan to outline the measures by which both stationary and mobile sources of pollutants can be controlled in order to achieve all standards within the deadlines specified in the Clean Air Act. These plans are submitted to the State, which after approval, submits them to US EPA as the State Implementation Plan (SIP).

State Regulations

The California Clean Air Act of 1988, amended in 1992, outlines a program for areas in the State to attain the CAAQS by the earliest practical date. The California Air Resources Board (CARB) is the state air pollution control agency and is a part of the California EPA. The California Clean Air Act (CCAA) sets more stringent air quality standards for all of the pollutants covered under national standards, and additionally regulates levels of vinyl chloride, hydrogen sulfide, sulfates, and visibility-reducing particulates. If an area does not meet CAAQS, CARB designates the area as a nonattainment area. The San Joaquin Valley Air Basin does not meet the CAAQS for ozone, $PM_{10}$, and $PM_{2.5}$. CARB requires regions that do not meet CAAQS for ozone to submit clean air plans that describe plans to attain the standard or show progress toward attainment.

In addition to the US EPA, CARB further regulates the amount of air pollutants that can be emitted by new motor vehicles sold in California. Motor vehicle emissions standards have always been more stringent than federal standards since they were first imposed in 1961. CARB has also developed Inspection and Maintenance (I/M) and "Smog Check" programs with the California Bureau of Automotive Repair. Inspection programs for trucks and buses have also been implemented. CARB also sets standards for motor vehicle fuels sold in California.

San Joaquin Valley

The San Joaquin Valley Air Pollution Control District (SJVAPCD) is made up of eight counties in California's Central Valley: San Joaquin, Stanislaus, Merced, Madera, Fresno, Kings, Tulare and the San Joaquin Valley portion of Kern. The primary role of the SJVAPCD is to develop plans and implement control measures in the San Joaquin Valley to control air pollution. These controls primarily affect stationary sources such as industry and power plants. Rules and regulations have been developed by SJVAPCD to control air pollution from a wide range of air pollution sources. In March 2007, an Indirect Source Review (ISR) rule was adopted that controls air pollution from new land developments. SJVAPCD also conducts public education and outreach efforts such as the Spare the Air, Wood Burning, and Smoking Vehicle voluntary programs.

## NATIONAL AND STATE AMBIENT AIR QUALITY STANDARDS

The CAA and CCAA promulgate, respectively, national and state ambient air quality standards. Air quality standards have been established by US EPA (i.e., NAAQS) and California (i.e., CAAQS) for specific air pollutants most pervasive in urban environments. The NAAQS and CAAQS are shown in Table 1. Ambient standards specify the concentration of pollutants to which the public may be exposed without adverse health effects. Individuals vary widely in their sensitivity to air pollutants, and standards are set to protect more pollution-sensitive populations (e.g., children and the elderly). National and state standards are reviewed and updated periodically based on new health studies. California ambient standards tend to be at least as protective as national ambient standards and are often more stringent. For planning purposes, regions like the San Joaquin Valley Air Basin are given an air quality status designation by the federal and state regulatory agencies. Areas with monitored pollutant concentrations that are lower than ambient air quality standards are designated "attainment" on a pollutant-by-pollutant basis. When monitored concentrations exceed ambient standards within an air basin, it is designated "nonattainment" for that pollutant. US EPA designates areas as "unclassified" when insufficient data are available to determine the attainment status; however, these areas are typically considered to be in attainment of the standard.

## CRITERIA AIR POLLUTANTS AND THEIR HEALTH EFFECTS

The primary criteria air pollutants emitted by the proposed Project include ozone ($O_3$) precursors ($NO_x$ and ROG), carbon monoxide (CO), and suspended particulate matter ($PM_{10}$ and $PM_{2.5}$). Other criteria pollutants, such as lead (Pb) and sulfur dioxide ($SO_2$), would not be substantially emitted by the proposed Project or Project traffic, and air quality standards for them are being met throughout the San Joaquin Valley Air Basin.

**TABLE 1 Ambient Air Quality Standards**[2]

| Pollutant | Averaging Time | California Standards Concentration | National Standards Concentration |
|---|---|---|---|
| Ozone | 1-hour | 0.09 ppm (180 µg/$m^3$) | — |
| | 8-hour | 0.070 ppm (137 µg/$m^3$) | 0.070 ppm (137 µg/$m^3$) (3-year average of annual 4$^{th}$ highest daily maxima) |
| Carbon Monoxide | 8-hour | 9.0 ppm (10,000 µg/$m^3$) | 9 ppm (10,000 µg/$m^3$) |
| | 1-hour | 20 ppm (23,000 µg/$m^3$) | 35 ppm (40,000 µg/$m^3$) |
| Nitrogen dioxide | Annual Average | 0.030 ppm (57 µg/$m^3$) | 0.053 ppm (100 µg/$m^3$) |
| | 1-hour | 0.18 ppm (339 µg/$m^3$) | 0.100 ppm (188 µg/$m^3$) (3-year average of annual 98$^{th}$ percentile daily maxima) |
| Sulfur dioxide | Annual | - | Not applicable in SJV |
| | 24-hour | 0.04 ppm (105 µg/$m^3$) | Not applicable in SJV |
| | 3-hour | — | 0.5 ppm (1,300 µg/$m^3$) |
| | 1-hour | 0.25 ppm (655 µg/$m^3$) | 0.075 ppm (196 µg/$m^3$) (3-year average of annual 99$^{th}$ percentile daily maxima) |
| Respirable particulate matter (10 micron) | 24-hour | 50 µg/$m^3$ | 150 µg/$m^3$ |
| | Annual Arithmetic Mean | 20 µg/$m^3$ | — |
| Fine particulate matter (2.5 micron) | Annual Arithmetic Mean | 12 µg/$m^3$ | 12.0 µg/$m^3$ (3-year average) |
| | 24-hour | — | 35 µg/$m^3$ (3-year average of annual 98$^{th}$ percentile daily concentrations) |
| Sulfates | 24-hour | 25 µg/$m^3$ | — |
| Lead | 30-day | 1.5 µg/$m^3$ | — |
| | 3 Month Rolling Average | — | 0.15 µg/$m^3$ |

Source: CARB website, 10/1/15.
$SO_2$ Federal 24 hour and annual standards are not applicable in the SJVAPCD.
µg/$m^3$ = micrograms per cubic meter
ppm = parts per million

[2] Source: California Air Resources Board (http://www.arb.ca.gov)

Ozone ($O_3$)

While $O_3$ serves a beneficial purpose in the upper atmosphere (stratosphere) by reducing ultraviolet radiation potentially harmful to humans, when it reaches elevated concentrations in the lower atmosphere it can be harmful to the human respiratory system and to sensitive species of plants. $O_3$ concentrations build to peak levels during periods of light winds, bright sunshine, and high temperatures. Research has shown that exposure to ozone damages the alveoli (the individual air sacs in the lung where the exchange of oxygen and carbon dioxide between the air and blood takes place). Ozone is a strong irritant that attacks the respiratory system, leading to the damage of lung tissue. Short-term $O_3$ exposure can reduce lung function in children, make persons susceptible to respiratory infection, and produce symptoms that cause people to seek medical treatment for respiratory distress. Long-term exposure can impair lung defense mechanisms and lead to emphysema and chronic bronchitis. A healthy person exposed to high concentrations may become nauseated or dizzy, may develop headache or cough, or may experience a burning sensation in the chest. Sensitivity to $O_3$ varies among individuals, but about 20 percent of the population is sensitive to $O_3$, with exercising children being particularly vulnerable.

$O_3$ is formed in the atmosphere by a complex series of photochemical reactions that involve "ozone precursors" that are two families of pollutants: oxides of nitrogen ($NO_x$) and reactive organic gases (ROG). $NO_x$ and ROG are emitted from a variety of stationary and mobile sources. While $NO_2$, an oxide of nitrogen, is another criteria pollutant itself, ROGs are not in that category, but are included in this discussion as $O_3$ precursors. Recently, CARB adopted an 8-hour health based standard for $O_3$ of 0.070 ppm. More recently, US EPA revised the 8-hour NAAQS for $O_3$ from 0.08 ppm to 0.075 ppm.

Carbon Monoxide (CO)

CO is a colorless, odorless, poisonous gas. Carbon monoxide's health effects are related to its affinity for hemoglobin in the blood. Exposure to high concentrations of CO reduces the oxygen-carrying capacity of the blood and can cause dizziness and fatigue, and causes reduced lung capacity, impaired mental abilities and central nervous system function, and induces angina in persons with serious heart disease. Primary sources of CO in ambient air are passenger cars, light-duty trucks, and residential wood burning. The monitored CO levels in the Valley during the last 10 years have been well below ambient air quality standards.

Nitrogen Dioxide ($NO_2$)

The major health effect from exposure to high levels of $NO_2$ is the risk of acute and chronic respiratory disease. $NO_2$ is a combustion by-product, but it can also form in the atmosphere by chemical reaction. $NO_2$ is a reddish-brown colored gas often observed during the same conditions that produce high levels of $O_3$ and can affect regional visibility. $NO_2$ is one compound in a group of compounds consisting of oxides of nitrogen ($NO_x$). As described above, $NO_x$ is an $O_3$ precursor compound. Monitored levels of $NO_2$ in the Valley are below ambient air quality standards.

Particulate Matter (PM)

Respirable particulate matter ($PM_{10}$) and fine particulate matter ($PM_{2.5}$) consist of particulate matter that is 10 microns or less in diameter and 2.5 microns or less in diameter, respectively. $PM_{10}$ and $PM_{2.5}$ represent fractions of particulate matter that can be inhaled and cause adverse health effects. $PM_{10}$ and $PM_{2.5}$ are a health concern, particularly at levels above the Federal and

State ambient air quality standards. $PM_{2.5}$ (including diesel exhaust particles) is thought to have greater effects on health because minute particles are able to penetrate to the deepest parts of the lungs. Scientific studies have suggested links between fine particulate matter and numerous health problems including asthma, bronchitis, acute and chronic respiratory symptoms such as shortness of breath and painful breathing. Children are more susceptible to the health risks of $PM_{2.5}$ because their immune and respiratory systems are still developing. These fine particulates have been demonstrated to decrease lung function in children. Certain components of PM are linked to higher rates of lung cancer. Very small particles of certain substances (e.g., sulfates and nitrates) can also directly cause lung damage or can contain absorbed gases (e.g., chlorides or ammonium) that may be injurious to health.

Particulate matter in the atmosphere results from many kinds of dust- and fume-producing industrial and agricultural operations, fuel combustion, and atmospheric photochemical reactions. Some sources of particulate matter, such as mining and demolition and construction activities, are more local in nature, while others, such as vehicular traffic, have a more regional effect. In addition to health effects, particulates also can damage materials and reduce visibility. Dust comprised of large particles (diameter greater than 10 microns) settles out rapidly and is more easily filtered by human breathing passages. This type of dust is considered more of a soiling nuisance rather than a health hazard.

In 1983, CARB replaced the standard for “suspended particulate matter” with a standard for suspended $PM_{10}$ or “respirable particulate matter.” This standard was set at 50 micrograms per cubic meter ($\mu g/m^3$) for a 24-hour average and 30 $\mu g/m^3$ for an annual average. CARB revised the annual $PM_{10}$ standard in 2002, pursuant to the Children's Environmental Health Protection Act. The revised $PM_{10}$ standard is 20 $\mu g/m^3$ for an annual average. $PM_{2.5}$ standards were first promulgated by the EPA in 1997 and were since revised to lower the 24-hour $PM_{2.5}$ standard to 35 $\mu g/m^3$ for 24-hour exposures. That same action by EPA and revoked the annual $PM_{10}$ standard due to lack of scientific evidence correlating long-term exposures of ambient $PM_{10}$ with health effects. CARB has only adopted an annual average $PM_{2.5}$ standard, which is set at 12 $\mu g/m^3$. This is equal to the NAAQS of 12 $\mu g/m^3$.

## TOXIC AIR CONTAMINANTS

Besides the "criteria" air pollutants, there is another group of substances found in ambient air referred to as Hazardous Air Pollutants (HAPs) under the Federal Clean Air Act and Toxic Air Contaminants (TACs) under the California Clean Air Act. These contaminants tend to be localized and are found in relatively low concentrations in ambient air. However, they can result in adverse chronic health effects if exposure to low concentrations occurs for long periods. They are regulated at the local, state, and federal level.

HAPs are the air contaminants identified by US EPA as known or suspected to cause cancer, serious illness, birth defects, or death. Many of these contaminants originate from human activities, such as fuel combustion and solvent use. Mobile source air toxics (MSATs) are a subset of the 188 HAPS. Of the 21 HAPs identified by EPA as MSATs, a priority list of six priority HAPs were identified that include: diesel exhaust, benzene, formaldehyde, acetaldehyde, acrolein, and 1,3-butadiene. While vehicle miles traveled in the United States is expected to increase by 64% over the period 2000 to 2020, emissions of MSATs are anticipated to decrease substantially as a result of efforts to control mobile source emissions (by 57% to 67% depending on the contaminant)[3].

California developed a program under the Tanner Toxics Act (Assembly Bill [AB] 1807) to identify, characterize and control TACs. Subsequently, AB 2728 incorporated all 188 HAPs into the AB 1807 process. TACs include all HAPs plus other containments identified by CARB. These are a broad class of compounds known to cause morbidity or mortality (cancer risk). TACs are found in ambient air, especially in urban areas, and are caused by industry, agriculture, fuel combustion, and commercial operations (e.g., dry cleaners). TACs are typically found in low concentrations, even near their source (e.g., diesel particulate matter near a freeway). Because chronic exposure can result in adverse health effects, TACs are regulated at the regional, state, and federal level.

Particulate matter from diesel exhaust is the predominant TAC in urban air and is estimated to represent about 70 percent of the cancer risk from TACs (based on the statewide average). According to CARB, diesel exhaust is a complex mixture of gases, vapors and fine particles. This complexity makes the evaluation of health effects of diesel exhaust a complex scientific issue. Some chemicals in diesel exhaust, such as benzene and formaldehyde, have been previously identified as TACs by ARB, and are listed as carcinogens either under State Proposition 65 or under the Federal Hazardous Air Pollutants programs.

CARB reports that recent air pollution studies have shown an association that diesel exhaust and other cancer-causing toxic air contaminants emitted from vehicles are responsible for much of the overall cancer risk from TACs in California. Particulate matter emitted from diesel-fueled engines (diesel particulate matter [DPM]) was found to comprise much of that risk. In August 1998, CARB formally identified DPM as a TAC. Diesel particulate matter is of particular concern since it can be distributed over large regions, thus leading to widespread public exposure. The particles emitted by diesel engines are coated with chemicals, many of which have been identified by EPA as HAPs, and by CARB as TACs. Diesel engines emit particulate matter at a rate about 20 times greater than comparable gasoline engines. The vast majority of diesel exhaust particles (over 90 percent) consist of $PM_{2.5}$, which are the particles that can be inhaled deep into the lung. Like other particles of this size, a portion will eventually become trapped within the lung possibly leading to adverse health effects. While the gaseous portion of diesel exhaust also contains TACs, CARB's 1998 action was specific to DPM, which accounts for much of the cancer-causing potential from diesel exhaust. California has adopted a comprehensive diesel risk reduction program to reduce DPM emissions 85 percent by 2020. The U.S. EPA and CARB adopted low sulfur diesel fuel standards in 2006 that reduce diesel particulate matter substantially. Between 2006 and 2012, statewide ambient DPM concentrations were reduced almost 50 percent[4].

Smoke from residential wood combustion can be a source of TACs. Wood smoke is typically emitted during wintertime when dispersion conditions are poor. Localized high TAC concentrations can result when cold stagnant air traps smoke near the ground and, with no wind;

[3] Federal Highway Administration, 2006. Interim Guidance on Air Toxic Analysis in NEPA Documents.

the pollution can persist for many hours, especially in sheltered valleys during winter. Wood smoke also contains a significant amount of $PM_{10}$ and $PM_{2.5}$. Wood smoke is an irritant and is implicated in worsening asthma and other chronic lung problems.

Exposure to TACs is usually evaluated in terms of health risk or cancer risk. For cancer health effects, the risk is expressed as the number of chances in a population of a million people who might be expected to get cancer over a 70-year lifetime Based on CARB's 2012 estimates of statewide exposure, DPM is estimated to increase statewide cancer risk by 520 cancers per million residents exposed over a lifetime[4].

## EXISTING AIR QUALITY

As previously discussed, the San Joaquin Valley experiences poor air quality conditions, due primarily to elevated levels of ozone and particulate matter. CARB, in cooperation with SJVAPCD, monitors air quality throughout the San Joaquin Valley Air Basin. Monitoring data presented in Table 2 was derived for each pollutant based upon the closest monitoring station to the project site. Ozone standards are exceeded on about 40 to 53 days annually. On an annual basis, the PM2.5 standards are exceed on an estimated 25 to 34 days and PM10 standards are exceeded 121 to 139 days (note that these pollutants are measured every sixth day).

**TABLE 2 Summary of Criteria Air Pollution Monitoring Data for Kings County[5]**

| Pollutant | Standard | Monitored Values | | |
|---|---|---|---|---|
| | | 2014 | 2015 | 2016 |
| Ozone (ppm) | State 1-Hour | 0.108 | 0.119 | 0.097 |
| Ozone (ppm) | State 8-Hour | 0.095 | 0.094 | 0.088 |
| Ozone (ppm) | Federal 8-Hour | 0.094 | 0.094 | 0.088 |
| $PM_{10}$ (ug/m3) | Federal 24-Hour | 131 | 137 | 152 |
| $PM_{10}$ (ug/m3) | State 24-Hour | 126 | 109 | 110 |
| $PM_{2.5}$ (ug/m3) | Federal 24-Hour | 96.7 | 98.2 | 59.7 |
| Carbon Monoxide (ppm) | State/Federal 8-Hour | ND | ND | ND |
| Nitrogen Dioxide (ppb) | State 1-Hour | 50 | 51 | 52 |

Note: (1) Monitored values are the high values considering the form of the applicable standard.

<u>Ozone</u>

In California, ozone concentrations are generally lower near the coast than inland. The inland regions, such as the San Joaquin Valley, typically experience some of the higher ozone concentrations. This is because of the greater frequency of hot days and stagnant conditions that are conducive to ozone formation. Some areas of the Valley lie downwind of urban areas that are a source of ozone precursor pollutants.

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[4] California Air Resources Board - Overview: Diesel Exhaust and Health. (www.arb.gov/research/diesel/diesel-health.htm )

[5] California Air Resources Board - Air Quality Data Statistics (http://www.arb.ca.gov/adam/welcome.html)

Particulate Matter ($PM_{2.5}$ and $PM_{10}$)

Most areas of California have either 24-hour or annual $PM_{10}$ concentrations that exceed the State standards. Most urban areas exceed the State annual standard and the 2006 24-hour federal standard. In the San Joaquin Valley, there is a strong seasonal variation in PM, with higher $PM_{10}$ and $PM_{2.5}$ concentrations in the fall and winter months. These higher concentrations are caused by increased activity for some emission sources and meteorological conditions that are conducive to the build-up of particulate matter. Industry and motor vehicles consistently emit particulate matter. Seasonal sources of particulate matter in San Joaquin Valley include wildfires, agricultural activities, windblown dust, and residential wood burning. In California, area sources, which are primarily fugitive dust, account for the majority of directly emitted particulate matter. This includes dust from paved and unpaved roads. CARB estimates that 85 percent of directly emitted $PM_{10}$ and 66 percent of directly emitted $PM_{2.5}$ is from area sources. During the winter, the $PM_{2.5}$ size fraction makes up much of the total particulate matter concentrations. The major contributor to high levels of ambient $PM_{2.5}$ is the secondary formation of particulate matter caused by the reaction of $NO_x$ and ammonium to form ammonium nitrate. CARB estimates that the secondary portion of $PM_{2.5}$ makes up about 50 percent of the annual concentrations in the San Joaquin Valley[6]. The San Joaquin Valley also records high $PM_{10}$ levels during the fall. During this season, both the coarse fraction (from dust) and the $PM_{2.5}$ fraction result in elevated $PM_{2.5}$ and $PM_{10}$ concentrations.

Carbon Monoxide

State and federal standards for carbon monoxide are met throughout California as a result of cleaner vehicles and fuels that were reformulated in the 1990s. For CO, the monitored value used was the air basin average data, as this value most likely represents the average air quality in the project area.

Other Pollutants

Air monitoring data indicate that the San Joaquin Valley meets ambient air quality standards all other air pollutants.

Air Quality Trends

Air quality in the Valley has improved significantly despite a natural low capacity for pollution, created by unique geography, topography, and meteorology. Emissions have been reduced at a rate similar or better than other areas in California. Since 1990, emissions of ozone precursors (i.e., $NO_x$ and ROG) have been reduced by 40% or greater, resulting in much fewer days where ozone standards have been exceeded. Direct emissions of $PM_{10}$ and $PM_{2.5}$ have been reduced by 10% to 13%. As a result, the San Joaquin Valley is the first air basin classified as "serious nonattainment" under the NAAQS to come into attainment of the $PM_{10}$ standards.

## ATTAINMENT STATUS

Areas that do not violate ambient air quality standards are considered to have attained the standard. Violations of ambient air quality standards are based on air pollutant monitoring data and are

[6] CARB. 2009. The California Almanac of Emissions and Air Quality. See http://www.arb.ca.gov/aqd/almanac/almanac09/almanac09.htm

judged for each air pollutant. The San Joaquin Valley as a whole does not meet State or federal ambient air quality standards for ground level $O_3$ and State standards for $PM_{10}$ and $PM_{2.5}$. The attainment status for the Valley with respect to various pollutants of concern is described in Table 3.

**TABLE 3 Project Area Attainment Status**

| Pollutant | Federal Status | State Status |
|---|---|---|
| Ozone ($O_3$) – 1-Hour Standard | No Designation | Severe Nonattainment |
| Ozone ($O_3$) – 8-Hour Standard | Extreme Nonattainment | Nonattainment |
| Respirable Particulate Matter ($PM_{10}$) | Attainment-Maintenance | Nonattainment |
| Fine Particulate Matter ($PM_{2.5}$) | Nonattainment | Nonattainment |
| Carbon Monoxide (CO) | Attainment/Unclassified | Attainment/Unclassified |
| Nitrogen Dioxide ($NO_2$) | Attainment/Unclassified | Attainment |
| Sulfur Dioxide ($SO_2$) | Attainment/Unclassified | Attainment |
| Sulfates and Lead | No Designation | Attainment |
| Hydrogen Sulfide | No Designation | Unclassified |
| Visibility Reducing Particles | No Designation | Unclassified |

Under the Federal Clean Air Act, the US EPA has classified the region as *extreme nonattainment* for the 8-hour $O_3$ standard. On March 19, 2008, the US Environmental Protection Agency posted a final rule in the Federal Register affirming the agency's October 30, 2006 determination that the Valley has attained the NAAQS for $PM_{10}$. The Valley is designated *nonattainment* for the older 1997 $PM_{2.5}$ NAAQS. SJVAPCD has determined, based on the 2004-06 $PM_{2.5}$ data, that the Valley has attained the 1997 24-Hour $PM_{2.5}$ standard; however, US EPA recently designated the Valley as nonattainment for the newer 2006 24-hour $PM_{2.5}$ standard. The US EPA classifies the region as *attainment* or *unclassified* for all other air pollutants, which include CO and $NO_2$.

At the State level, the region is considered *severe non-attainment* for ground level $O_3$ and *non-attainment* for $PM_{10}$ and $PM_{2.5}$. California ambient air quality standards are more stringent than the national ambient air quality standards. The region is required to adopt plans on a triennial basis that show progress towards meeting the State $O_3$ standard. The area is considered attainment or unclassified for all other pollutants.

## REGIONAL AIR QUALITY PLANS

In response to not meeting the NAAQS, the region is required to submit attainment plans to US EPA through the State, which are referred to as State Implementation Plans (SIP).

CARB submitted the 2004 Extreme Ozone Attainment Demonstration Plan to EPA in 2004, which addressed the old 1-hour NAAQS. The region's 2007 Ozone Plan, addressing the 8-hour ozone NAAQS, was submitted to US EPA and approved in March 2012. That plan predicts attainment of the standard throughout 90 percent of the district by 2020 and the entire district by 2024. To accomplish these goals, the plan would reduce $NO_x$ emissions further by 75 percent and ROG emissions by 25 percent. A wide variety of control measures are included in these plans, such as reducing or offsetting emissions from construction and traffic associated with land use developments. The air basin was recently designated as an extreme ozone nonattainment area for the more stringent 2008 8-hour ozone NAAQS. The plan to address this standard is expected to be due to EPA in 2016. Addressing the 2008 8-hour ozone standard will pose a tremendous challenge for the Valley, given the naturally high background ozone levels and ozone transport into the Valley.

On April 25, 2008, US EPA proposed to approve the 2007 $PM_{10}$ Maintenance Plan and Request for Redesignation. The region now meets the NAAQS for $PM_{10}$. US EPA has designated the basin as Attainment.

The SJVAPCD adopted the 2012 $PM_{2.5}$ Plan on December 20, 2012. This plan was approved by CARB on January 24, 2013. This plan predicts that the Valley will attain the 2006 $PM_{2.5}$ NAAQS by the 2019 deadline. The plan uses control measures to reduce NOx, which also leads to fine particulate formation in the atmosphere. The plan incorporates measures to reduce direct emissions of $PM_{2.5}$, including a strengthening of regulations for various SJVAB industries and the general public through new rules and amendments. The plan estimates that the SJVAB will reach the $PM_{2.5}$ standard by 2014.

Both the ozone and $PM_{2.5}$ plans include all measures (i.e., federal, state and local) that would be implemented through rule making or program funding to reduce air pollutant emissions. Transportation Control Measures (TCMs) are part of these plans. The plans described above addressing ozone also meet the state planning requirements.

## SJVAPCD RULES AND REGULATIONS

The SJVAPCD has adopted rules and regulations that apply to land use projects, such as the WSP solar projects. These are described below.

<u>SJVAPCD Indirect Source Review Rule</u>

On December 15, 2005, the SJVAPCD adopted the Indirect Source Review Rule (ISR or Rule 9510) to reduce ozone precursor (i.e., ROG and $NO_x$) and PM10 emissions from new land use development projects. The rule is the result of state requirements outlined in the region's portion of the State Implementation Plan (SIP). The SJVAPCD's SIP commitments are contained in the 2004 Extreme Ozone Attainment Demonstration Plan and the 2003 $PM_{10}$ Plan. These plans identified the need to reduce $PM_{10}$ and $NO_x$ substantially in order to attain and maintain the ambient air-pollution standards on schedule.

New projects that would generate substantial air pollutant emissions, for which final discretionary approval was granted after March 1, 2006 are subject to this rule. The rule requires projects to mitigate both construction and operational period emissions by applying the SJVAPCD-approved mitigation measures and paying fees to support programs that reduce emissions. The rule establishes minimum floor areas for various types of development (i.e., commercial, industrial, office, etc.) for which ISR compliance is required. For land uses not specifically identified, such as solar projects, the minimum floor area is 9,000 square feet. Since the WSP solar projects would each exceed 9,000 feet, this rule would be applicable to each WSP solar field. The rule requires mitigated exhaust emissions during construction based on the following levels:

- 20% reduction from unmitigated baseline in total $NO_x$ exhaust emissions
- 45% reduction from unmitigated baseline in total PM10 exhaust emissions

For operational emissions, Rule 9510 requires the following reductions:

- 33.3% of the total operational $NO_x$ emissions from unmitigated baseline
- 50% of the total operational PM10 exhaust emissions from unmitigated baseline

Fees apply to the unmitigated portion of the emissions and are based on estimated costs to reduce the emissions from other sources plus expected costs to cover administration of the program. In accordance with the ISR, each WSP solar project will be required to submit an Air Impact Assessment (AIA) to the Air District prior to submittal of the last discretionary permit application to Kings County.

<u>Regulation VIII – Fugitive $PM_{10}$</u>

SJVAPCD controls fugitive $PM_{10}$ through Regulation VIII (Fugitive $PM_{10}$ Prohibitions). The purpose of this regulation is to reduce ambient concentrations of $PM_{10}$ by requiring actions to prevent, reduce or mitigate anthropogenic (human caused) fugitive dust emissions. This applies to activities such as construction, bulk materials, open areas, paved and unpaved roads, material transport, and agricultural areas. Sources regulated are required to provide dust control plans for Air District approval that meet the regulation requirements. Fees are collected by SJVAPCD to cover costs for reviewing plans and conducting field inspections.

## SENSITIVE RECEPTORS

"Sensitive receptors" are defined as facilities where sensitive population groups, such as children, the elderly, the acutely ill, and the chronically ill, are likely to be located. These land uses include schools, playgrounds, childcare centers, retirement homes, convalescent homes, hospitals, medical clinics, and residential areas. Worker locations are typically not considered as sensitive receptors. There are several sensitive receptors within one mile of the project boundaries, all of which consist of residences. Immediately adjacent to the WSP plan area, there are about 20 residential dwellings at Shannon Ranch near Lincoln/Gale and Avenal Cutoff, and two residential dwellings at Stone Land Company Ranch along Nevada Avenue, east of Avenal Cutoff Road. The next nearest residences consist of two ranch complexes with a total of 6 dwellings on the east side of Highway 41 near Nevada Avenue. To the northeast, between the Kings River and the east WSP boundary, there is a series of 4 residences along and near 22nd Avenue which runs north-south approximately one mile from the WSP boundary. The nearest schools are located at least 3 miles from the WSP Plan Area in Lemoore and Stratford, and the nearest hospital is located 3 miles northeast at Naval Air Station Lemoore.

### BUFFERS FROM SOURCES OF AIR POLLUTION

The SJVAPCD and CARB recommend that communities include buffers between sensitive receptors and sources of air toxic contaminant emissions and odors. In April 2005, CARB released the final version of the Air Quality and Land Use Handbook, which is intended to encourage local land use agencies to consider the risks from air pollution prior to making decisions that approve the siting of new sensitive receptors near sources of air pollution. CARB made recommendations regarding the siting of new sensitive land uses near freeways, truck distribution centers, dry cleaners, gasoline dispensing stations, and other air pollution sources. The proposed project does not include any of the type of sources listed by CARB.

## GREENHOUSE GAS REGULATIONS AND GUIDANCE

### STATE OF CALIFORNIA

Regulations addressing GHG emissions from land use development projects are primarily driven by the State. AB 32, the Global Warming Solutions Act of 2006, codifies the State of California's GHG emissions target by directing CARB to reduce the state's global warming emissions to 1990 levels by 2020. AB 32 was signed and passed into law by Governor Schwarzenegger on September 27, 2006. Since that time, CARB, the California Energy Commission (CEC), the California Public Utilities Commission (CPUC), and the California Building Standards Commission (CBSC) have all been developing regulations that will help meet the goals of AB 32.

A Scoping Plan for AB 32 was adopted by CARB in December 2008. It contains the State of California's main strategies to reduce GHGs from Business-As-Usual (BAU) emissions projected in 2020 back down to 1990 levels. BAU is the quantification of the projected emissions in 2020, including increases in emissions caused by growth, without any GHG reduction measures. The Scoping Plan has a range of GHG reduction actions, including direct regulations, alternative compliance mechanisms, monetary and non-monetary incentives, voluntary actions, and market-based mechanisms such as a cap-and-trade system. It required CARB and other state agencies to develop and adopt regulations and other initiatives reducing GHGs by 2012.

As directed by AB 32, CARB has also approved a statewide GHG emissions limit. CARB established the amount of 427 MMT of $CO_2e$ as the total statewide GHG 1990 emissions level and 2020 emissions limit. The limit is a cumulative statewide limit, not a sector- or facility-specific limit. The 2008 Scoping Plan estimated that 2020 Business as Usual (BAU) emissions would be 596 MMT of CO2e, indicating that a statewide reduction of 28 percent would be required to achieve 1990 emissions levels. In 2011 CARB revised the 2020 BAU annual emissions forecast downward to 507 MMT of $CO_2e$. Thus, an estimated reduction of 80 MMT of $CO_2e$ (a 16% reduction from the revised 2020 BAU) was determined to be necessary to reduce statewide emissions to meet the AB 32 target by 2020. In April 2015, Governor Brown signed Executive Order EO-B-30-15 which sets a greenhouse gas emissions target at 40 percent of 1990 levels by 2030. On September 8, 2016, Governor Brown signed SB 32, which establishes by statute the

GHG reduction target of 40 percent of 1990 levels by 2030. The CARB is currently updating the AB 32 Scoping Plan to reflect the 2030 target.

## SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT

In August 2008, the San Joaquin Valley Air Pollution Control District adopted the Climate Change Action Plan (CCAP). The goals of the CCAP are to establish District processes for assessing the significance of project specific GHG impacts for projects permitted by the District; assist local land use agencies, developers, and the public by identifying and quantifying GHG emission reduction measures for development projects, and by providing tools to streamline evaluation of project specific GHG effects; ensure that collateral emissions from GHG emission reduction projects do not adversely impact public health or environmental justice communities in the Valley; and assist Valley businesses in complying with state law related to GHG emission reduction. In particular, the CCAP directed the District's Air Pollution Control Officer to develop guidance to assist District staff, valley businesses, land use agencies, and other permitting agencies in addressing GHG emissions as part of the CEQA process. Pursuant to this directive, on December 17, 2009, SJVAPCD adopted *Guidance for Valley Land-Use Agencies in Addressing GHG Emissions Impacts for New Projects under CEQA* (described below). The CCAP also directs District staff to investigate and develop a greenhouse gas banking program, enhance the existing emissions inventory process to include greenhouse gas emissions reporting consistent with new state requirements, and administer voluntary greenhouse gas emission reduction agreements.

### *SJVAPCD's Guidance for Addressing GHG Emissions Impacts Under CEQA*

Under its mandate to provide local agencies with assistance in complying with CEQA in climate change matters, SJVAPCD has developed *Guidance for Valley Land-Use Agencies in Addressing GHG Emissions Impacts for New Projects under CEQA.* As a general principal to be applied in determining whether a proposed project would be deemed to have a less-than-significant impact on global climate change, a project must be determined to have reduced or mitigated GHG emissions by 29 percent relative to Business-As-Usual conditions, consistent with GHG emission reduction targets established in CARB's Scoping Plan for AB 32 implementation. The SJVAPCD guidance is intended to streamline the process of determining if project specific GHG emissions would have a significant effect. The proposed approach relies on the use of performance-based standards and their associated pre-quantified GHG emission reduction effectiveness (Best Performance Standards). Establishing Best Performance Standards (BPS) is intended to help project proponents, lead agencies, and the public by proactively identifying effective, feasible mitigation measures. Emission reductions achieved through implementation of BPS would be pre-quantified, thus reducing the need for project specific quantification of GHG emissions. For land use development projects, BPS would include emissions reduction credits for such project features as bicycle racks, pedestrian access to public transit, and so forth. Projects implementing a sufficient level of Best Performance Standards would be determined to have a less-than-significant individual and cumulative impact on global climate change and would not require project specific quantification of GHG emissions. For all projects for which the lead agency has determined that an Environmental Impact Report is required, quantification of GHG emissions would be required whether or not the project incorporates Best Performance Standards. SJVAPCD's guidance document does not constitute a rule or regulation, but is intended for use by other agencies in their assessment of the significance of project impacts to global climate change under CEQA.

# IMPACT ANALYSIS

## STANDARDS OF SIGNIFICANCE

Appendix G, of the California Environmental Quality Act (CEQA) Guidelines (Environmental Checklist) contains a list of project effects that may be considered significant. The project would result in a significant impact if it would:

- Conflict with or obstruct implementation of the applicable air quality plan;
- Violate any air quality standard or contribute substantially to an existing or projected air quality violation;
- Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is a nonattainment area for an applicable federal or state ambient air quality standard (including releasing emissions that exceed quantitative thresholds for ozone precursors);
- Expose sensitive receptors to substantial pollutant concentrations;
- Create objectionable odors affecting a substantial number of people;
- Generate greenhouse gas emissions, either directly or indirectly, that may have a significant effect on the environment;
- Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases.

The SJVAPCD has developed the Guide for Assessing and Mitigating Air Quality Impacts (SJVAPCD 2015), also known as the GAMAQI. The following thresholds of significance, as set forth in the SJVAPCD's GAMAQI, are applied to determine whether a proposed project would result in a significant air quality impact:

1) <u>Construction Emissions of PM</u>. Construction projects are required to comply with Regulation VIII as listed in the SJVAPCD; however, the size of the project and the proximity to sensitive receptors may warrant additional measures.

2) <u>Criteria Air Pollutant Emissions</u>. SJVAPCD's current adopted thresholds of significance for criteria pollutant emissions and their application is presented in Table 4. These thresholds address both construction and operational emissions. Note that the District treats permitted equipment and activities separately.

3) <u>Ambient Air Quality</u>. Emissions that are predicted to cause or contribute to a violation of an ambient air quality would be considered a significant impact. SJVAPCD recommends that dispersion modeling be conducted for construction or operation when on-site emissions exceed 100 pounds per day for any criteria pollutant after implementation of all mitigation measures.

4) <u>Local CO Concentrations</u>. Traffic emissions associated with the proposed project would be considered significant if the project contributes to CO concentrations at receptor locations in excess of the ambient air quality standards.

5) Toxic Air Contaminants or Hazardous Air Pollutants. Exposure to HAPs or TACs would be considered significant if the probability of contracting cancer for the Maximally Exposed Individual would exceed 20 in 1 million or would result in a Hazard Index greater than 1 for non-cancer health effects.

6) Odors. Odor impacts associated with the proposed project would be considered significant if the project has the potential to frequently expose members of the public to objectionable odors through development of a new odor source or placement of receptors near an existing odor source.

7) GHGs. In SJVAPCD's *Guidance for Valley Land-Use Agencies in Addressing GHG Emissions Impacts for New Projects Under CEQA*, the District recommends that land use development projects demonstrate a 29 percent reduction in GHG emissions from Business-As-Usual (BAU).

**TABLE 4 SJVAPCD Air Quality Thresholds of Significance – Criteria Pollutant Emission Levels in tons per year (tpy)**

| Pollutant/Precursor | Construction Emissions | Operational Emissions | |
|---|---|---|---|
| | | Permitted Equipment and Activities | Non-Permitted Equipment and Activities |
| Carbon Monoxide (CO) | 100 | 100 | 100 |
| Nitrogen Oxides (NOx) | 10 | 10 | 10 |
| Reactive Organic Gases | 10 | 10 | 10 |
| Sulfur Dioxide (SOx) | 27 | 27 | 27 |
| Particulate Matter – PM10 | 15 | 15 | 15 |
| Particulate Matter – $PM_{2.5}$ | 15 | 15 | 15 |

With respect to cumulative air quality impacts, the GAMAQI provides that any proposed project that would individually have a significant air quality impact (i.e., exceed significance thresholds for criteria pollutants ROG, $NO_x$, or $PM_{10}$) would also be considered to have a significant cumulative impact (GAMAQI, p. 66). In cases where project emissions are all below the applicable significance thresholds, a project may still contribute to a significant cumulative impact if there are other projects nearby whose emissions would combine with project emissions to result in an exceedance of one or more significance thresholds for criteria pollutants (GAMAQI, p.108).

## AIR QUALITY IMPACTS

Development-related air quality impacts fall into two categories: short-term impacts due to construction, and long-term impacts due to facility operation. During construction, the WSP solar projects would affect local particulate concentrations primarily due to fugitive dust sources and contribute to ozone and $PM_{10}$/$PM_{2.5}$ levels due to exhaust emissions. Over the long-term, the operational emissions would result in very slight increases in emissions of ozone precursors such as ROG and $NO_x$, primarily due to motor vehicle trips (employee trips, site deliveries and onsite maintenance activities). As discussed below and as summarized in Table 5, the emissions for construction and comparisons with the applicable significance levels are presented below.

The CalEEMod program was not used to estimate construction related emissions as this model was designed to provide emissions estimates for more standardized residential and commercial land uses and would be inadequate for the purposes of evaluating a Master Plan for a series of solar power development projects. On- and offsite-fugitive dust emissions including on-site fugitives, on-site windblown dust, fugitive dust from paved and unpaved roads, etc., were derived from estimation techniques in EPA AP-42, and the Midwest Research Institute construction dust study (1999), for the Level II analysis scenario. Construction equipment exhaust emissions were estimated using data supplied by the applicant, i.e., types of equipment used, number on site, daily use hours, HP ratings, and emissions factors derived from the SCAQMD Offroad database and EMFAC2014.

**Impact 1**: Construction Dust. Construction activity involves a high potential for the emission of fugitive particulate matter emissions that would affect local air quality. This would be a ***potentially significant*** impact for construction of Solar Generating Facilities (SGFs) 1 through 12 and (for $PM_{10}$), SGF 2+3 (the period where certain construction activities of both solar projects occur during the same time period but in different locations) for $PM_{2.5}$.

Construction dust (fugitive) emissions for PM10 and PM2.5 are summarized in Table 5. Construction activities would temporarily affect local air quality, causing a temporary increase in particulate dust and other pollutants. Dust emission during periods of construction would increase particulate concentrations at neighboring properties. This impact is potentially significant, but it can be mitigated through compliance with existing SJVAPCD requirements, discussed below.

As stated in the Introduction, the Westlands Solar Park consists of a series of photovoltaic solar power production facilities covering approximately 21,000 acres with a generating capacity of approximately 2000 MWs. The WSP will be developed as twelve (12) separate solar generating facilities (SGFs) with SGF 1 anticipated to begin construction in 2016 and SGF 12 beginning construction in late 2029. Supporting facilities included in WSP consist of two (2) 230kV switchyards. Related to the WSP solar development is the planned construction of 23 miles of gen-tie transmission corridor, including upgrades at the existing PG&E Gates substation.

Grading and site disturbance (e.g., vehicle travel on exposed areas) would likely result in the greatest emissions of dust and $PM_{10}$/$PM_{2.5}$. Windy conditions during construction could cause substantial emissions of $PM_{10}$/$PM_{2.5}$. The estimated dust emissions from construction of the WSP solar projects are shown in Table 5. The table shows emissions of fugitive dust under "uncontrolled" and "controlled" conditions.

**TABLE 5 WSP SOLAR AND GEN-TIE PROJECTS – CONSTRUCTION FUGITIVE DUST EMISSIONS**

| Project | On-and Off-Site Fugitive Dust Emissions, Tons per Year | |
|---|---|---|
| | $PM_{10}$ Fugitives | $PM_{2.5}$ Fugitives |

| | Uncontrolled | Controlled | Uncontrolled | Controlled |
|---|---|---|---|---|
| **Solar Generating Facility (SGF) 1** | 13.25 | 3.8 | 2.33 | 0.7 |
| **SGF 2** | **21.13** | 4.8 | 4.06 | 0.9 |
| **South Gen Tie** | 11.14 | 2.4 | 1.51 | 0.3 |
| **Gates Substation Upgrades** | 0.55 | 0.1 | 0.09 | 0.0 |
| ***Overlap: SGF 2 + South Gen Tie and Gates Substation Upgrades[3]*** | ***33.07*** | *7.2* | *7.68* | *1.7* |
| **SGF 3** | 13.41 | 2.9 | 2.61 | 1.2 |
| ***Overlap SGF 2+3[3]*** | ***31.00*** | 6.7 | *2.48* | 0.5 |
| **SGF 4** | **29.98** | 7.6 | 5.53 | 1.3 |
| **SGF 5** | **23.27** | 6.7 | 4.08 | 1.4 |
| **SGF 6** | **22.24** | 5.7 | 4.10 | 1.1 |
| **SGF 7** | **15.43** | 3.9 | 2.84 | 1.0 |
| **SGF 8** | **38.02** | 8.5 | 7.33 | 0.7 |
| **SGF 9** | **34.52** | 8.7 | 6.40 | 1.6 |
| **SGF 10** | **22.49** | 5.8 | 4.18 | 1.5 |
| **SGF 11** | **27.16** | 7.3 | 5.07 | 1.0 |
| **SGF 12** | **17.15** | 4.5 | 3.07 | 1.3 |
| **N. WSP 230 kV Switchyard** | 1.10 | 0.3 | 1.86 | 0.8 |
| **S. WSP 230 kV Switchyard** | 1.10 | 0.3 | 0.12 | 0.1 |
| **North Gen Tie** | 11.14 | 2.4 | 1.51 | 0.1 |
| ***SJVAPCD Significance Thresholds (TPY)*** | ***15*** | ***15*** | ***15*** | **15** |
| **Exceeds Threshold** | Yes | **No** | **Yes** | **No** |

The SJVAPCD's GAMAQI emphasizes implementation of effective and comprehensive control measures rather than requiring a detailed quantification of construction emissions. SJVAPCD has adopted a set of $PM_{10}$ fugitive dust rules collectively called Regulation VIII. This regulation essentially prohibits the emissions of visible dust (limited to 20-percent opacity) and requires that disturbed areas or soils be stabilized. Compliance with Regulation VIII during the construction phases of the WSP solar projects would be required. Prior to construction of each solar project, the applicant would be required to submit a dust control plan that meets the regulation requirements. These plans are reviewed by SJVAPCD and construction cannot begin until District approval is obtained. The provisions of Regulation VIII and its constituent rules pertaining to construction activities generally require:

- Effective dust suppression (e.g., watering) for land clearing, grubbing, scraping, excavation, land leveling, grading, cut and fill and demolition activities.
- Effective stabilization of all disturbed areas of a construction site, including storage piles, not used for seven or more days.
- Control of fugitive dust from on-site unpaved roads and off-site unpaved access roads.
- Removal of accumulations of mud or dirt at the end of the workday or once every 24 hours from public paved roads, shoulders and access ways adjacent to the site.
- Cease outdoor construction activities that disturb soils during periods with high winds.
- Record keeping for each day dust control measures are implemented.

- Limit traffic speeds on unpaved roads to 15 mph.
- Install sandbags or other erosion control measures to prevent silt runoff to public roadways.
- Landscape or replant vegetation in disturbed areas as quickly as possible.
- Prevent the tracking of dirt on public roadways. Limit access to the construction sites, so tracking of mud or dirt on to public roadways can be prevented. If necessary, use wheel washers for all exiting trucks, or wash off the tires or tracks of all trucks and equipment leaving the site.
- Suspend grading activity when winds (instantaneous gusts) exceed 25 mph or dust clouds cannot be prevented from extending beyond the site.

Based on the provisions of Regulation VIII, the following dust control options were incorporated into the emission estimates for fugitive dust:

- Earthwork/Equipment movement on site were controlled by 84% based on the application of watering 3 times per day
- Limiting speeds to less than 15 mph
- Unpaved road use utilized 80% control via watering 2 times per day
- Unpaved road speeds were limited to 15 mph
- Trackout of dirt was controlled by 84% by utilizing graveled entrances, metal cleaning grates, periodic water washing of the pavement and pavement sweeping between washings

Anyone who prepares or implements a Dust Control Plan must attend a training course conducted by the District. Construction sites are subject to SJVAPCD inspections under this regulation. Compliance with Regulation VIII, including the effective implementation of a Dust Control Plan that has been reviewed and approved by the SJVAPCD, would reduce dust and $PM_{10}/PM_{2.5}$ emissions to a less than significant level.

**Mitigation Measure for Impact 1**: None required beyond compliance with SJVAPCD Regulation VIII.

**Impact 2:** Construction Exhaust Emissions. Equipment and vehicle trips associated with construction would emit ozone precursor air pollutants of $NO_x$ and ROG on a temporary basis. Construction exhaust emissions of $NO_x$ would exceed the GAMAQI significance thresholds for SGF 2, 3, 4 and 2+3 (overlap period) with the South Gen Tie in and the Gates Substation. For all other WSP solar projects, construction exhaust emissions would be considered a less-than-significant impact.

Construction equipment exhaust affects air quality both locally and regionally. Emissions of diesel particulate matter, a TAC, can affect local air quality. This impact is discussed under Impact 5. Emissions of air pollutants that could affect regional air quality were addressed by estimating emissions and comparing them to the SJVAPCD significance thresholds. Construction equipment exhaust emissions were estimated using data supplied by the applicant, i.e., types of equipment used, number on site, daily use hours, HP ratings, and emissions factors derived from the SCAQMD Offroad database (http://www.aqmd.gov/home/regulations/ceqa/air-quality-analysis-handbook/off-road-mobile-source-emission-factors). Offsite vehicular emissions were calculated using applicant data for the number of proposed vehicles in use, trip distances, and trips per day, in conjunction with emissions factors from the EMFAC2014 model. On and offsite fugitive dust emissions including on-site fugitives, on-site windblown dust, fugitive dust from paved and unpaved roads, etc., were derived from estimation techniques in EPA AP-42, and the Midwest Research Institute construction dust study (1999), for the Level II analysis scenario.

Unmitigated construction emissions from all WSP solar and gen-tie projects (on and off-site) are reported in Table 5. SJVAPCD regulations that would apply to construction activities include Rule 4102, regarding creation of a nuisance, Rule 4601 which limits volatile organic compound emissions from architectural coatings, storage and cleanup, and Rule 4641 which limits emissions form asphalt paving materials, and Rule 9510 that applies to indirect sources.

As mentioned, the WSP is planned be developed as 12 separate solar projects, each of which would require its own Conditional Use Permit from Kings County. The project sponsor has calculated the construction and operational inputs for each solar and gen-tie project. Rule 9510 would require that the projects reduce construction exhaust emissions by 20 percent for $NO_x$ and 45 percent for $PM_{10}$ and these reductions would be applied to the unmitigated emissions presented for each project in Table 6. SJVAPCD encourages reductions through on-site mitigation measures. (Note: The use of the term “mitigation” under Rule 9510 does not refer to mitigation of impacts under CEQA, where the goal is to reduce the emissions below the significance thresholds expressed in tons per year. Therefore, application of ISR reductions does not necessarily result in reduction of emission below the CEQA thresholds.)

As shown in Table 6, the CEQA significance thresholds for NOx would be exceeded by the annual construction emission for SGF 1, SGF 2, SGF 3, SGF 5, SGF 6, and SGF 7. (Note: It is anticipated that construction of SGF 2the South Gen Tie, and the Gates Substation upgrades may overlap during 2019. It is also possible that construction of SGFs 2 and 3 may overlap in 2020. Thus additional calculations to reflect these scenarios were included in Table 6 for the assumed years when the construction these project elements would overlap, which is intended to represent the worst-case development intensity periods during the WSP buildout period.) As expected, the CEQA thresholds for NOx for these possible overlapping projects were also exceeded. Since the construction of six of the first seven SGFs would exceed the CEQA significance thresholds for NOx, as shown in Table 6 below, the potential impact would be significant. Construction period emissions of ROG, CO, $SO_2$, and $PM_{10}/PM_{2.5}$ (as exhaust) for all SGFs, gen-ties, switchyards, and substation upgrade projects would be below the thresholds used by SJVAPCD to determine the significance of construction air quality impacts. The $PM_{10}/PM_{2.5}$ (as fugitive dust) emissions would be mitigated to less-than-significant levels through implementation dust control measures required under SJVAPCD Regulation VIII, as discussed in Impact 1 above.

At the end of the productive lives of the WSP solar facilities, after 25 to 30 years of operation, it is assumed that each SGF would be decommissioned. The activities associated with deconstruction would be comparable to construction, but emissions are expected to be substantially lower due to anticipated reductions in vehicle and equipment emissions over time, and also because of the generally lower intensity of equipment use associated with decommissioning. For even the largest 250 MW solar facilities, emissions are expected to not exceed SJVAPCD significance thresholds for pollutants ROG, CO, $SO_2$, NOx, and $PM_{10}/PM_{2.5}$ (as exhaust). With the application of Regulation VIII dust control requirements, fugitive $PM_{10}$ emissions are likewise expected to be below the applicable significance thresholds for the even the largest SGFs, as they are for construction.  Therefore, the emissions associated with SGF decommissioning would be less than significant.

## TABLE 6 WSP Solar and Gen-Tie Projects – Construction Emissions Summary

| Project (order based on construction sequence) | On-and Off-Site Construction, Tons per Year[1] | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | $NO_x$[1] | CO | ROG | $SO_x$ | PM10[2] Exhaust | PM10 Fugitive | PM10 Total | PM2.5 Exhaust | PM2.5 Fugitive | PM2.5 Total | $CO_2e$ Total[2] |
| Solar Generating Facility (SGF) 1 | **11.97** | 7.85 | 1.27 | 0.04 | 0.37 | 3.79 | 4.16 | 0.37 | 0.65 | 1.02 | 4212 |
| SGF 2 | **14.05** | 8.74 | 1.77 | 0.04 | 0.54 | 4.77 | 5.31 | 0.54 | 0.88 | 1.42 | 4172 |
| South Gen Tie | 9.86 | 5.32 | 1.18 | 0.02 | 0.42 | 2.36 | 2.78 | 0.42 | 0.32 | 0.74 | 1826 |
| Gates Substation Upgrades | 1.27 | 0.96 | 0.21 | 0.01 | 0.03 | 0.12 | 0.15 | 0.03 | 0.02 | 0.05 | 371 |
| *Overlap: SGF 2 + South Gen Tie and Gates Substation Upgrades* | ***25.43*** | *14.99* | *3.16* | *0.07* | *1.03* | *7.19* | *8.22* | *1.03* | *1.20* | *2.23* | *6347* |
| SGF 3 | **12.23** | 6.57 | 1.64 | 0.03 | 0.51 | 2.90 | 3.41 | 0.51 | 0.54 | 1.05 | 2611 |
| *Overlap: SGF 2 + 3* | ***23.53*** | *13.60* | *3.06* | *0.06* | *0.95* | *6.74* | *7.69* | *0.95* | *1.25* | *2.20* | *5969* |
| SGF 4 | 9.72 | 10.11 | 1.09 | 0.07 | 0.21 | 7.63 | 7.85 | 0.21 | 1.35 | 1.56 | 6280 |
| SGF 5 | **11.02** | 9.20 | 1.08 | 0.07 | 0.26 | 6.72 | 6.98 | 0.26 | 1.14 | 1.40 | 6219 |
| SGF 6 | **10.65** | 8.88 | 1.28 | 0.05 | 0.32 | 5.68 | 6.00 | 0.32 | 1.00 | 1.32 | 5081 |
| SGF 7 | **12.29** | 11.19 | 2.07 | 0.05 | 0.53 | 3.94 | 4.47 | 0.53 | 0.69 | 1.22 | 5096 |
| SGF 8 | 4.37 | 7.00 | 0.78 | 0.05 | 0.14 | 8.52 | 8.67 | 0.14 | 1.57 | 1.72 | 4684 |
| SGF 9 | 5.60 | 8.97 | 1.00 | 0.07 | 0.19 | 8.65 | 8.83 | 0.19 | 1.54 | 1.73 | 6168 |
| SGF 10 | 4.38 | 7.10 | 0.78 | 0.05 | 0.13 | 5.76 | 5.89 | 0.13 | 1.02 | 1.16 | 5007 |
| SGF 11 | 9.47 | 13.79 | 1.84 | 0.08 | 0.34 | 7.25 | 7.59 | 0.34 | 1.29 | 1.63 | 7568 |
| SGF 12 | 3.44 | 5.31 | 0.65 | 0.04 | 0.11 | 4.51 | 4.62 | 0.11 | 0.78 | 0.89 | 3316 |
| N. WSP 230 kV Switchyard | 0.93 | 0.68 | 0.13 | 0.01 | 0.02 | 0.29 | 0.31 | 0.02 | 0.05 | 0.08 | 303 |
| S. WSP 230 kV Switchyard | 0.72 | 0.66 | 0.10 | 0.01 | 0.02 | 0.29 | 0.31 | 0.02 | 0.05 | 0.08 | 303 |
| North Gen Tie | 4.42 | 4.52 | 0.70 | 0.02 | 0.15 | 2.36 | 2.51 | 0.15 | 0.32 | 0.47 | 1786 |
| SGF/Substation Water Use | | | | | | | | | | | 518 |
| Gen-Tie Line Water Use | | | | | | | | | | | 20 |
| SJVAPCD Significance Thresholds (TPY) | 10 | 100 | 10 | 27 | | | 15 | | | 15 | NA |
| Exceeds Threshold | Yes | No | No | No | | | No | No | No | No | NA |
| WSP Projects that Exceed Thresholds | SGF 1-3, 5-7 | - | - | - | | | | - | | | - |
| Notes: [1] No Reduction for ISR assumed. [2] in metric tons | | | | | | | | | | | |

**Mitigation Measure for Impact 2:** The following construction measures shall be implemented during construction of SGFs 1, 2, 3, 5, 6 and 7 and the South Gen Tie to reduce construction NOx emissions to less than 10 tons per year for each project:

1. Develop a plan to use construction equipment with low NOx emissions. This may include the use of equipment that meets U.S. EPA Tier 3 and Tier 4 standards. As explained below, the reasonable availability of Tier 4 equipment for this project cannot be assumed at this time, so mitigated emissions were computed based on an assumption that all equipment would at least meet Tier 3 standards which will fully mitigate the significant project emissions. Additional reductions would occur with Tier 4 equipment.

2. Minimize Idling Time. Set idling time limit of 5 minutes or less for construction equipment.

3. Evaluate the feasibility of a work shuttle or carpool program to reduce emissions from worker travel;

4. Evaluate the feasibility of methods to reduce truck travel for delivery of equipment, by reducing the number of necessary truck trips;

5. The project proponent is expected to execute a Voluntary Emissions Reduction Agreement (VERA) with SJVAPCD which provides for further reduction of construction NOx to reduce the project's air quality impacts to less-than-significant levels, as determined by the SJVAPCD.

Use of Tier 3 equipment for the significant phases of the SGF construction would reduce the on-site project emissions of $NO_x$ by about 30 percent. However, off-site vehicle travel also contributes to NOx emissions. Application of Tier 4 equipment would reduce these on-site emissions still further, but were not quantified, since this equipment may not be available for the construction projects, especially for the first few SFGs. (The availability of Tier 4 equipment is dependent upon the sizes and quantities of the construction fleet needed during each phase. As the new Tier 4 equipment replaces the older tiered fleets, the availability is expected to increase over the next five years but was assumed to be minimally available during the development of the first four SGFs.) Additionally, reductions can be implemented through the use of newer or retrofitted construction fleets, a reduction of construction traffic, use of electrical powered stationary equipment, and idling restrictions for equipment and trucks. It is likely that the combined use of Tier 3 and 4 equipment would reduce NOx emissions for SGFs 1, 3, 5, 6 and 7 to less-than-significant levels, but the NOx emissions for SGF 2 (and both of overlap construction combinations listed in Table 6) would remain above the 10-ton per year significance threshold, without the implementation of off-site measures through Voluntary Emission Reduction Agreements (VERAs). (See next paragraph for a description of VERAs.) For purposes of this analysis, it is assumed that each affected SGF applicant within the WSP plan area would execute a VERA with the Air District, as needed following project-specific analysis, to reduce NOx emissions to less-than-significant levels.

In cases where it is not feasible to fully mitigate project emissions through on-site measures, the project proponent and SJVAPCD may enter into a contractual agreement, i.e., Voluntary Emissions Reduction Agreement (VERA), in which the project proponent agrees to mitigate project-specific emissions by providing funds to the SJVAPCD. The SJVAPCD's role is to administer the implementation of the VERA consisting of identifying emissions reductions projects, funding those projects and verifying that emissions reductions have been successfully achieved. The types of emission reduction projects that have been funded in the past include electrification of stationary internal combustion engines (such as agricultural irrigation pumps), replacing old heavy-duty trucks with new, cleaner more efficient heavy duty trucks, and replacement of old farm tractors. The SJVAPCD has been successfully developing and implementing VERA contracts with project proponents since 2005. It is the SJVAPCD's experience that implementation of a VERA is a feasible mitigation measure, which effectively achieves the emission reductions by supplying real and contemporaneous emissions reductions measures (GAMAQI, p. 116-117). Therefore, the implementation of the executed VERAs, in combination with feasible onsite emission reduction measures, would be considered by the SJVAPCD to reduce the construction NOx emissions to acceptable levels (it is assumed that this would include the necessary reductions for the overlapping construction years when combined emissions would be higher, if any construction periods for SGFs and/or other project elements do in fact overlap). Therefore, with the implementation of the above mitigation measures, the air quality impacts of construction emissions by the WSP solar, gen-tie, and substation projects would be less than significant.

**Impact 3:** Operational Emissions. The operational emissions, generated primarily by operations and maintenance activities, would be below GAMAQI significance thresholds. These increases would be *less-than-significant*.

As noted earlier, project construction is expected to begin in 2016 for SGF 1 and end in 2030 for SGF 12. During this period, the construction of the switchyards, gen-tie projects and upgrades to the substations would also occur. The first fully operational year after completion of all SGFs and related projects is expected to be in late 2030 or early 2031.

The effect of the full operations of the WSP solar and gen-tie projects on regional air quality was evaluated by predicting associated emissions for 2031, after all projects are completed and operational. The primary maintenance roads within all SGFs will be graveled with aggregate base, which would reduce fugitive dust associated with maintenance vehicles trips. In addition, all SGF sites will be revegetated with low growing plants to provide stability to the soil surface and reduce wind erosion. The annual emissions associated with the operation of the completed projects are shown in Table 7.

**TABLE 7 Unmitigated WSP Solar Operations Emissions Summary**

| | Operational Emissions – Tons per Year (TPY) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | $NO_x$ | CO | ROG | $SO_x$ | PM10 Exhaust | PM10 Fugitives | PM2.5 Exhaust | PM2.5 Fugitives | $CO_2e$ |
| All Site Operations Areas* | 0.8 | 4.0 | 0.26 | 0.01 | .028 | 5.974 | .026 | .605 | 1069 |
| SJVAPCD Significance Thresholds TPY | 10 | 100 | 10 | 27 | 15 | 15 | 15 | 15 | NA |
| Exceeds Threshold | No | No | No | No | No | No | No | No | No |

* Operations emissions include both on and off-site emissions. Operational emissions associated with the substations and gen-tie lines are expected to be negligible when compared to the solar projects.

Emissions sources include: Worker commutes, site deliveries, onsite vehicle use, onsite portable internal combustion engine use, offsite paved road fugitives, onsite unpaved road fugitives, GHG emissions from water use. Does not include reductions required under ISR.

Based on the implementation of the requirements of SJVAPCD Rule 9510, the SGF operational emissions, generated primarily by mobile sources, would increase emissions, but they would be well below all GAMAQI significance thresholds. These increases would be less-than-significant.

Photovoltaic energy projects do not typically include stationary combustion equipment, so no air emissions are anticipated from these sources. If stationary sources are included , they may require permits from SJVAPCD. Such sources could include combustion emissions from standby emergency generators (rated 50 horsepower or greater). These sources would normally result in minor emissions, compared to those from traffic generation reported above. Sources of stationary air pollutant emissions complying with all applicable SJVAPCD regulations generally will not be considered to have a significant air quality impact. Stationary sources that are exempt from SJVAPCD permit requirements due to low emission thresholds would not be considered to have a significant air quality impact.

As noted, the operational emissions of regional pollutants would not exceed the Air District's CEQA significance thresholds for any pollutant, as shown in Table 7.Therefore, the air quality impacts of operational emissions by the WSP solar, gen-tie, and switching station projects would be less than significant.

**Mitigation Measure for Impact 3:** None Required. However, the project would be subject to SJVAPCD Rule 9510 that would require reductions of operation emissions by 33% for $NO_x$ and 50% for $PM_{10}$. These reductions would take the form of an offsite mitigation fee payable to SJVAPCD to obtain off-site reductions.

**Impact 4:** Carbon monoxide concentrations from traffic. Mobile emissions generated by WSP traffic would increase carbon monoxide concentrations slightly at intersections in the vicinity. However, resulting concentrations would be below ambient air quality standards, and therefore, considered a *less-than-significant* impact.

Operational traffic generated by WSP projects would increase concentrations of carbon monoxide along roadways providing access to the facilities. Carbon monoxide is a localized air pollutant, where highest concentrations are found very near sources. The major source of carbon monoxide is automobile traffic. Elevated concentrations, therefore, are usually only found near areas of high traffic volume and congestion. The GAMAQI recommends air quality modeling of CO concentrations following the Project-Level Carbon Monoxide Protocol developed by UC Davis.[7]

Emissions and ambient concentrations of CO have decreased greatly in recent years. These improvements are due largely to the introduction of cleaner burning motor vehicles and reformulated motor vehicle fuels. No exceedances of the State or federal CO standards have been recorded at any of San Joaquin Valley's monitoring stations in the past 15 years. The San Joaquin Valley Air Basin has attained the State and National CO standards.

Despite this progress, localized CO concentrations are still a concern in the San Joaquin Valley and are addressed through the SJVAPCD screening method that can be used to determine with fair certainty whether a project's CO emissions at any given intersection would not cause a potential CO hotspot. A project can be said to have a potential to create a CO violation or create a localized hotspot if either of the following conditions are met: level of service (LOS) on one or more streets or intersections would be reduced to LOS E or F; or the project would substantially worsen an already LOS F street or intersection within the project vicinity. All roadways in the vicinity that would be affected by WSP operational traffic currently operate at LOS C or better, and are anticipated to continue doing so after full WSP buildout. Since neither of the threshold conditions would be met, the potential impact on CO would be considered less than significant.

Other local pollutants, such as lead (Pb) and sulfur dioxide ($SO_2$) would not be substantially emitted by the project, and air quality standards for them are being met throughout the San Joaquin Valley Air Basin. Since it is evident that the WSP project operations would not result in impacts involving these or other local pollutants, these pollutants are not evaluated in this report.

**Mitigation Measure for Impact 4:** None Required

**Impact 5:** Exposure of Sensitive Receptors to Toxic Air Contaminants. Diesel exhaust emissions from construction and operational vehicles and equipment would expose nearby receptors to toxic air contaminants. However, given the relatively minor use of heavy duty equipment for solar project construction, the use of Tier 3 equipment, the limited number of nearby sensitive receptors, the relatively short period of construction emissions that would occur in the vicinity of the sensitive receptors, and the very low intensity of solar operations, the health risks from toxic air contaminants would not be significant. This impact would be ***less than significant***.

Diesel particulate matter (DPM) would be emitted from diesel-fueled vehicles and equipment during construction activities and from vehicle traffic attracted by the WSP solar projects while operational. The particulate matter component of diesel exhaust has been classified as a Toxic Air

[7] UC Davis. 1998. Project-Level Carbon Monoxide Protocol. Institute of Transportation Studies.

Contaminant (TAC) by CARB based on its potential to cause cancer and other adverse health effects.

The highest daily levels of DPM would be emitted during construction activities from use of heavy-duty diesel equipment such as bulldozers, excavators, loaders, graders and diesel-fueled haul trucks. However, these emissions would be intermittent, vary throughout the WSP plan area, and be of a relatively short duration (about 1-2 years of construction activity for each SGF). In contrast, low-level DPM emissions would result from project operation but they would be constant over the lifetime of the project. Operational DPM emissions could result from the potential use of pickup trucks with a portable water trailer (and pump) which would be used for cleaning solar panels. The panel cleaning is expected to occur four (4) times per year.

DPM emissions from construction activities, in the form of $PM_{10}$ exhaust, were estimated using the methods discussed above which are based on an estimated schedule for construction activities (grading, and construction) and types of equipment expected to be used. These emissions are reported in Table 5. The total $PM_{10}$ exhaust construction emissions for any given SGF are very low, with the largest SGFs (250 MW) emitting 0.37 tons per year. This emission rate is very low compared to the SJVAPCD significance threshold of 15 tons per year. Emissions from other vehicles during operations (e.g., employee vehicles and onsite maintenance vehicles) were estimated using emission factors for diesel-fueled vehicles. Those emissions are reported in Table 7. At full WSP buildout, the operations-related $PM_{10}$ exhaust emissions would total 0.028 tons per year for the entire WSP plan area, which is extremely low compared to the 15 ton per year significance threshold.

Cancer risk, which is the primary adverse effect from exposure to DPM, is based on lifetime exposures. Construction activities would be temporary; however, they could be locally elevated during intense construction activities. (However, given the minimal grading required for solar facilities, the use of heavy earth moving equipment would be relatively low compared to conventional land development projects.) In general, sensitive receptors are not in close proximity to the SGF construction sites. In addition, the construction sites are quite large, so construction activities at any one area would be relatively brief. There are some rural residences near SGF 10, 11 and 12 (i.e., 20 dwellings at Shannon Ranch and 2 dwellings at Stone Land Company Ranch). For construction near these residences, a potential for cancer risk, while unlikely to be significant, would exist. DPM concentrations dissipate rapidly with distance from the source, with concentrations dropping about 80 percent at approximately 1,000 feet from the source. Thus the emissions from construction activity within 1,000 feet of the receptors has the greatest potential to contribute to cancer risk. During construction of SGFs 10, 11, and 12, construction activity would occur within 1,000 feet of the Shannon Ranch complex for a total duration of approximately 3.2 months, compared to a total construction period of about 55 months for the entirety all three nearby SGFs. The total $PM_{10}$ exhaust emissions from construction all three of these nearby SGFs would be 1.23 tons, of which approximately 0.07 tons would be generated within 1,000 feet of the Shannon Ranch dwellings. It was noted that the solar PV facilities would require very little grading, so emissions from heavy earthmoving equipment would be relatively low, which is reflected in the low estimated $PM_{10}$ exhaust emissions levels. Another factor that reduces potential cancer risk is that, under prevailing wind conditions, the Shannon Ranch is located upwind or crosswind from these three nearest SGFs, so most DPMs are likely to be dispersed away from the ranch instead of toward it. Regarding the two dwellings at the Stone Land Company Ranch, during the 9-month construction period for the nearby SGF 12, construction activity would occur within 1,000 of these residences for about 0.4 months, during which time $PM_{10}$ exhaust emissions would total approximately 0.01 tons.

In addition, these low emissions of DPM would be reduced substantially by the application of ISR that would reduce construction $PM_{10}$ emissions by 45 percent (most of which would occur through on-site reductions, as discussed in the mitigation measures for Impact 2 above). Also, since it is anticipated that SGFs 10, 11, and 12 would be constructed toward the end of the WSP buildout period, technical advances in DPM emissions controls for construction equipment are expected to further reduce $PM_{10}$ emissions at the time of construction.

As noted, operational emissions would be very low given the low intensity nature of solar operations. Also, operational emissions would only occur over a 30-year operational life for each SGF, not an entire 70-year exposure period.

As a point of comparison, a recent HRA conducted on the 400-MW Tranquillity solar project in Fresno County found the lifetime cancer risk for the maximally exposed receptor to be 2.45 in 1 million. The construction and operational characteristics of the Tranquillity solar project are virtually identical to those of the WSP solar development. The Tranquillity solar project has several sensitive receptors located directly adjacent and downwind of the project site, and therefore that project represents a worst-case scenario for health risk assessment of large PV solar projects in the San Joaquin Valley. Since atmospheric conditions at the Tranquillity site are also very similar to those of the WSP plan area, the results of the Tranquillity health risk assessment are fully transferable to WSP solar development. Based on this comparison, it is reasonable to conclude that the increased lifetime cancer risk for the nearest sensitive receptors at the Shannon Ranch and the Stone Ranch Land Company resulting from the WSP solar development and operation, would be well below the 20 in 1 million significance threshold.

As is the case for WSP solar projects, diesel particulate matter (DPM) would be emitted from diesel-fueled vehicles and equipment during construction of the gen-tie projects and related facilities. Operational emissions would be negligible due to the very low intensity of inspection and maintenance activities associated with gen-tie lines and related facilities, as discussed above.

There are a total of 10 sensitive receptors (all residences) located within 1,000 feet of the southern gen-tie corridor. There are no residences within 1,000 feet of the northern gen-tie corridor. The nearest 10 residences, located along Nevada and Jayne Avenues, are situated 125 feet to 180 feet from the corridor boundary. It is anticipated that nearest transmission towers would be located approximately 300 feet from the nearest dwelling at the Stone Land Company Ranch and 400 feet from the nearest of the 8 dwellings on the south side of Jayne Avenue. Also few if any new access roads would need to be constructed, given that all tower sites would be readily accessible from the adjacent county roads. It is expected that staging areas would be located well away from any existing residences. The planned locations of the two WSP switching stations are located at least 2 miles and 3 miles from the nearest residences, respectively.

Construction of the gen-tie towers would proceed quickly. The total time required at each tower site for clearing, grading, excavation of footings, and tower assembly and erection, and clean up, would be 1 to 2 weeks. The area subject to temporary grading at each tower site would be approximately one acre, so the duration of grading equipment operation would be brief. Similarly, the time required for auguring holes for the concrete footings at each tower site would also be short.

The maximally exposed sensitive receptor along Nevada and Jayne Avenues would be 300 feet or more away from the nearest tower site. However, even under worst-case conditions with the nearest tower placed in proximity to the maximally exposed receptor, the total duration of nearby construction could be up to two weeks, but likely much shorter, with total operating time for diesel equipment shorter still. Construction of other towers and temporary access roads in the vicinity would occur at least 800 feet away and farther. At this distance, most diesel particulates would be dispersed and concentrations reaching the receptor would be low. Operational emissions would be negligible given the very low frequency of inspection and maintenance activities at would take place at the nearest tower. The very low level of exhaust emissions associated with construction of the gen-tie projects and related facilities is indicated by the low levels of $PM_{10}/PM_{2.5}$ (as exhaust) shown in Table 5. As shown, the total annual emissions (including off-site truck travel) of exhaust particulate matter is calculated to be 0.43 tons for the entire Southern Gen-Tie, and 0.17 tons for the entire Northern Gen-Tie (for which emissions are lower due to its later construction year when equipment will have lower emissions), both of which are well below the significance threshold of 15 tons per year.

Given the very brief duration of construction that would occur at the nearest residential receptor, and considering the negligible operational emissions, and the lifetime exposure period considered in evaluating cancer risk, it is expected that the increased cancer risk at the maximally exposed receptor would be very low and would be well below the risk threshold of 20 in 1 million. Therefore, the overall health risk due to emissions of diesel particulate matter from construction of the gen-tie projects and related facilities would be less than significant.

In summary, given the relatively minor use of heavy equipment for solar project construction, the very small number of nearby sensitive receptors, the relatively short period of construction emissions that would occur in the vicinity of the sensitive receptors, and the very low intensity of solar operations, the health risks from toxic air contaminants to the nearest sensitive receptors would not be significant. Therefore, no long-term health risks are anticipated, and the potential impacts of WSP solar development and Gen-Tie construction in terms of health risk from toxic air contaminants would be less than significant.

**Mitigation Measure for Impact 5:** None required.

**Impact 6:** Odors. The project would result in temporary odors during construction. This impact would be ***less-than-significant***.

During construction, the various diesel powered vehicles and equipment in use onsite would create localized odors. These odors would be temporary and would dissipate relatively quickly and thus would not likely to be noticeable for extended periods of time much beyond the boundaries of the WSP solar projects. Most if not all diesel odors carried off-site would disperse into the atmosphere before reaching the nearest sensitive receptors. The potential for diesel odor impacts is therefore less than significant.

During project operations, the WSP solar facilities are not expected to generate any objectionable odors. Therefore, the odor impacts associated with SGF operations would be less than significant.

**Mitigation Measure for Impact 6:** None proposed.

**Impact 7:** Consistency with Clean Air Planning Efforts. The WSP solar development would not conflict with the current clean air plan or obstruct its implementation. This would be a ***less-than-significant impact***.

The SJVACPD's CEQA guidance states that projects with emissions below the thresholds of significance for criteria pollutants would be determined to not conflict with or obstruct implementation of the District's air quality plan (SJVAPCD 2015, p. 65.) As discussed under Impact 2, it is calculated that the emissions of criteria pollutants for the SGF projects would exceed some significance thresholds prior to mitigation, but that implementation of the Mitigation Measures for Impact 2 would result in reduction of emissions levels to below the applicable thresholds of significance. Therefore, the implementation of the WSP Master Plan would not conflict with or obstruct implementation of efforts outlined in the region's air pollution control plans to attain or maintain ambient air quality standards. This would be a less-than-significant impact.

**Mitigation Measure for Impact 7:** None required.

**Impact 8:** Greenhouse Gas Emissions. The WSP solar projects would generate greenhouse gas emissions, either directly or indirectly, that may have a significant effect on the environment. However, the GHG emissions resulting from WSP solar development would be very small compared to the substantial net benefit to global climate change resulting from the renewable power generation provided. Therefore, WSP solar development would result in a ***less-than-significant impact*** to global climate change.

Introduction

The emission of greenhouse gases (GHG) from many sources over long periods of time has resulted in, and continues to contribute to, global warming and climate change. The effects of climate change include: melting polar ice caps, sea level rise, increased coastal flooding, increased frequency and severity of extreme weather events, habitat disruption, and other adverse environmental effects. It is generally accepted that individual development projects, in and of themselves, are too small to have a perceptible effect on global climate. However, the GHG emissions from each development project results in an incremental contribution to global warming and climate change. The geographic scope of climate change is global, and the cumulative emissions of GHGs globally have resulted in cumulatively significant climate change impacts. Thus, in CEQA terms, GHG emissions associated with individual development projects are by nature cumulative in their effects. As such, a significant impact would occur if the GHG emissions associated with a project represent a considerable contribution to the cumulatively significant impacts resulting from global climate change.

GHG Emissions

The WSP solar and gen-tie projects would directly generate greenhouse gas emissions during construction, and routine operational and maintenance activities. The three GHGs associated with the project, $CO_2$, $CH_4$, and $N_2O$, would be emitted from on road vehicles and non-road equipment during construction and from vehicles used during routine operational activities. Estimated greenhouse gas emissions from construction and operational activities are shown in Tables 5 and 7 above.

Another GHG that would be used at the solar projects is sulfur hexafluoride ($SF_6$) which would be used as a gas insulator in switchgear at on-site substations during project operations. Older switchgear, manufactured before 1999, is prone to leaking $SF_6$ into the atmosphere. Newer switchgears have a very low leak rate and are subject to CARB regulations which provide for leak prevention methods to reduce emissions to levels consistent with the AB 32 Scoping Plan. As such, the potential for emissions of $SF_6$ from WSP solar projects is considered negligible.

The WSP solar and gen-tie projects would emit a total of 115,617 metric tons of $CO_2e$ (Carbon Dioxide equivalents) over their estimated 30-year operational lifetimes. (Note: Since the first SGF would begin operation in 2018 and the last SGF would begin operation in 2030, the collective life of the WSP solar facilities would be about 43 years, although individual solar facilities are assumed to have useful lives of 30 years.) Construction emissions, at 83,442 metric tons of $CO_2e$, represent 71 percent of total CO2e, while operational emissions, at 32,175 metric tons of $CO_2e$, represent 29 percent of total $CO_2e$. The total $CO_2e$ emissions annualized over the lives of the projects (30 years each) is equivalent to 3,854 tons per year of $CO_2e$ for the entire plan area. [Note: The GHG emissions associated with SGF decommissioning would be equivalent to approximately 75 percent of construction emissions[8]. However, since many of the materials salvaged from deconstruction would be recyclable or reusable, these emissions would be largely offset by the avoided emissions associated with the manufacture of future equipment and components from virgin materials.]

Upon completion, the 2,000 MW generated at the Westlands Solar Park would deliver approximately 5 million megawatt-hours per year (MWh/yr) of electricity to the grid. This electric power would be dispatched to the California Independent System Operator (CAISO) in accordance with a complex and dynamic formula that takes into account numerous variables in ongoing dispatching decisions to meet demand for electricity at any given time. One of those variables is compliance with the mandate to integrate electricity generated from renewable sources into the system at a predetermined rate, i.e., 50 percent by 2030 as mandated by the current California Renewables Portfolio Standard (RPS). Since fossil fuel sources are typically less expensive and more reliable than renewable sources at the utility scale, it is expected that in the absence of an RPS mandate, these fossil sources would continue to be the dominant fuel source for electrical generation in California. Thus renewable sources of electricity, such as solar generation, are considered to offset an equivalent amount of generation from other fuel sources, such as natural gas or coal, that would otherwise be dispatched by the CAISO in the absence of an RPS mandate. In other words, the installation and operation of solar facilities, such as those at the Westlands Solar Park, would result in a net reduction of fossil-based generation, and hence a net reduction in $CO_2$ emissions, relative to overall $CO_2$ emissions that would occur without the WSP solar projects.

[8] Kings County. 2012. Initial Study and Negative Declaration – Conditional Use Permit No. 11-03 (SunPower Henrietta Solar Project). June.

In order to quantify the amount of net reduction in $CO_2$ emissions that would be represented by the WSP solar and gen-tie facilities, the $CO_2$ emissions from fossil-fueled plants with the same electrical output was considered for comparison. For example, a large combined cycle natural gas power plant rated at approximately 660 MWs would be expected to produce approximately 1.92 million metric tons/yr of CO2e. Scaled up to a 2,000 MW facility, the CO2e emissions would be approximately 5.82 million metric tons/yr. The GHG emissions of 3,854 $MTCO_2e$ per year from WSP solar and gen-tie facilities would be far less, and would be 99.93 percent less than emissions from a fossil-fueled plant with comparable generating capacity.

The emissions reductions associated with typical land development projects, such as commercial or residential projects, can be quantified because business-as-usual baseline conditions can be readily established. For renewable solar PV projects, no baseline of business-as-usual conditions has been established, so there is no way to measure emissions reductions against the SJVAPCD 29 percent reduction target for land development projects. However, as an electrical generating facility, it is reasonable to assume that in a business-as-usual scenario that does not include the AB 32 and RPS mandates, natural gas-fueled generation project would be favored over renewable generation given the comparative cost and reliability advantages of natural gas generation. Thus the natural gas power plant described above would reasonably represent BAU, and the WSP emissions reduction of over 99 percent would more than satisfy the 29 percent reduction target of the SJVAPCD.

In summary, the WSP solar and gen-tie facilities would result in a substantial reduction in GHG emissions compared to fossil-fueled power generation that would likely be dispatched in the absence of the RPS requirements. Thus while GHG emissions would occur during construction and operation of WSP solar and gen-tie facilities, the net effect would be beneficial in terms of impacts to global climate change. Therefore, the impact of a relatively small amount of GHG emissions resulting from WSP solar and gen-tie projects would be *less than significant*.

<u>Consistency with GHG Reduction Plans and Policies</u>

The Climate Change Scoping Plan adopted by the California Air Resources Board outlines the strategies for achieving the AB 32 emissions reduction targets. One of the key strategies is the Renewables Portfolio Standard (RPS), which requires all electric utilities in California to include a minimum of 50 percent renewable generation sources in their overall energy mix by 2030. The solar photovoltaic generating facilities in the Westlands Solar Park, together with the gen-tie facilities, will help increase the proportion of renewables in the statewide energy portfolio, thereby furthering the implementation of RPS by the target year instead of hindering or delaying its implementation. The addition of the WSP solar generation to the state's electrical supply will help facilitate the retirement of existing older fossil-fueled generation plants, thereby avoiding or offsetting those sources of GHG emissions. Therefore, the project would have *no impact* in terms of conflicting with a plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases.

Mitigation Measure for Impact 8: None needed

## CUMULATIVE AIR QUALITY IMPACTS

Methodology

The SJVAPCD has developed criteria to determine if a development Project could result in potentially significant regional emissions. According to Section 4.3.2 of the GAMAQI (Thresholds of Significance for Impacts from Project Operations), any proposed project that would individually have a significant air quality impact (i.e., exceed significance thresholds for ROG or $NO_x$) would also be considered to have a significant cumulative air quality impact. Impacts of local pollutants (CO and TACs) are cumulatively significant when the combined emissions from the project and other existing and planned projects will exceed air quality standards. For local impacts of $PM_{10}$ from unrelated construction projects, the GAMAQI recommends a qualitative approach where construction activities from unrelated projects in the area should be examined to determine if enhanced dust suppression measures are necessary.

Regional Air Pollutants

As discussed under ‘Significance Criteria” above, cumulative ozone impacts would be considered significant only if the project-specific emissions exceed the SJVAPCD significance thresholds for ozone precursors ROG or $NO_x$, or the project is not consistent with the regional clean air plan. As discussed in Impact 3 above, project-specific emissions of ozone precursor pollutants (ROG and $NO_x$) and $PM_{10}$ were found to be less-than-significant, after mitigation. As discussed under Impact 7 above, the project would be consistent with clean air planning efforts and would not conflict with or obstruct their implementation. Therefore, the project contribution to cumulative regional air quality impacts would be less than significant.

Local Air Pollutant Emissions

Construction period $PM_{10}$ and $PM_{2.5}$ emissions would be localized. As shown in Table 6 above, the $PM_{10}$ construction exhaust from the various WSP projects (e.g., SGFs, gen-ties, switchyards, substation upgrades) would be well below the $PM_{10}$ significance threshold of 15 tons, while the $PM_{10}$ dust emissions from the WSP projects would be substantially greater than the $PM_{10}$ significance threshold of 15 tons. For fugitive dust emissions, the preparation and implementation of SJVAPCD-approved dust control plans, pursuant to Regulation VIII, total $PM_{10}$ emissions from the WSP projects would be reduced to the extent that the impact would be less than significant.

There are four other approved solar projects (or groups of related projects) in the immediate WSP vicinity, of which two have been completed (Mustang/Orion/Kent South, and Kettleman), and two have not yet commenced construction (American Kings, Mustang 2). Depending on construction schedules, the construction of one or more SGFs in Westlands Solar Park could overlap with the construction of one or more of these other proximate solar projects. By the time the first WSP solar project commences construction, it is assumed that the American Kings and Mustang 2 projects may be under construction at the same time as the first WSP solar project. The implementation of mitigations for $PM_{10}$ for exhaust emissions, and implementation of dust control measures required for each project under SJVAPCD Regulation VIII would reduce $PM_{10}$ emissions from each project to below the 15 ton per year significance threshold. It is possible that the combined $PM_{10}$ emissions from the American Kings, Mustang 2, and first WSP solar project could exceed 15 tons per year, although the 15 ton threshold for exhaust component of $PM_{10}$ would not be exceeded. As noted above, where $PM_{10}$ emissions from unrelated projects may occur, the SJVAPCD would employ a qualitative approach to determine if enhanced dust suppression measures would be necessary. The need for enhanced dust control would be determined by the SJVAPCD on a case-by-case basis in conjunction with its review and approval of the Dust Control Plans for each project. This process would ensure that cumulative $PM_{10}$ emissions would be less than significant.

In summary, the cumulative project impacts to localized air quality impacts from criteria pollutants for which the region is in non-attainment would be less-than-significant.

Cumulative Toxic Air Pollutant Impacts

As discussed above, the American Kings and Mustang 2 solar projects may be under construction at the same time as the first WSP solar project. The first SGF in WSP (i.e., SGF 1) is expected to be constructed in the northeast corner of the WSP plan area, which is directly southwest of the American Kings project and directly west of the Mustang 2 project. As such, all three projects would potentially contribute to emissions of TACs at the same time. In considering the geographic extent of TAC impacts, it is important to note that DPM concentrations diminish rapidly from the source. Pollutant dispersion studies have shown that there is about an 80 percent drop off in DPM concentrations at approximately 1,000 feet from the source (CARB 2014). Thus multiple sources of DPM emissions must all be proximate to a receptor to have an additive effect to DPM concentrations at the receptor site. The nearest residential receptors to the SGF 1 site are located 2.5 miles southwest (Shannon Ranch) and 2.5 miles north (residences at NAS Lemoore). The nearest residential receptors to the Mustang 2 site are located 1.3 miles east (rural residence) and 2.0 miles north (residences at NAS Lemoore). The nearest residential receptors to the American Kings site are located 350 feet north (residences at NAS Lemoore). Although the residences at NAS Lemoore may be temporarily subject to DPM emissions from nearby construction at the American Kings project, it is not expected that this would result in significant increase in lifetime cancer risk to the affected residents. The DPM emissions from the SGF 1 and Mustang 2 projects would be too far from these receptors to make any contribution to the DPM exposure at NAS Lemoore since most if not all DPM emissions from these projects would disperse into the atmosphere before reaching these receptor locations. All the other nearest residential receptors are at least one mile from any of the three projects, where DPM concentrations would be negligible. Therefore, cumulative emissions of DPM or TACs are not anticipated to result in a significant increase in cancer risk to exposed persons.

Cumulative GHG Emissions Impacts

As discussed under Impact 8, the overall effects of GHG emissions are considered to be cumulatively significant only at the global level, and project-level impacts are considered significant if the project makes a considerable contribution to the cumulative impact. As discussed, the construction and operation of the WSP solar projects would generate some greenhouse gas emissions from fossil-fueled vehicles and equipment; however, these emissions would be more than offset by the avoided greenhouse gas emissions resulting from the WSP projects' renewable electricity generation. Since all of the cumulative projects are also solar PV generating facilities, they would each result in a net benefit to climate change by offsetting an equivalent amount of fossil-fueled power generation. Thus none of the cumulative projects, including the WSP solar projects, would make a considerable contribution to the cumulative climate change impact. Therefore, the cumulative impact to climate change would be less than significant, and the project contribution would be no cumulatively considerable.

Summary of Cumulative Contribution to Air Quality Impacts

The project would not contribute to local cumulative air quality impacts with respect to any standard or significance criteria. In addition, the project's contribution to cumulative regional air quality impacts would be less than significant. In conclusion, the project would not have a cumulatively significant impact on air quality.

# Appendix 1

## Construction and Operational Emissions Calculations

SG1 2018

## Tons/Period

| | NOx | CO | VOC | SOx | PM10 | CO2 | Fug PM10 | Fug PM2.5 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| on-off site travel | 4.06 | 3.58 | 0.14 | 0.03 | 0.03 | 2806 | 3.79 | 0.65 | | |
| on-site equipment | 7.91 | 4.28 | 1.12 | 0.01 | 0.34 | 1406 | | | | |
| Total | 11.97 | 7.85 | 1.27 | 0.04 | 0.37 | 4212 | 3.79 | 0.65 | 4.16 | 1.02 |

CONSTRUCTION EQUIPMENT EXHAUST EMISSIONS

Project: WSP **Main Site Construction-SGF 1**

**Assumptions:**

1. The average engines employed in construction equipment use consumes fuel at a rate of: diesel 0.06 gal/hp-hr; gasoline 0.11 gal/hp-hr

Ref: EPA, NR-009b Publication, November 2002.
Ref: Sacramento County APCD Const. Program Data, V. 6.0.3, 3/2007.
Ref: EPA, NR-009c Publication, EPA 420-P-04-009, April 2004.
Ref: Niland Energy Project, IID, AFC Vol 2, App A.
Ref: South Coast AQMD PR XXI, Draft Staff Report, 3-15-95, and SCAQMD CEQA Manual, 11/03.
The above noted references present fuel consumption values which range from 0.050 to 0.064 gal/hp-hr for diesel engines used in construction related equipment. The value of 0.060 gal/hp-hr was chosen as a reasonable upper mid-range value for construction diesel emissions calculations.
For gasoline the mid-range value from SCAQMD of 0.11 gal/hp-hr was used.

2. Construction equipment exhaust emissions will be calculated on an annual basis using the site specific equipment list, HP ratings, hours of use, days of use, etc. Annual emissions will be apportioned to daily values based on the estimated construction period time on site.

3. The equipment list derived from the South Coast AQMD Offroad database (2016) will be used to establish the various equipment categories. Avg HP values were derived from SCAQMD and SacMetro AQMD construction resources.

4. Construction Schedule: 8 months; 8 hrs/day; 0.67 years

Construction Totals: 240 hrs/month; 1920 hrs/const period; 240 days/const period

5. Anticipated Construction Start Year: 2016

6. Maximum anticipated equipment use month is: n/a

7. N2O EF diesel, lb/gal: 0.000183
N2O EF gasoline, lb/gal: 0.000164
CARB, Mandatory GHG Reporting Regulation Table 4, Appendix A, 2007.

Equipment types and use rates supplied by the Applicant.

| **Equipment Category**** | | **Weighted Average HP** | **# of Units Used for Project** | **Avg Use Rate Hrs/day** | **# of Days On Site (each)** | **Total Hrs/Day** | **Total Hrs per Const Period** | **Total HP-Hrs Period** |
|---|---|---|---|---|---|---|---|---|
| Aerial Lifts | | 63 | 1 | 6 | 38 | 6 | 228 | 14364 |
| Air Compressors | | 78 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bore-Drill Rigs | | 206 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cement Mixers | | 9 | 0 | 0 | 0 | 0 | 0 | 0 |
| Concrete/Industrial Saws | | 81 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cranes | | 226 | 1 | 2 | 38 | 2 | 76 | 17176 |
| Crawler Tractors/Dozers | | 208 | 3 | 7 | 85 | 21 | 1785 | 371280 |
| Crushing/Processing Eq. | | 85 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dumpers/Tenders/Water Trucks | | 16 | 7 | 7 | 78 | 49 | 3822 | 61152 |
| Excavators | | 163 | 0 | 0 | 0 | 0 | 0 | 0 |
| Forklifts | | 89 | 8 | 6 | 80 | 48 | 3840 | 341760 |
| Generator Sets | | 84 | 0 | 0 | 0 | 0 | 0 | 0 |
| Graders | | 175 | 5 | 7 | 43 | 35 | 1505 | 263375 |
| Off-Highway Tractors | | 123 | 0 | 0 | 0 | 0 | 0 | 0 |
| Off-Highway Trucks | | 400 | 12 | 7 | 88 | 84 | 7392 | 2956800 |
| Other Diesel Construction Eq. | | 172 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other General Industrial Eq. | | 88 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Material Handling Eq. | | 167 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pavers | | 126 | 1 | 4 | 11 | 4 | 44 | 5544 |
| Paving Eq. Other | | 131 | 0 | 0 | 0 | 0 | 0 | 0 |
| Plate Compactors | | 8 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pressure Washers | | 13 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pumps | | 84 | 0 | 0 | 0 | 0 | 0 | 0 |
| Roller Compactors | | 81 | 1 | 7 | 17 | 7 | 119 | 9639 |
| Rough Terrain Forklifts | | 100 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber Tired Dozers | | 255 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber Tires Loaders | | 200 | 0 | 0 | 0 | 0 | 0 | 0 |
| Scrapers | | 362 | 0 | 0 | 0 | 0 | 0 | 0 |
| Signal Boards | | 6 | 0 | 0 | 0 | 0 | 0 | 0 |
| Skid Steer Loaders | | 65 | 1 | 7 | 75 | 7 | 525 | 34125 |
| Surfacing Eq. | | 254 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sweepers/Scrubbers | | 64 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tractors | (single category) | 98 | 2 | 7 | 98 | 14 | 1372 | 134456 |
| Front End Loaders | | 98 | 1 | 7 | 33 | 7 | 231 | 22638 |
| Backhoes | | 98 | 1 | 4 | 63 | 4 | 252 | 24696 |
| Trenchers | | 81 | 3 | 4 | 86 | 12 | 1032 | 83592 |
| Welders | | 46 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gasoline Const Eq. | | 175 | 0 | 0 | 0 | 0 | 0 | 0 |

** diesel equipment unless otherwise specified.

Const Period Diesel Hp-Hrs = 4340597
Const Period Gasoline Hp-Hrs = 0
Const Period Diesel Fuel Use = 260436 gals
Const Period Gasoline Fuel Use = 0 gals

Offroad equipment emissions factors derived SCAQMD Off Road database for 2016.
The SCAQMD EFs as presented incorporate the average equipment load factors.
Emissions factors for each category of equipment represent the composite factors for the stated equipment category as derived from the SCAQMD Offroad database for the construction start year.

**2016 Equipment Emissions Factors**

| Equip. Type | lbs/hr VOC (ROG) | lbs/hr CO | lbs/hr NOx | lbs/hr SOx | lbs/hr PM10 | lbs/hr CO2 | lbs/hr CH4 |
|---|---|---|---|---|---|---|---|
| Aerial Lifts | 0.0397 | 0.1800 | 0.2482 | 0.0004 | 0.0150 | 34.7217 | 0.0036 |
| Air Compressors | 0.0704 | 0.3207 | 0.4729 | 0.0007 | 0.0318 | 63.6073 | 0.0064 |
| Bore-Drill Rigs | 0.0623 | 0.5016 | 0.5340 | 0.0017 | 0.0160 | 164.9093 | 0.0056 |
| Cement Mixers | 0.0088 | 0.0418 | 0.0542 | 0.0001 | 0.0023 | 7.2481 | 0.0008 |
| Concrete/Industrial Saws | 0.0756 | 0.3936 | 0.4589 | 0.0007 | 0.0336 | 58.4637 | 0.0068 |
| Cranes | 0.1137 | 0.4263 | 0.9387 | 0.0014 | 0.0388 | 128.6292 | 0.0103 |
| Crawler Tractors/Dozers | 0.1335 | 0.5549 | 0.9315 | 0.0013 | 0.0546 | 114.0188 | 0.0120 |
| Crushing/Processing Eq. | 0.1337 | 0.6461 | 0.8965 | 0.0015 | 0.0538 | 132.3090 | 0.0121 |
| Dumpers/Tenders | 0.0093 | 0.0314 | 0.0587 | 0.0001 | 0.0024 | 7.6244 | 0.0008 |
| Excavators | 0.0988 | 0.5213 | 0.6603 | 0.0013 | 0.0332 | 119.5800 | 0.0089 |
| Forklifts | 0.0427 | 0.2190 | 0.2816 | 0.0006 | 0.0137 | 54.3958 | 0.0039 |
| Generator Sets | 0.0581 | 0.2862 | 0.4370 | 0.0007 | 0.0241 | 60.9927 | 0.0052 |
| Graders | 0.1197 | 0.5883 | 0.8866 | 0.0015 | 0.0441 | 132.7430 | 0.0108 |
| Off-Highway Tractors | 0.1803 | 0.7067 | 1.4108 | 0.0017 | 0.0670 | 151.4197 | 0.0163 |
| Off-Highway Trucks | 0.1816 | 0.5831 | 1.3322 | 0.0027 | 0.0459 | 260.0516 | 0.0164 |
| Other Diesel Construction Eq. | 0.0720 | 0.3602 | 0.5680 | 0.0013 | 0.0234 | 122.5629 | 0.0065 |
| Other General Industrial Eq. | 0.1267 | 0.4731 | 1.0122 | 0.0016 | 0.0425 | 152.2399 | 0.0114 |
| Other Material Handling Eq. | 0.1202 | 0.4608 | 0.9913 | 0.0015 | 0.0411 | 141.1941 | 0.0108 |
| Pavers | 0.1269 | 0.5135 | 0.7128 | 0.0009 | 0.0489 | 77.9335 | 0.0114 |
| Paving Eq. Other | 0.0965 | 0.4198 | 0.6393 | 0.0008 | 0.0436 | 68.9412 | 0.0087 |
| Plate Compactors | 0.0050 | 0.0263 | 0.0314 | 0.0001 | 0.0012 | 4.3138 | 0.0005 |
| Pressure Washers | 0.0121 | 0.0579 | 0.0764 | 0.0001 | 0.0044 | 9.4135 | 0.0011 |
| Pumps | 0.0562 | 0.2785 | 0.3830 | 0.0006 | 0.0239 | 49.6067 | 0.0051 |
| Roller Compactors | 0.0792 | 0.3944 | 0.5273 | 0.0008 | 0.0353 | 67.0483 | 0.0071 |
| Rough Terrain Forklifts | 0.0775 | 0.4549 | 0.5104 | 0.0008 | 0.0372 | 70.2808 | 0.0070 |
| Rubber Tired Dozers | 0.2591 | 0.9834 | 2.0891 | 0.0025 | 0.0858 | 239.0905 | 0.0234 |
| Rubber Tires Loaders | 0.0983 | 0.4557 | 0.7114 | 0.0012 | 0.0375 | 108.6114 | 0.0089 |
| Scrapers | 0.2383 | 0.9053 | 1.9017 | 0.0027 | 0.0783 | 262.4900 | 0.0215 |
| Signal Boards | 0.0161 | 0.0921 | 0.1172 | 0.0002 | 0.0060 | 16.6983 | 0.0014 |
| Skid Steer Loaders | 0.0305 | 0.2184 | 0.2044 | 0.0004 | 0.0106 | 30.2770 | 0.0028 |
| Surfacing Eq. | 0.1045 | 0.4506 | 0.9731 | 0.0017 | 0.0353 | 165.9721 | 0.0094 |
| Sweepers/Scrubbers | 0.0810 | 0.4988 | 0.5192 | 0.0009 | 0.0332 | 78.5433 | 0.0073 |
| Tractors | 0.0610 | 0.3689 | 0.4070 | 0.0008 | 0.0258 | 66.7979 | 0.0055 |
| Front End Loaders | 0.0610 | 0.3689 | 0.4070 | 0.0008 | 0.0258 | 66.7979 | 0.0055 |
| Backhoes | 0.0610 | 0.3689 | 0.4070 | 0.0008 | 0.0258 | 66.7979 | 0.0055 |
| Trenchers | 0.1200 | 0.4479 | 0.5719 | 0.0007 | 0.0453 | 58.7146 | 0.0108 |
| Welders | 0.0482 | 0.1951 | 0.2173 | 0.0003 | 0.0168 | 25.6027 | 0.0044 |
| Gasoline Const Eq. (assumed 175 hp category) | 0.0771 | 0.3855 | 1.08 | 0.00014 | 0.1542 | 14.1565 | 0.00037 |

(gasoline EFs: EPA OMS-AMD Report NR-009A, 2-13-98, and SCAQMD EMFAC 2007 CEQA Tables, 2016.)

Construction Period Emissions, lbs

| Equip. Type | VOC | CO | NOx | SOx | PM10 | CO2 | CH4 |
|---|---|---|---|---|---|---|---|
| Aerial Lifts | 9 | 41 | 57 | 0 | 3 | 7917 | 1 |
| Air Compressors | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bore-Drill Rigs | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cement Mixers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Concrete/Industrial Saws | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cranes | 9 | 32 | 71 | 0 | 3 | 9776 | 1 |
| Crawler Tractors/Dozers | 238 | 991 | 1663 | 2 | 97 | 203524 | 21 |
| Crushing/Processing Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dumpers/Tenders | 35 | 120 | 225 | 0 | 9 | 29140 | 3 |
| Excavators | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Forklifts | 164 | 841 | 1081 | 2 | 52 | 208880 | 15 |
| Generator Sets | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Graders | 180 | 885 | 1334 | 2 | 66 | 199778 | 16 |
| Off-Highway Tractors | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Off-Highway Trucks | 1343 | 4310 | 9848 | 20 | 339 | 1922301 | 121 |
| Other Diesel Construction Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other General Industrial Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Material Handling Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pavers | 6 | 23 | 31 | 0 | 2 | 3429 | 1 |
| Paving Eq. Other | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Plate Compactors | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pressure Washers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pumps | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Roller Compactors | 9 | 47 | 63 | 0 | 4 | 7979 | 1 |
| Rough Terrain Forklifts | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber Tired Dozers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber Tires Loaders | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Scrapers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Signal Boards | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Skid Steer Loaders | 16 | 115 | 107 | 0 | 6 | 15895 | 1 |
| Surfacing Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sweepers/Scrubbers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tractors | 84 | 506 | 558 | 1 | 35 | 91647 | 8 |
| Front End Loaders | 14 | 85 | 94 | 0 | 6 | 15430 | 1 |
| Backhoes | 15 | 93 | 103 | 0 | 7 | 16833 | 1 |
| Trenchers | 124 | 462 | 590 | 1 | 47 | 60594 | 11 |
| Welders | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gasoline Const Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| **Totals** | **VOC** | **CO** | **NOx** | **SOx** | **PM10** | **PM2.5** | **CO2** | **CH4** | **N2O** |
|---|---|---|---|---|---|---|---|---|---|
| lbs per const. period | 2246 | 8551 | 15825 | 30 | 677 | 671.23 | 2793122 | 203 | 48 |
| tons per const. period | 1.1 | 4.3 | 7.9 | 0.015 | 0.34 | 0.34 | 1396.56 | 0.10 | 0.02 |
| Average lbs/day = | 9.4 | 35.6 | 65.9 | 0.123 | 2.82 | 2.80 | 11638.01 | 0.84 | 0.20 |
| Normalized TPY = | *1.12* | *4.28* | *7.91* | *0.01* | *0.34* | *0.34* | *1396.56* | *0.10* | *0.018* |

| | |
|---|---|
| CO2e, tons/period | 1406.2 |
| CO2e, tons/yr: | 1406.2 |

CARB-CEIDARS, Updated Size Fractions for PM Profiles: PM2.5 = 0.991 of PM10 : Diesel Vehicle Exhaust

Other Assumptions and References:

1. Trench construction times per: Southern Regional Water Pipeline Alliance, 3/08.
   Optimum trench construction progress rate is 80m (260ft) per day.
   Non-optimum trench construction progress rate is 30m (100 ft) per day.
   An average progress of 180 ft/day is used where applicable.
2. Paving speeds can range from 3 to 15 m/min depending on asphalt delivery rates and required compaction thickness.
   A minium paving speed of 3 m/min (10 ft/min or 600 ft/hr) was used where applicable.
   The minimum speed is based upon a 3" compacted layer, 12 ft lane width, with an asphalt delivery rate of ~ 140 tons/hr.
   Ref: Asphalt Paving Speed, Pavement Worktip No. 31, AAPA, 11/2001.
3. Estimation of maximum daily emissions is extremely variable, and these values are not required by SJVAPCD.
4. Construction schedule note: applicant data indicates a construction work day period of 8 hours
   The equipment use rates provided by the applicant are consistent with an 8 hour workday.
5. GWP values: CH4=25, N2O=298, ref: 40 CFR 98 Subpart A, Table A-1.

**CONSTRUCTION PHASE - SGF 1**

| | | | |
|---|---|---|---|
| **MRI Level 2 Analysis (Refs 1, 3-7)** | Acres | 931 | |
| Acres Subject to Construction Disturbance Activites: | | 93.1 | note (10) |
| Avg Acres Subject to Construction Disturbance Activites on any day of this phase: | | 9.3 | |
| Emissions Factor for PM10 Uncontrolled, tons/acre/month: | | 0.12 | |
| PM2.5 fraction of PM10 (per CARB CEIDARS Profiles): | | 0.21 | |
| **Activity Levels:** Hrs/Day: | | 8 | |
| Days/Wk: | | 5 | |
| Days/Month: | Applicant Data | 22 | |
| Phase Const Period, Months: | | 8 | 0.67 years |
| Phase Const Period, Days: | | 240 | |

**Wet Season Adjustment:** (Per AP-42, Section 13.2.2, Figure 13.2.2-1, 12/03 or CalEEMod, Appendix D, Table 1.1.)

| | |
|---|---|
| Mean # days/year with rain >= 0.01 inch: | 40 |
| Mean # months/yr with rain >= 0.01 inch: | 1.33 |
| Adjusted Const Period, Months: | 7.11 |
| Adjusted Const Period, Days: | 213 |

**Controls for Fugitive Dust:** Proposed watering cycle: 3 times per day

3 watering cycles/8 hour construction shift yields a 68% reduction, use 68% for non-desert sites. (11)(12)
Speed control of onsite const traffic to <15 mph yields a 40-70% reduction (use 50% control as conservative for site). (11)(12)

| | | |
|---|---|---|
| Calculated % control based on mitigations proposed: | 84 | % control |
| Conservative control % used for emissions estimates: | 84 | % control |
| | 0.16 | release fraction |

| **Emissions: Controlled** | PM10 | PM2.5 |
|---|---|---|
| tons/month | 0.179 | 0.038 |
| tons/period | 1.271 | 0.267 |
| Max lbs/day | 16.250 | 3.413 |

**Soil Handling Emissions (Cut and Fill): (2)**

| | |
|---|---|
| Total cu.yds of soil handled: | 0 |
| Total tons of soil handled: | 0.0 |
| Total days soil handled: | 213 |
| Tons soil/day: | 0 |
| Control Eff, watering, % | 80 |
| Release Fraction: | 0.2 |

| Emissions: | PM10 | PM2.5 |
|---|---|---|
| tons/period | 0.000 | 0.000 |
| tons/month | 0.000 | 0.000 |
| max lbs/day | 0.000 | 0.000 |

| | | | |
|---|---|---|---|
| Mean annual wind speed, mph: (8) | | | 8.03 |
| Avg. Soil moisture, %: (9) | | | 5 |
| Avg. Soil density, tons/cu.yd: | | | 1.3 |
| k factor for PM10: | | | 0.35 |
| Number of Drops per ton: | | | 4 |
| Calc 1 | wind | | 1.851 |
| Calc 2 | moisture | | 3.607 |
| Calc 3 | int | | 0.513 |
| Calc 4 | PM10 | lb/ton | 0.0006 |
| PM2.5 fraction of PM10: | | | 0.210 |

| **Emissions Totals:** | **PM10** | **PM2.5** |
|---|---|---|
| **tons/period** | **1.271** | **0.267** |

**Methodology References:**

(1) MRI Report, South Coast AQMD Project No. 95040, March 1996, Level 2 Analysis Procedure.
MRI Report uncontrolled factor of 0.11 tons/acre/month is based on 168 hours per month of const activity.
For an activity rate of ~180 hrs/month, the adjusted EF would be 0.12 tons/acre/month (uncontrolled).
(2) Soil Handling (Cut and Fill), EPA, AP-42, Section 13.2.4., 11/06.
(3) URBEMIS, Version 9.2.4, User's Manual Appendix A, page A-6.
(4) CARB Area Source Methodology, Section 7.7, 9/02.
(5) WRAP Fugitive Dust Handbook, 9/06.
(6) USEPA, AP-42, Section 13.2.3, 2/10.
(7) Estimating PM Emissions from Construction Operations, USEPA, MRI, 9/99.
(8) Wind speed data for Lemoore met station. Annual avg wind speed = 8.03 mph, % calms = 3.44%.
(9) Soil Moisture; 5% assumed avg value
(10) adjusted applicant value based on 7.5% of total acreage disturbed on any given day
(11) SCAQMD CEQA Handbook 1993.
(12) SCAQMD, Sample Construction Scenarios for Projects Less than Five Acres, Fugitive Dust Mitigations, February 2005.

**OFFSITE PAVED ROAD FUGITIVE DUST EMISSIONS**
(associated with delivery truck and worker vehicle traffic on I-5 and plant access road)

| | | | |
|---|---|---|---|
| Average mileage for construction related vehicles: | | NA | miles, roundtrip distance*** |
| Avg weight of vehicular equipment on road: | | 4.1 | tons (range 2 - 42 tons) |
| Road surface silt loading factor: | | 0.015 | g/m2 (range 0.03 - 400 g/m2) |
| | | | Limited Access Freeway >10,000 ADT **(I-5)** |
| Particle size multiplier factors: | PM10 | 0.0022 | lb/VMT |
| | PM2.5 | 0.00054 | lb/VMT |
| C factors (brake and tire wear): | PM10 | 0.00047 | lb/VMT |
| | PM2.5 | 0.00036 | lb/VMT |
| Avg vehicle speed on road: | | 65 | mph |
| Avg. Number of vehicles per day: | | 195 | |
| | | | calculated per Applicant da |
| Avg. Number of work days per month: | | 22 | **VMT/period: 5431085** |
| | Total vehicles per month: | 4290 | |
| Number of work months: | | 7.11 | adjusted for precip events |
| | Total vehicles per const period: | 30501.9 | |

| | PM10 | |
|---|---|---|
| Calc 1 | 0.022 | |
| Calc 2 | 4.217 | |
| Calc 3 | 0.0007 | lb/VMT |

| **Emissions** | **PM10** | **PM2.5** |
|---|---|---|
| **lbs/period** | **3655.65** | **617.81** |
| **tons/period** | **1.828** | **0.309** |

EPA, AP-42, Section 13.2.1, March 2006, updated 9/2008.
PM2.5 fraction of PM10 per CARB CEIDARs is 0.169
*** Note: avg roundtrip distance traveled by delivery or worker vehicles on freeways (I-5) and other State Routes in the project area.
Vehicles per day: worker + deliveries+staff support vehciles (averages)
Vehicle Weight: 9% are trucks. Assumme 0.09*24 tons + 0.91 * 2 tons = 4.1 tons

**ONSITE UNPAVED ROAD FUGITIVE DUST**

| | | | | | |
|---|---|---|---|---|---|
| Length of Unpaved Roads on Construction site: | | 0.1 | miles* | | |
| Avg weight of construction vehicular equipment on road: | | 4.1 | tons (range 2 - 42 tons) | | |
| Road surface silt content: | | 8.5 | % (range 1.8 - 35%) | | |
| Road surface material moisture content: | | 5 | % (range 0.03 - 13%) | | |
| | | k | a | b | |
| Particle size multiplier factors: | PM10 | 1.5 | 0.9 | 0.45 | |
| | PM2.5 | 0.15 | 0.9 | 0.45 | |
| C factors (brake and tire wear): | PM10 | 0.00047 | lb/VMT | | |
| | PM2.5 | 0.00036 | lb/VMT | | |
| Avg construction vehicle speed on road: | | 5 | mph (range 5-55 mph) | | |
| Avg number of construction vehicles per day: | | 74 | ** | | |
| | | | | **calculated per Applicant dat** | |
| Number of construction work days per month: | | 22 | | **VMT/period:** | **5396.1** |
| Total vehicles per month: | | 1628 | | | |
| Number of construction work months: | | 7.11 | adjusted for precipitation events | | |
| Total vehicles per const period: | | 53961 | | | |
| Control reduction due to watering, speed control, etc. = | | 80 | | | |
| | | 0.8 | | | |
| Release Fraction = | | 0.2 | | | |

| | PM10 | PM2.5 |
|---|---|---|
| Calc 1 | 0.733 | 0.733 |
| Calc 2 | 1.151 | 1.151 |
| Calc 3 | 1.266 | 0.127 |
| Calc 4 | 1.266 | 0.127 |
| Controlled lb/VMT | 0.253 | 0.025 |

| **Emissions** | **PM10** | **PM2.5** |
|---|---|---|
| **lbs/period** | **1366.55** | **136.99** |
| **tons/period** | **0.683** | **0.068** |

EPA, AP-42, Section 13.2.2, March 2006
Soil Moisture; 5% avg
Soil silt content: 8.5% per AP-42 for construction site scraper routes
** const equipment plus site support pickups plus

**CONSTRUCTION PHASE - Truck Hauling/Delivery and Site Support Vehicle Emissions**

**All Phases**

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Delivery/Hauling Vehicle Use Rates** | | | | | Emissions Factors (lbs/vmt) | | | | | | |
| Delivery Roundtrip Distance: | 0 | miles | NOx | CO | VOC | SOx | PM10 | CO2 | | | |
| Const Days per Period: | 0 | | 0.00774877 | 0.00056881 | 0.00013224 | 0.000026 | 5.2881E-05 | 3.17439316 | HDDT | | |
| Avg Deliveries per Day: | 0 | | 0.000569 | 0.00393159 | 9.5515E-05 | 0.000013 | 3.8032E-06 | 1.0634582 | MDGT | | |
| Fraction of Deliveries-Diesel: | 0.95 | HDDT | | | **Daily Emissions (lbs)** | | | | | | |
| Fraction of Deliveries-Gas: | 0.05 | MDGT | **NOx** | **CO** | **VOC** | **SOx** | **PM10** | **CO2** | **PM2.5** | | |
| Total Delivery VMT: | **994085** | **per Applicant** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | HDDT | |
| Total Daily VMT-Diesel | 0 | | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | MDGT | |
| Total Daily VMT-Gasoline | 0 | | | | **Tons per Const Period** | | | | | | |
| Total Period VMT-Diesel | 944380.75 | | 3.659 | 0.269 | 0.062 | 0.012 | 0.025 | 1498.9 | 0.021 | HDDT | |
| Total Period VMT-Gasoline | 49704.25 | | 0.014 | 0.098 | 0.002 | 0.000 | 0.000 | 26.4 | 0.000 | MDGT | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Construction Site Support Vehicle Use Rates (LDTs)** | | | | | **Daily Emissions, lbs** | | | | | | |
| Gasoline Vehicle VMT Period: | 75900 | | **NOx** | **CO** | **VOC** | **SOx** | **PM10** | **CO2** | | | **PM2.5** |
| Avg Daily Gasoline VMT: | 300 | | 0.00053213 | 0.00473183 | 0.00010839 | 0.000008 | 5.9144E-06 | 0.68648682 | lbs/vmt* | LDT gasoline | |
| Avg Daily Diesel VMT: | 0 | | 0.1596 | 1.4195 | 0.0325 | 0.0024 | 0.0018 | 205.9460 | lbs/day | gasoline | 0.0012 |
| Total Phase Const Days: | 240 | | | | | | | | | | |
| | | | | | **Tons per Const Period** | | | | | | |
| Ref: EMFAC 2014, SJVAPCD Year 2016 | | | 0.0202 | 0.1796 | 0.0041 | 0.0003 | 0.0002 | 26.1 | **tons/period** | **gasoline** | 0.0001 |

LDT1-gas, MDV-gas, HDDT-dsl

See EF data in WSP Support Appendix

**Notes*****

VMT for delivery/hauling for all vehicles includes: (1) materials deliveries to site, (2) materials removal from site, other VMT as specified below.

Support Vehicle VMT: best estimate at time of filing, 10 LDT (gasoline) at 30 VMT/day

CARB-CEIDARS, Updated Fractions for PM Profiles: PM2.5 = 0.991 of PM10 for Diesel Exhaust, and 0.998 for Gasoline Vehicles.

**CONSTRUCTION PHASE - Worker Travel - Emissions**

Ref: SJVAPCD EMFAC 2014, Year 2016
LDA-gas
See EF data in WSP Support Appendix

**Worker Travel to Site**

| | |
|---|---|
| Avg Occupancy/Vehicle: | 0 |
| Avg Roundtrip Distance, miles: | 0.0 |
| Avg # of Worker Vehicles, per day: | 0 |
| Avg Daily Worker VMT: | 0 |
| Max # of Worker Vehicles, per day: | 0 |
| Max Daily Worker VMT: | 0 |
| Total Const Days: | 240 |
| **Total Const Period Worker VMT:** | **4437000** |

**VMT data supplied by Applicant.**

Emissions Factors (lbs/VMT)

| NOx | CO | VOC | SOx | PM10 | CO2 |
|---|---|---|---|---|---|
| 0.00016457 | 0.001365523 | 3.3944E-05 | 0.000007 | 3.65512E-06 | 0.6946741 |

**Daily Emissions (lbs)**

| | NOx | CO | VOC | SOx | PM10 | CO2 | PM2.5 |
|---|---|---|---|---|---|---|---|
| Avg | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**Tons per Const Period**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Avg | 0.365 | 3.029 | 0.075 | 0.016 | 0.008 | 1541.1 | 0.000 |

**Worker Travel by Busing from Staging Area**

| | |
|---|---|
| Total Bus VMT/Const Period: | 0 |
| Avg Bus VMT/Const Day: | 0 |
| Max Bus VMT/Const Day: | 0 |

| | | |
|---|---|---|
| Bus Round Trips/Day: | 0 | max |
| Bus Occupancy/Trip: | 0 | |

Ref: SJVAPCD EMFAC 2014, Year 2016
All other buses-DSL
See EF data in WSP Support Appendix

# buses supplied by Applicant.

Emissions Factors (lbs/VMT)

| NOx | CO | VOC | SOx | PM10 | CO2 |
|---|---|---|---|---|---|
| 0.012001 | 0.001203 | 0.000458 | 0.000026 | 0.00015 | 2.734838 |

**Daily Emissions (lbs)**

| | **NOx** | **CO** | **VOC** | **SOx** | **PM10** | **CO2** | **PM2.5** |
|---|---|---|---|---|---|---|---|
| Avg | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Max | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**Tons per Const Period**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Avg | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

**CONSTRUCTION PHASE - Trackout Emissions**

| | | | | | | |
|---|---|---|---|---|---|---|
| Paved Road Length (miles): | 0.1 | estimated roundtrip trackout distance | | | | |
| Daily # of Vehicles: | 74 | | | | | |
| Avg Vehicle Weight (tons): | 6.8 | | | **PM10** | **PM2.5*** | |
| Total Unadjusted VMT/day | 7.4 | | | 0.361 | | |
| Particle Size Multipliers | PM10 | | | 1.924 | | |
| lb/VMT | 0.023 | | | 0.002 | 0.0004 | lb/VMT |
| C factor, lb/VMT | 0.00047 | | | **0.129** | **0.0217** | **lbs/day** |
| Road Sfc Silt Loading (g/m^2): | 0.56 | local X 2 | | **0.001** | **0.0002** | **tons/month** |
| # of Active Trackout Points: | 1 | ** | | **0.01** | **0.0017** | **tons/period** |
| Added Trackout Miles: | PM10 | | | | | |
| Trackout VMT/day: | 44 | | *Default Silt Load Values for Paved Road Types* | | | |
| Final Adjusted VMT/day | 52 | | | Freeway | 0.02 g/m2 | |
| Final Adjusted VMT/month | 1140 | | | Arterial | 0.036 g/m2 | |
| Final Adjusted VMT/period | 8103 | | | Collector | 0.036 g/m2 | |
| Construction days/month: | 22 | | | Local | 0.28 g/m2 | |
| Adj. Construction months/period: | 7.11 | | | Rural | 1.6 g/m2 | |
| Control Applied to Trackout: | Gravel entrance, metal cleaning grates, water washing, sweeping | | | | | |
| Control Efficiency, % | 84 | 0.84 | Release Factor = | | 0.16 | |

* PM2.5 fraction of PM10 assumed to be 0.169 (CARB CEIDARS updated fraction values) for paved roads.
** 1 controlled ingress/egress point is planned for site construction
EPA, AP-42, Section 13.2.1, Proposed revisions dated 9/2008.
Use silt loading factor from default values for road type if no site specific data is available.
Trackout effects approximately 0.05 mi. of roadway arriving and departing from the site access point.
Plant access road is already paved. Entrance will be gravelled with metal grates for take out control.
Vehicle count = delivery trucks plus site support trucks (see Unpaved Onsite tab)
Worker vehicles not counted for trackout, they will park on the site perimeter.

SGF2 2019-2020

## Tons/Period

| | NOx | CO | VOC | SOx | PM10 | CO2 | Fug PM10 |
|---|---|---|---|---|---|---|---|
| on-off site travel | 5.21 | 4.55 | 0.18 | 0.05 | 0.04 | 4281 | 9.14 |
| on-site equipment | 21.71 | 12.21 | 3.21 | 0.04 | 1.00 | 3715 | |
| Total | 26.92 | 16.76 | 3.39 | 0.08 | 1.04 | 7996 | 9.14 |
| Months: | 23 | | | | | | |
| Max Year Months: | 12 | | | | | | |
| Total per Year: | 14.05 | 8.74 | 1.77 | 0.04 | 0.54 | 4171.79 | 4.77 |

| Fug |
| --- |
| **PM 2.5** |
| 1.68 |
| 1.68 |
| 0.88 |

CONSTRUCTION EQUIPMENT EXHAUST EMISSIONS

Project: WSP **Main Site Construction-SGF 2**

**Assumptions:**

1. The average engines employed in construction equipment use consumes fuel at a rate of:

| | | |
|---|---|---|
| diesel | 0.06 | gal/hp-hr |
| gasoline | 0.11 | gal/hp-hr |

Ref: EPA, NR-009b Publication, November 2002.
Ref: Sacramento County APCD Const. Program Data, V. 6.0.3, 3/2007.
Ref: EPA, NR-009c Publication, EPA 420-P-04-009, April 2004.
Ref: Niland Energy Project, IID, AFC Vol 2, App A.
Ref: South Coast AQMD PR XXI, Draft Staff Report, 3-15-95, and SCAQMD CEQA Manual, 11/03.
The above noted references present fuel consumption values which range from 0.050 to 0.064 gal/hp-hr for diesel engines used in construction related equipment. The value of 0.060 gal/hp-hr was chosen as a reasonable upper mid-range value for construction diesel emissions calculations.
For gasoline the mid-range value from SCAQMD of 0.11 gal/hp-hr was used.

2. Construction equipment exhaust emissions will be calculated on an annual basis using the site specific equipment list, HP ratings, hours of use, days of use, etc. Annual emissions will be apportioned to daily values based on the estimated construction period time on site.

3. The equipment list derived from the South Coast AQMD Offroad database (2016) will be used to establish the various equipment categories. Avg HP values were derived from SCAQMD and SacMetro AQMD construction resources.

| | | | | | |
|---|---|---|---|---|---|
| 4. Construction Schedule: | 24 | months | Construction Totals: | 220 | hrs/month |
| | 8 | hrs/day | | 5280 | hrs/const period |
| | 2 | years | | 660 | days/const period |

5. Anticipated Construction Start Year: 2016

6. Maximum anticipated equipment use month is: n/a

7. N2O EF diesel, lb/gal: 0.000183
N2O EF gasoline, lb/gal: 0.000164
CARB, Mandatory GHG Reporting Regulation
Table 4, Appendix A, 2007.

Equipment types and use rates supplied by the Applicant.

| Equipment Category** | Weighted Average HP | # of Units Used for Project | Avg Use Rate Hrs/day | # of Days On Site (each) | Total Hrs/Day | Total Hrs per Const Period | Total HP-Hrs Period |
|---|---|---|---|---|---|---|---|
| Aerial Lifts | 63 | 1 | 6 | 94 | 6 | 564 | 35532 |
| Air Compressors | 78 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bore-Drill Rigs | 206 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cement Mixers | 9 | 0 | 0 | 0 | 0 | 0 | 0 |
| Concrete/Industrial Saws | 81 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cranes | 226 | 1 | 2 | 94 | 2 | 188 | 42488 |
| Crawler Tractors/Dozers | 208 | 3 | 7 | 210 | 21 | 4410 | 917280 |
| Crushing/Processing Eq. | 85 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dumpers/Tenders/Water Trucks | 16 | 7 | 7 | 192 | 49 | 9408 | 150528 |
| Excavators | 163 | 0 | 0 | 0 | 0 | 0 | 0 |
| Forklifts | 89 | 8 | 6 | 200 | 48 | 9600 | 854400 |
| Generator Sets | 84 | 0 | 0 | 0 | 0 | 0 | 0 |
| Graders | 175 | 5 | 7 | 108 | 35 | 3780 | 661500 |
| Off-Highway Tractors | 123 | 0 | 0 | 0 | 0 | 0 | 0 |
| Off-Highway Trucks | 400 | 12 | 7 | 220 | 84 | 18480 | 7392000 |
| Other Diesel Construction Eq. | 172 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other General Industrial Eq. | 88 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Material Handling Eq. | 167 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pavers | 126 | 1 | 4 | 28 | 4 | 112 | 14112 |
| Paving Eq. Other | 131 | 0 | 0 | 0 | 0 | 0 | 0 |
| Plate Compactors | 8 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pressure Washers | 13 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pumps | 84 | 0 | 0 | 0 | 0 | 0 | 0 |
| Roller Compactors | 81 | 1 | 7 | 42 | 7 | 294 | 23814 |
| Rough Terrain Forklifts | 100 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber Tired Dozers | 255 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber Tires Loaders | 200 | 0 | 0 | 0 | 0 | 0 | 0 |
| Scrapers | 362 | 0 | 0 | 0 | 0 | 0 | 0 |
| Signal Boards | 6 | 0 | 0 | 0 | 0 | 0 | 0 |
| Skid Steer Loaders | 65 | 1 | 7 | 188 | 7 | 1316 | 85540 |
| Surfacing Eq. | 254 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sweepers/Scrubbers | 64 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tractors (single category) | 98 | 2 | 7 | 245 | 14 | 3430 | 336140 |
| Front End Loaders (single category) | 98 | 1 | 7 | 83 | 7 | 581 | 56938 |
| Backhoes (single category) | 98 | 1 | 4 | 158 | 4 | 632 | 61936 |
| Trenchers | 81 | 10 | 4 | 235 | 40 | 9400 | 761400 |
| Welders | 46 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gasoline Const Eq. | 175 | 0 | 0 | 0 | 0 | 0 | 0 |

** diesel equipment unless otherwise specified.

| | | |
|---|---|---|
| Const Period Diesel Hp-Hrs = | 11393608 | |
| Const Period Gasoline Hp-Hrs = | 0 | |
| Const Period Diesel Fuel Use = | 683616 | gals |
| Const Period Gasoline Fuel Use = | 0 | gals |

Offroad equipment emissions factors derived SCAQMD Off Road database for 2016.
The SCAQMD EFs as presented incorporate the average equipment load factors.
Emissions factors for each category of equipment represent the composite factors for the stated equipment category as derived from the SCAQMD Offroad database for the construction start year.

**2016 Equipment Emissions Factors**

| Equip. Type | lbs/hr VOC (ROG) | lbs/hr CO | lbs/hr NOx | lbs/hr SOx | lbs/hr PM10 | lbs/hr CO2 | lbs/hr CH4 |
|---|---|---|---|---|---|---|---|
| Aerial Lifts | 0.0397 | 0.1800 | 0.2482 | 0.0004 | 0.0150 | 34.7217 | 0.0036 |
| Air Compressors | 0.0704 | 0.3207 | 0.4729 | 0.0007 | 0.0318 | 63.6073 | 0.0064 |
| Bore-Drill Rigs | 0.0623 | 0.5016 | 0.5340 | 0.0017 | 0.0160 | 164.9093 | 0.0056 |
| Cement Mixers | 0.0088 | 0.0418 | 0.0542 | 0.0001 | 0.0023 | 7.2481 | 0.0008 |
| Concrete/Industrial Saws | 0.0756 | 0.3936 | 0.4589 | 0.0007 | 0.0336 | 58.4637 | 0.0068 |
| Cranes | 0.1137 | 0.4263 | 0.9387 | 0.0014 | 0.0388 | 128.6292 | 0.0103 |
| Crawler Tractors/Dozers | 0.1335 | 0.5549 | 0.9315 | 0.0013 | 0.0546 | 114.0188 | 0.0120 |
| Crushing/Processing Eq. | 0.1337 | 0.6461 | 0.8965 | 0.0015 | 0.0538 | 132.3090 | 0.0121 |
| Dumpers/Tenders | 0.0093 | 0.0314 | 0.0587 | 0.0001 | 0.0024 | 7.6244 | 0.0008 |
| Excavators | 0.0988 | 0.5213 | 0.6603 | 0.0013 | 0.0332 | 119.5800 | 0.0089 |
| Forklifts | 0.0427 | 0.2190 | 0.2816 | 0.0006 | 0.0137 | 54.3958 | 0.0039 |
| Generator Sets | 0.0581 | 0.2862 | 0.4370 | 0.0007 | 0.0241 | 60.9927 | 0.0052 |
| Graders | 0.1197 | 0.5883 | 0.8866 | 0.0015 | 0.0441 | 132.7430 | 0.0108 |
| Off-Highway Tractors | 0.1803 | 0.7067 | 1.4108 | 0.0017 | 0.0670 | 151.4197 | 0.0163 |
| Off-Highway Trucks | 0.1816 | 0.5831 | 1.3322 | 0.0027 | 0.0459 | 260.0516 | 0.0164 |
| Other Diesel Construction Eq. | 0.0720 | 0.3602 | 0.5680 | 0.0013 | 0.0234 | 122.5629 | 0.0065 |
| Other General Industrial Eq. | 0.1267 | 0.4731 | 1.0122 | 0.0016 | 0.0425 | 152.2399 | 0.0114 |
| Other Material Handling Eq. | 0.1202 | 0.4608 | 0.9913 | 0.0015 | 0.0411 | 141.1941 | 0.0108 |
| Pavers | 0.1269 | 0.5135 | 0.7128 | 0.0009 | 0.0489 | 77.9335 | 0.0114 |
| Paving Eq. Other | 0.0965 | 0.4198 | 0.6393 | 0.0008 | 0.0436 | 68.9412 | 0.0087 |
| Plate Compactors | 0.0050 | 0.0263 | 0.0314 | 0.0001 | 0.0012 | 4.3138 | 0.0005 |
| Pressure Washers | 0.0121 | 0.0579 | 0.0764 | 0.0001 | 0.0044 | 9.4135 | 0.0011 |
| Pumps | 0.0562 | 0.2785 | 0.3830 | 0.0006 | 0.0239 | 49.6067 | 0.0051 |
| Roller Compactors | 0.0792 | 0.3944 | 0.5273 | 0.0008 | 0.0353 | 67.0483 | 0.0071 |
| Rough Terrain Forklifts | 0.0775 | 0.4549 | 0.5104 | 0.0008 | 0.0372 | 70.2808 | 0.0070 |
| Rubber Tired Dozers | 0.2591 | 0.9834 | 2.0891 | 0.0025 | 0.0858 | 239.0905 | 0.0234 |
| Rubber Tires Loaders | 0.0983 | 0.4557 | 0.7114 | 0.0012 | 0.0375 | 108.6114 | 0.0089 |
| Scrapers | 0.2383 | 0.9053 | 1.9017 | 0.0027 | 0.0783 | 262.4900 | 0.0215 |
| Signal Boards | 0.0161 | 0.0921 | 0.1172 | 0.0002 | 0.0060 | 16.6983 | 0.0014 |
| Skid Steer Loaders | 0.0305 | 0.2184 | 0.2044 | 0.0004 | 0.0106 | 30.2770 | 0.0028 |
| Surfacing Eq. | 0.1045 | 0.4506 | 0.9731 | 0.0017 | 0.0353 | 165.9721 | 0.0094 |
| Sweepers/Scrubbers | 0.0810 | 0.4988 | 0.5192 | 0.0009 | 0.0332 | 78.5433 | 0.0073 |
| Tractors | 0.0610 | 0.3689 | 0.4070 | 0.0008 | 0.0258 | 66.7979 | 0.0055 |
| Front End Loaders | 0.0610 | 0.3689 | 0.4070 | 0.0008 | 0.0258 | 66.7979 | 0.0055 |
| Backhoes | 0.0610 | 0.3689 | 0.4070 | 0.0008 | 0.0258 | 66.7979 | 0.0055 |
| Trenchers | 0.1200 | 0.4479 | 0.5719 | 0.0007 | 0.0453 | 58.7146 | 0.0108 |
| Welders | 0.0482 | 0.1951 | 0.2173 | 0.0003 | 0.0168 | 25.6027 | 0.0044 |
| Gasoline Const Eq. (assumed 175 hp category) | 0.0771 | 0.3855 | 1.08 | 0.00014 | 0.1542 | 14.1565 | 0.00037 |

(gasoline EFs: EPA OMS-AMD Report NR-009A, 2-13-98, and SCAQMD EMFAC 2007 CEQA Tables, 2016.)

Construction Period Emissions, lbs

| **Equip. Type** | **VOC** | **CO** | **NOx** | **SOx** | **PM10** | **CO2** | **CH4** |
|---|---|---|---|---|---|---|---|
| Aerial Lifts | 22 | 102 | 140 | 0 | 8 | 19583 | 2 |
| Air Compressors | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bore-Drill Rigs | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cement Mixers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Concrete/Industrial Saws | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cranes | 21 | 80 | 176 | 0 | 7 | 24182 | 2 |
| Crawler Tractors/Dozers | 589 | 2447 | 4108 | 6 | 241 | 502823 | 53 |
| Crushing/Processing Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dumpers/Tenders | 87 | 296 | 553 | 1 | 22 | 71730 | 8 |
| Excavators | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Forklifts | 410 | 2102 | 2703 | 6 | 131 | 522199 | 37 |
| Generator Sets | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Graders | 452 | 2224 | 3351 | 6 | 167 | 501768 | 41 |
| Off-Highway Tractors | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Off-Highway Trucks | 3357 | 10775 | 24619 | 49 | 848 | 4805753 | 303 |
| Other Diesel Construction Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other General Industrial Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Material Handling Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pavers | 14 | 58 | 80 | 0 | 5 | 8729 | 1 |
| Paving Eq. Other | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Plate Compactors | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pressure Washers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pumps | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Roller Compactors | 23 | 116 | 155 | 0 | 10 | 19712 | 2 |
| Rough Terrain Forklifts | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber Tired Dozers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber Tires Loaders | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Scrapers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Signal Boards | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Skid Steer Loaders | 40 | 287 | 269 | 0 | 14 | 39845 | 4 |
| Surfacing Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sweepers/Scrubbers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tractors | 209 | 1265 | 1396 | 3 | 89 | 229117 | 19 |
| Front End Loaders | 35 | 214 | 236 | 0 | 15 | 38810 | 3 |
| Backhoes | 39 | 233 | 257 | 0 | 16 | 42216 | 3 |
| Trenchers | 1128 | 4211 | 5376 | 7 | 426 | 551918 | 102 |
| Welders | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gasoline Const Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| **Totals** | **VOC** | **CO** | **NOx** | **SOx** | **PM10** | **PM2.5** | **CO2** | **CH4** | **N2O** |
|---|---|---|---|---|---|---|---|---|---|
| lbs per const. period | 6428 | 24410 | 43420 | 78 | 2000 | 1982.06 | 7378385 | 580 | 125 |
| tons per const. period | 3.2 | 12.2 | 21.7 | 0.039 | 1.00 | 0.99 | 3689.19 | 0.29 | 0.06 |
| Average lbs/day = | 9.7 | 37.0 | 65.8 | 0.119 | 3.03 | 3.00 | 11179.37 | 0.88 | 0.19 |
| Normalized TPY = | *1.6* | *6.1* | *10.9* | *0.0* | *0.5* | *0.5* | *1844.6* | *0.1* | *0.031* |

| | |
|---|---|
| CO2e, tons/period | 3715.1 |
| CO2e, tons/yr: | 1857.5 |

Other Assumptions and References:

1. Trench construction times per: Southern Regional Water Pipeline Alliance, 3/08.
   Optimum trench construction progress rate is 80m (260ft) per day.
   Non-optimum trench construction progress rate is 30m (100 ft) per day.
   An average progress of 180 ft/day is used where applicable.
2. Paving speeds can range from 3 to 15 m/min depending on asphalt delivery rates and required compaction thickness.
   A minium paving speed of 3 m/min (10 ft/min or 600 ft/hr) was used where applicable.
   The minimum speed is based upon a 3" compacted layer, 12 ft lane width, with an asphalt delivery rate of ~ 140 tons/hr.
   Ref: Asphalt Paving Speed, Pavement Worktip No. 31, AAPA, 11/2001.
3. Estimation of maximum daily emissions is extremely variable, and these values are not required by SJVAPCD.
4. Construction schedule note: applicant data indicates a construction work day period of 8 hours
   The equipment use rates provided by the applicant are consistent with an 8 hour workday.
5. GWP values: CH4=25, N2O=298, ref: 40 CFR 98 Subpart A, Table A-1.
6. CARB-CEIDARS, Updated Size Fractions for PM Profiles: PM2.5 = 0.991 of PM10 : Diesel Vehicle Exhaust

**CONSTRUCTION PHASE - SGF 2**

| | | | |
|---|---|---|---|
| **MRI Level 2 Analysis (Refs 1, 3-7)** | Acres | 1544 | |
| Acres Subject to Construction Disturbance Activites: | | 154.4 | |
| Max Acres Subject to Construction Disturbance Activites on any day of this phase: | | 11.6 | note (10) |
| Emissions Factor for PM10 Uncontrolled, tons/acre/month: | | 0.12 | |
| PM2.5 fraction of PM10 (per CARB CEIDARS Profiles): | | 0.21 | |
| **Activity Levels:** Hrs/Day: | | 8 | |
| Days/Wk: | | 5 | |
| Days/Month: | Applicant Data | 22 | |
| Phase Const Period, Months: | | 23 | 1.92 years |
| Phase Const Period, Days: | | 506 | |

**Wet Season Adjustment:** (Per AP-42, Section 13.2.2, Figure 13.2.2-1, 12/03 or CalEEMod, Appendix D, Table 1.1.)

| | |
|---|---|
| Mean # days/year with rain >= 0.01 inch: | 40 |
| Mean # months/yr with rain >= 0.01 inch: | 1.33 |
| Adjusted Const Period, Months: | 23.00 |
| Adjusted Const Period, Days: | 429 |

**Controls for Fugitive Dust:** Proposed watering cycle: 3 times per day

3 watering cycles/8 hour construction shift yields a 68% reduction, use 68% for non-desert sites. (11)(12)
Speed control of onsite const traffic to <15 mph yields a 40-70% reduction (use 50% control as conservative for site). (11)(12)

| | | |
|---|---|---|
| Calculated % control based on mitigations proposed: | 84 | % control |
| Conservative control % used for emissions estimates: | 84 | % control |
| | 0.16 | release fraction |

| **Emissions: Controlled** | PM10 | PM2.5 |
|---|---|---|
| tons/month | 0.222 | 0.047 |
| tons/period | 5.114 | 1.074 |
| Max lbs/day | 20.212 | 4.245 |

**Soil Handling Emissions (Cut and Fill): (2)**

| | | | | | |
|---|---|---|---|---|---|
| Total cu.yds of soil handled: | 0 | Mean annual wind speed, mph: (8) | | | 8.03 |
| Total tons of soil handled: | 0.0 | Avg. Soil moisture, %: (9) | | | 5 |
| Total days soil handled: | 429 | Avg. Soil density, tons/cu.yd: | | | 1.3 |
| Tons soil/day: | 0 | k factor for PM10: | | | 0.35 |
| Control Eff, watering, % | 80 | Number of Drops per ton: | | | 4 |
| Release Fraction: | 0.2 | Calc 1 | wind | | 1.851 |
| | | Calc 2 | moisture | | 3.607 |
| | | Calc 3 | int | | 0.513 |
| | | Calc 4 | PM10 | lb/ton | 0.0006 |
| | | PM2.5 fraction of PM10: | | | 0.210 |

| Emissions: | PM10 | PM2.5 |
|---|---|---|
| tons/period | 0.000 | 0.000 |
| tons/month | 0.000 | 0.000 |
| max lbs/day | 0.000 | 0.000 |

| **Emissions Totals:** | **PM10** | **PM2.5** |
|---|---|---|
| **tons/period** | **5.114** | **1.074** |

**Methodology References:**

(1) MRI Report, South Coast AQMD Project No. 95040, March 1996, Level 2 Analysis Procedure.
MRI Report uncontrolled factor of 0.11 tons/acre/month is based on 168 hours per month of const activity.
For an activity rate of ~180 hrs/month, the adjusted EF would be 0.12 tons/acre/month (uncontrolled).
(2) Soil Handling (Cut and Fill), EPA, AP-42, Section 13.2.4., 11/06.
(3) URBEMIS, Version 9.2.4, User's Manual Appendix A, page A-6.
(4) CARB Area Source Methodology, Section 7.7, 9/02.
(5) WRAP Fugitive Dust Handbook, 9/06.
(6) USEPA, AP-42, Section 13.2.3, 2/10.
(7) Estimating PM Emissions from Construction Operations, USEPA, MRI, 9/99.
(8) Wind speed data for Lemoore met station. Annual avg wind speed = 8.03 mph, % calms = 3.44%.
(9) Soil Moisture; 5% assumed avg value
(10) adjusted applicant value based on 7.5% of total acreage disturbed on any given day
(11) SCAQMD CEQA Handbook 1993.
(12) SCAQMD, Sample Construction Scenarios for Projects Less than Five Acres, Fugitive Dust Mitigations, February 2005.

**OFFSITE PAVED ROAD FUGITIVE DUST EMISSIONS**
(associated with delivery truck and worker vehicle traffic on I-5 and plant access road)

| | | | |
|---|---|---|---|
| Average mileage for construction related vehicles: | | NA | miles, roundtrip distance*** |
| Avg weight of vehicular equipment on road: | | 4.1 | tons (range 2 - 42 tons) |
| Road surface silt loading factor: | | 0.015 | g/m2 (range 0.03 - 400 g/m2) |
| | | | Limited Access Freeway >10,000 ADT **(I-5)** |
| Particle size multiplier factors: | PM10 | 0.0022 | lb/VMT |
| | PM2.5 | 0.00054 | lb/VMT |
| C factors (brake and tire wear): | PM10 | 0.00047 | lb/VMT |
| | PM2.5 | 0.00036 | lb/VMT |
| Avg vehicle speed on road: | | 65 | mph |
| Avg. Number of vehicles per day: | | 195 | |
| | | | calculated per Applicant da |
| Avg. Number of work days per month: | | 22 | **VMT/period: 8644346.7** |
| | Total vehicles per month: | 4290 | |
| Number of work months: | | 21.33 | adjusted for precip events |
| | Total vehicles per const period: | 91505.7 | |

| | PM10 | |
|---|---|---|
| Calc 1 | 0.022 | |
| Calc 2 | 4.217 | |
| Calc 3 | 0.0007 | lb/VMT |

| **Emissions** | **PM10** | **PM2.5** |
|---|---|---|
| **lbs/period** | **5818.49** | **983.32** |
| **tons/period** | **2.909** | **0.492** |

EPA, AP-42, Section 13.2.1, March 2006, updated 9/2008.
PM2.5 fraction of PM10 per CARB CEIDARs is 0.169
*** Note: avg roundtrip distance traveled by delivery or worker vehicles on freeways (I-5) and other State Routes in the project area.
Vehicles per day: worker + deliveries+staff support vehciles (averages)

**ONSITE UNPAVED ROAD FUGITIVE DUST**

| | | | | |
|---|---|---|---|---|
| Length of Unpaved Roads on Construction site: | | 0.1 | miles* | |
| Avg weight of construction vehicular equipment on road: | | 4.1 | tons (range 2 - 42 tons) | |
| Road surface silt content: | | 8.5 | % (range 1.8 - 35%) | |
| Road surface material moisture content: | | 5 | % (range 0.03 - 13%) | |
| | | k | a | b |
| Particle size multiplier factors: | PM10 | 1.5 | 0.9 | 0.45 |
| | PM2.5 | 0.15 | 0.9 | 0.45 |
| C factors (brake and tire wear): | PM10 | 0.00047 | lb/VMT | |
| | PM2.5 | 0.00036 | lb/VMT | |
| Avg construction vehicle speed on road: | | 5 | mph (range 5-55 mph) | |
| Avg number of construction vehicles per day: | | 74 | ** | |
| Number of construction work days per month: | | 22 | **VMT/period:** | **8581.5467** |
| Total vehicles per month: | | 1628 | | |
| Number of construction work months: | | 21.33 | adjusted for precipitation events | |
| Total vehicles per const period: | | 85815.467 | | |
| Control reduction due to watering, speed control, etc. = | | 80 | | |
| | | 0.8 | | |
| Release Fraction = | | 0.2 | | |

| | PM10 | PM2.5 |
|---|---|---|
| Calc 1 | 0.733 | 0.733 |
| Calc 2 | 1.151 | 1.151 |
| Calc 3 | 1.266 | 0.127 |
| Calc 4 | 1.266 | 0.127 |
| Controlled lb/VMT | 0.253 | 0.025 |

| **Emissions** | **PM10** | **PM2.5** |
|---|---|---|
| **lbs/period** | **2173.25** | **217.86** |
| **tons/period** | **1.087** | **0.109** |

EPA, AP-42, Section 13.2.2, March 2006
Soil Moisture; 5% avg
Soil silt content: 8.5% per AP-42 for construction site scraper routes
** const equipment plus site support pickups plus

**CONSTRUCTION PHASE - Truck Hauling/Delivery and Site Support Vehicle Emissions**

**All Phases**

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Delivery/Hauling Vehicle Use Rates** | | | | | Emissions Factors (lbs/vmt) | | | | | | |
| Delivery Roundtrip Distance: | 0 | miles | NOx | CO | VOC | SOx | PM10 | CO2 | | | |
| Const Days per Period: | 0 | | 0.00625339 | 0.00051535 | 0.00011377 | 0.000026 | 3.9844E-05 | 3.10646173 | HDDT | | |
| Avg Deliveries per Day: | 0 | | 0.00046982 | 0.00340025 | 7.8173E-05 | 0.000013 | 2.9202E-06 | 1.02361637 | MDGT | | |
| Fraction of Deliveries-Diesel: | 0.95 | HDDT | | | **Daily Emissions (lbs)** | | | | | | |
| Fraction of Deliveries-Gas: | 0.05 | MDGT | **NOx** | **CO** | **VOC** | **SOx** | **PM10** | **CO2** | **PM2.5** | | |
| Total Delivery VMT: | **1588347** | **per Applicant** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | HDDT | |
| Total Daily VMT-Diesel | 0 | | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | MDGT | |
| Total Daily VMT-Gasoline | 0 | | | | **Tons per Const Period** | | | | | | |
| Total Period VMT-Diesel | 1508929.33 | | 4.718 | 0.389 | 0.086 | 0.020 | 0.030 | 2343.7 | 0.025 | HDDT | |
| Total Period VMT-Gasoline | 79417.3333 | | 0.019 | 0.135 | 0.003 | 0.001 | 0.000 | 40.6 | 0.000 | MDGT | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Construction Site Support Vehicle Use Rates (LDTs)** | | | | | **Daily Emissions, lbs** | | | | | | |
| Gasoline Vehicle VMT Period: | 75900 | | **NOx** | **CO** | **VOC** | **SOx** | **PM10** | **CO2** | | | **PM2.5** |
| Avg Daily Gasoline VMT: | 300 | | 0.00040762 | 0.00359256 | 6.9991E-05 | 0.000008 | 5.0718E-06 | 0.6541839 | lbs/vmt* | LDT gasoline | |
| Avg Daily Diesel VMT: | 0 | | 0.1223 | 1.0778 | 0.0210 | 0.0024 | 0.0015 | 196.2552 | lbs/day | gasoline | 0.0010 |
| Total Phase Const Days: | 240 | | | | | | | | | | |
| | | | | | **Tons per Const Period** | | | | | | |
| Ref: EMFAC 2014, SJVAPCD Year 2016 | | | 0.0155 | 0.1363 | 0.0027 | 0.0003 | 0.0002 | 24.8 | **tons/period** | **gasoline** | 0.0001 |

LDT1-gas, MDV-gas, HDDT-dsl

See EF data in WSP Support Appendix

**Notes*****

VMT for delivery/hauling for all vehicles includes: (1) materials deliveries to site, (2) materials removal from site, other VMT as specified below.

Support Vehicle VMT: best estimate at time of filing, 10 LDT (gasoline) at 30 VMT/day

CARB-CEIDARS, Updated Fractions for PM Profiles: PM2.5 = 0.991 of PM10 for Diesel Exhaust, and 0.998 for Gasoline Vehicles.

**CONSTRUCTION PHASE - Worker Travel - Emissions**

Ref: SJVAPCD EMFAC 2014, Year 2020
LDA-gas
See EF data in WSP Support Appendix

**Worker Travel to Site**

| | |
|---|---|
| Avg Occupancy/Vehicle: | 0 |
| Avg Roundtrip Distance, miles: | 0.0 |
| Avg # of Worker Vehicles, per day: | 0 |
| Avg Daily Worker VMT: | 0 |
| Max # of Worker Vehicles, per day: | 0 |
| Max Daily Worker VMT: | 0 |
| Total Const Days: | 240 |
| **Total Const Period Worker VMT:** | **7056000** |

**VMT data supplied by Applicant.**

Emissions Factors (lbs/VMT)

| NOx | CO | VOC | SOx | PM10 | CO2 |
|---|---|---|---|---|---|
| 0.00013058 | 0.001103197 | 2.504E-05 | 0.000007 | 0.000004 | 0.65463696 |

**Daily Emissions (lbs)**

| | NOx | CO | VOC | SOx | PM10 | CO2 | PM2.5 |
|---|---|---|---|---|---|---|---|
| Avg | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**Tons per Const Period**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Avg | 0.461 | 3.892 | 0.088 | 0.025 | 0.014 | 2309.6 | 0.000 |

**Worker Travel by Busing from Staging Area**

| | |
|---|---|
| Total Bus VMT/Const Period: | 0 |
| Avg Bus VMT/Const Day: | 0 |
| Max Bus VMT/Const Day: | 0 |

| | | |
|---|---|---|
| Bus Round Trips/Day: | 0 | max |
| Bus Occupancy/Trip: | 0 | |

Ref: SJVAPCD EMFAC 2014, Year 2016
All other buses-DSL
See EF data in WSP Support Appendix

# buses supplied by Applicant.

Emissions Factors (lbs/VMT)

| NOx | CO | VOC | SOx | PM10 | CO2 |
|---|---|---|---|---|---|
| 0.012001 | 0.001203 | 0.000458 | 0.000026 | 0.00015 | 2.734838 |

**Daily Emissions (lbs)**

| | **NOx** | **CO** | **VOC** | **SOx** | **PM10** | **CO2** | **PM2.5** |
|---|---|---|---|---|---|---|---|
| Avg | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Max | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**Tons per Const Period**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Avg | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

**CONSTRUCTION PHASE - Trackout Emissions**

| | | | | | |
|---|---|---|---|---|---|
| Paved Road Length (miles): | 0.1 | estimated roundtrip trackout distance | | | |
| Daily # of Vehicles: | 74 | | | | |
| Avg Vehicle Weight (tons): | 6.8 | | **PM10** | **PM2.5*** | |
| Total Unadjusted VMT/day | 7.4 | | 0.361 | | |
| Particle Size Multipliers | PM10 | | 1.924 | | |
| lb/VMT | 0.023 | | 0.002 | 0.0004 | lb/VMT |
| C factor, lb/VMT | 0.00047 | | **0.129** | **0.0217** | **lbs/day** |
| Road Sfc Silt Loading (g/m^2): | 0.56 | local X 2 | **0.001** | **0.0002** | **tons/month** |
| # of Active Trackout Points: | 1 | ** | **0.03** | **0.0051** | **tons/period** |
| Added Trackout Miles: | PM10 | | | | |
| Trackout VMT/day: | 44 | *Default Silt Load Values for Paved Road Types* | | | |
| Final Adjusted VMT/day | 52 | | Freeway | 0.02 g/m2 | |
| Final Adjusted VMT/month | 1140 | | Arterial | 0.036 g/m2 | |
| Final Adjusted VMT/period | 24308 | | Collector | 0.036 g/m2 | |
| Construction days/month: | 22 | | Local | 0.28 g/m2 | |
| Adj. Construction months/period: | 21.33 | | Rural | 1.6 g/m2 | |
| Control Applied to Trackout: | Gravel entrance, metal cleaning grates, water washing, sweeping | | | | |
| Control Efficiency, % | 84 | 0.84 | Release Factor = | 0.16 | |

* PM2.5 fraction of PM10 assumed to be 0.169 (CARB CEIDARS updated fraction values) for paved roads.
** 1 controlled ingress/egress point is planned for site construction
EPA, AP-42, Section 13.2.1, Proposed revisions dated 9/2008.
Use silt loading factor from default values for road type if no site specific data is available.
Trackout effects approximately 0.05 mi. of roadway arriving and departing from the site access point.
Plant access road is already paved. Entrance will be gravelled with metal grates for take out control.
Vehicle count = delivery trucks plus site support trucks (see Unpaved Onsite tab)
Worker vehicles not counted for trackout, they will park on the site perimeter.

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## Tons/Period

| | NOx | CO | VOC | SOx | PM10 | CO2 | Fug PM10 |
|---|---|---|---|---|---|---|---|
| on-off site travel | 2.74 | 0.92 | 0.06 | 0.01 | 0.02 | 1507 | 5.80 |
| on-site equipment | 21.71 | 12.21 | 3.21 | 0.04 | 1.00 | 3715 | |
| Total | 24.45 | 13.13 | 3.28 | 0.05 | 1.02 | 5222 | 5.80 |
| Months: | 24 | | | | | | |
| Max Year Months: | 12 | | | | | | |
| Total per Year: | 12.23 | 6.57 | 1.64 | 0.03 | 0.51 | 2610.84 | 2.90 |

| Fug |
| --- |
| **PM 2.5** |
| 1.08 |
| 1.08 |
| |
| 0.54 |

CONSTRUCTION EQUIPMENT EXHAUST EMISSIONS

Project: WSP — **Main Site Construction-SGF 3**

**Assumptions:**

1. The average engines employed in construction equipment use consumes fuel at a rate of: diesel 0.06 gal/hp-hr; gasoline 0.11 gal/hp-hr

Ref: EPA, NR-009b Publication, November 2002.
Ref: Sacramento County APCD Const. Program Data, V. 6.0.3, 3/2007.
Ref: EPA, NR-009c Publication, EPA 420-P-04-009, April 2004.
Ref: Niland Energy Project, IID, AFC Vol 2, App A.
Ref: South Coast AQMD PR XXI, Draft Staff Report, 3-15-95, and SCAQMD CEQA Manual, 11/03.
The above noted references present fuel consumption values which range from 0.050 to 0.064 gal/hp-hr for diesel engines used in construction related equipment. The value of 0.060 gal/hp-hr was chosen as a reasonable upper mid-range value for construction diesel emissions calculations.
For gasoline the mid-range value from SCAQMD of 0.11 gal/hp-hr was used.

2. Construction equipment exhaust emissions will be calculated on an annual basis using the site specific equipment list, HP ratings, hours of use, days of use, etc. Annual emissions will be apportioned to daily values based on the estimated construction period time on site.

3. The equipment list derived from the South Coast AQMD Offroad database (2016) will be used to establish the various equipment categories. Avg HP values were derived from SCAQMD and SacMetro AQMD construction resources.

4. Construction Schedule: 24 months; 8 hrs/day; 2 years

Construction Totals: 220 hrs/month; 5280 hrs/const period; 660 days/const period

5. Anticipated Construction Start Year: 2018

6. Maximum anticipated equipment use month is: n/a

7. N2O EF diesel, lb/gal: 0.000183
N2O EF gasoline, lb/gal: 0.000164
CARB, Mandatory GHG Reporting Regulation
Table 4, Appendix A, 2007.

Equipment types and use rates supplied by the Applicant.

| Equipment Category** | Weighted Average HP | # of Units Used for Project | Avg Use Rate Hrs/day | # of Days On Site (each) | Total Hrs/Day | Total Hrs per Const Period | Total HP-Hrs Period |
|---|---|---|---|---|---|---|---|
| Aerial Lifts | 63 | 1 | 6 | 94 | 6 | 564 | 35532 |
| Air Compressors | 78 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bore-Drill Rigs | 206 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cement Mixers | 9 | 0 | 0 | 0 | 0 | 0 | 0 |
| Concrete/Industrial Saws | 81 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cranes | 226 | 1 | 2 | 94 | 2 | 188 | 42488 |
| Crawler Tractors/Dozers | 208 | 3 | 7 | 210 | 21 | 4410 | 917280 |
| Crushing/Processing Eq. | 85 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dumpers/Tenders/Water Trucks | 16 | 7 | 7 | 192 | 49 | 9408 | 150528 |
| Excavators | 163 | 0 | 0 | 0 | 0 | 0 | 0 |
| Forklifts | 89 | 8 | 6 | 200 | 48 | 9600 | 854400 |
| Generator Sets | 84 | 0 | 0 | 0 | 0 | 0 | 0 |
| Graders | 175 | 5 | 7 | 108 | 35 | 3780 | 661500 |
| Off-Highway Tractors | 123 | 0 | 0 | 0 | 0 | 0 | 0 |
| Off-Highway Trucks | 400 | 12 | 7 | 220 | 84 | 18480 | 7392000 |
| Other Diesel Construction Eq. | 172 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other General Industrial Eq. | 88 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Material Handling Eq. | 167 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pavers | 126 | 1 | 4 | 28 | 4 | 112 | 14112 |
| Paving Eq. Other | 131 | 0 | 0 | 0 | 0 | 0 | 0 |
| Plate Compactors | 8 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pressure Washers | 13 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pumps | 84 | 0 | 0 | 0 | 0 | 0 | 0 |
| Roller Compactors | 81 | 1 | 7 | 42 | 7 | 294 | 23814 |
| Rough Terrain Forklifts | 100 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber Tired Dozers | 255 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber Tires Loaders | 200 | 0 | 0 | 0 | 0 | 0 | 0 |
| Scrapers | 362 | 0 | 0 | 0 | 0 | 0 | 0 |
| Signal Boards | 6 | 0 | 0 | 0 | 0 | 0 | 0 |
| Skid Steer Loaders | 65 | 1 | 7 | 188 | 7 | 1316 | 85540 |
| Surfacing Eq. | 254 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sweepers/Scrubbers | 64 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tractors (single category) | 98 | 2 | 7 | 245 | 14 | 3430 | 336140 |
| Front End Loaders (single category) | 98 | 1 | 7 | 83 | 7 | 581 | 56938 |
| Backhoes (single category) | 98 | 1 | 4 | 158 | 4 | 632 | 61936 |
| Trenchers | 81 | 10 | 4 | 235 | 40 | 9400 | 761400 |
| Welders | 46 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gasoline Const Eq. | 175 | 0 | 0 | 0 | 0 | 0 | 0 |

** diesel equipment unless otherwise specified.

Const Period Diesel Hp-Hrs = 11393608
Const Period Gasoline Hp-Hrs = 0
Const Period Diesel Fuel Use = 683616 gals
Const Period Gasoline Fuel Use = 0 gals

Offroad equipment emissions factors derived SCAQMD Off Road database for 2016.
The SCAQMD EFs as presented incorporate the average equipment load factors.
Emissions factors for each category of equipment represent the composite factors for the stated equipment category as derived from the SCAQMD Offroad database for the construction start year.

**2016 Equipment Emissions Factors**

| Equip. Type | lbs/hr VOC (ROG) | lbs/hr CO | lbs/hr NOx | lbs/hr SOx | lbs/hr PM10 | lbs/hr CO2 | lbs/hr CH4 |
|---|---|---|---|---|---|---|---|
| Aerial Lifts | 0.0397 | 0.1800 | 0.2482 | 0.0004 | 0.0150 | 34.7217 | 0.0036 |
| Air Compressors | 0.0704 | 0.3207 | 0.4729 | 0.0007 | 0.0318 | 63.6073 | 0.0064 |
| Bore-Drill Rigs | 0.0623 | 0.5016 | 0.5340 | 0.0017 | 0.0160 | 164.9093 | 0.0056 |
| Cement Mixers | 0.0088 | 0.0418 | 0.0542 | 0.0001 | 0.0023 | 7.2481 | 0.0008 |
| Concrete/Industrial Saws | 0.0756 | 0.3936 | 0.4589 | 0.0007 | 0.0336 | 58.4637 | 0.0068 |
| Cranes | 0.1137 | 0.4263 | 0.9387 | 0.0014 | 0.0388 | 128.6292 | 0.0103 |
| Crawler Tractors/Dozers | 0.1335 | 0.5549 | 0.9315 | 0.0013 | 0.0546 | 114.0188 | 0.0120 |
| Crushing/Processing Eq. | 0.1337 | 0.6461 | 0.8965 | 0.0015 | 0.0538 | 132.3090 | 0.0121 |
| Dumpers/Tenders | 0.0093 | 0.0314 | 0.0587 | 0.0001 | 0.0024 | 7.6244 | 0.0008 |
| Excavators | 0.0988 | 0.5213 | 0.6603 | 0.0013 | 0.0332 | 119.5800 | 0.0089 |
| Forklifts | 0.0427 | 0.2190 | 0.2816 | 0.0006 | 0.0137 | 54.3958 | 0.0039 |
| Generator Sets | 0.0581 | 0.2862 | 0.4370 | 0.0007 | 0.0241 | 60.9927 | 0.0052 |
| Graders | 0.1197 | 0.5883 | 0.8866 | 0.0015 | 0.0441 | 132.7430 | 0.0108 |
| Off-Highway Tractors | 0.1803 | 0.7067 | 1.4108 | 0.0017 | 0.0670 | 151.4197 | 0.0163 |
| Off-Highway Trucks | 0.1816 | 0.5831 | 1.3322 | 0.0027 | 0.0459 | 260.0516 | 0.0164 |
| Other Diesel Construction Eq. | 0.0720 | 0.3602 | 0.5680 | 0.0013 | 0.0234 | 122.5629 | 0.0065 |
| Other General Industrial Eq. | 0.1267 | 0.4731 | 1.0122 | 0.0016 | 0.0425 | 152.2399 | 0.0114 |
| Other Material Handling Eq. | 0.1202 | 0.4608 | 0.9913 | 0.0015 | 0.0411 | 141.1941 | 0.0108 |
| Pavers | 0.1269 | 0.5135 | 0.7128 | 0.0009 | 0.0489 | 77.9335 | 0.0114 |
| Paving Eq. Other | 0.0965 | 0.4198 | 0.6393 | 0.0008 | 0.0436 | 68.9412 | 0.0087 |
| Plate Compactors | 0.0050 | 0.0263 | 0.0314 | 0.0001 | 0.0012 | 4.3138 | 0.0005 |
| Pressure Washers | 0.0121 | 0.0579 | 0.0764 | 0.0001 | 0.0044 | 9.4135 | 0.0011 |
| Pumps | 0.0562 | 0.2785 | 0.3830 | 0.0006 | 0.0239 | 49.6067 | 0.0051 |
| Roller Compactors | 0.0792 | 0.3944 | 0.5273 | 0.0008 | 0.0353 | 67.0483 | 0.0071 |
| Rough Terrain Forklifts | 0.0775 | 0.4549 | 0.5104 | 0.0008 | 0.0372 | 70.2808 | 0.0070 |
| Rubber Tired Dozers | 0.2591 | 0.9834 | 2.0891 | 0.0025 | 0.0858 | 239.0905 | 0.0234 |
| Rubber Tires Loaders | 0.0983 | 0.4557 | 0.7114 | 0.0012 | 0.0375 | 108.6114 | 0.0089 |
| Scrapers | 0.2383 | 0.9053 | 1.9017 | 0.0027 | 0.0783 | 262.4900 | 0.0215 |
| Signal Boards | 0.0161 | 0.0921 | 0.1172 | 0.0002 | 0.0060 | 16.6983 | 0.0014 |
| Skid Steer Loaders | 0.0305 | 0.2184 | 0.2044 | 0.0004 | 0.0106 | 30.2770 | 0.0028 |
| Surfacing Eq. | 0.1045 | 0.4506 | 0.9731 | 0.0017 | 0.0353 | 165.9721 | 0.0094 |
| Sweepers/Scrubbers | 0.0810 | 0.4988 | 0.5192 | 0.0009 | 0.0332 | 78.5433 | 0.0073 |
| Tractors | 0.0610 | 0.3689 | 0.4070 | 0.0008 | 0.0258 | 66.7979 | 0.0055 |
| Front End Loaders | 0.0610 | 0.3689 | 0.4070 | 0.0008 | 0.0258 | 66.7979 | 0.0055 |
| Backhoes | 0.0610 | 0.3689 | 0.4070 | 0.0008 | 0.0258 | 66.7979 | 0.0055 |
| Trenchers | 0.1200 | 0.4479 | 0.5719 | 0.0007 | 0.0453 | 58.7146 | 0.0108 |
| Welders | 0.0482 | 0.1951 | 0.2173 | 0.0003 | 0.0168 | 25.6027 | 0.0044 |
| Gasoline Const Eq. (assumed 175 hp category) | 0.0771 | 0.3855 | 1.08 | 0.00014 | 0.1542 | 14.1565 | 0.00037 |

(gasoline EFs: EPA OMS-AMD Report NR-009A, 2-13-98, and SCAQMD EMFAC 2007 CEQA Tables, 2016.)

Construction Period Emissions, lbs

| Equip. Type | VOC | CO | NOx | SOx | PM10 | CO2 | CH4 |
|---|---|---|---|---|---|---|---|
| Aerial Lifts | 22 | 102 | 140 | 0 | 8 | 19583 | 2 |
| Air Compressors | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bore-Drill Rigs | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cement Mixers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Concrete/Industrial Saws | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cranes | 21 | 80 | 176 | 0 | 7 | 24182 | 2 |
| Crawler Tractors/Dozers | 589 | 2447 | 4108 | 6 | 241 | 502823 | 53 |
| Crushing/Processing Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dumpers/Tenders | 87 | 296 | 553 | 1 | 22 | 71730 | 8 |
| Excavators | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Forklifts | 410 | 2102 | 2703 | 6 | 131 | 522199 | 37 |
| Generator Sets | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Graders | 452 | 2224 | 3351 | 6 | 167 | 501768 | 41 |
| Off-Highway Tractors | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Off-Highway Trucks | 3357 | 10775 | 24619 | 49 | 848 | 4805753 | 303 |
| Other Diesel Construction Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other General Industrial Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Material Handling Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pavers | 14 | 58 | 80 | 0 | 5 | 8729 | 1 |
| Paving Eq. Other | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Plate Compactors | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pressure Washers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pumps | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Roller Compactors | 23 | 116 | 155 | 0 | 10 | 19712 | 2 |
| Rough Terrain Forklifts | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber Tired Dozers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber Tires Loaders | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Scrapers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Signal Boards | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Skid Steer Loaders | 40 | 287 | 269 | 0 | 14 | 39845 | 4 |
| Surfacing Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sweepers/Scrubbers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tractors | 209 | 1265 | 1396 | 3 | 89 | 229117 | 19 |
| Front End Loaders | 35 | 214 | 236 | 0 | 15 | 38810 | 3 |
| Backhoes | 39 | 233 | 257 | 0 | 16 | 42216 | 3 |
| Trenchers | 1128 | 4211 | 5376 | 7 | 426 | 551918 | 102 |
| Welders | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gasoline Const Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| **Totals** | **VOC** | **CO** | **NOx** | **SOx** | **PM10** | **PM2.5** | **CO2** | **CH4** | **N2O** |
|---|---|---|---|---|---|---|---|---|---|
| lbs per const. period | 6428 | 24410 | 43420 | 78 | 2000 | 1982.06 | 7378385 | 580 | 125 |
| tons per const. period | 3.2 | 12.2 | 21.7 | 0.039 | 1.00 | 0.99 | 3689.19 | 0.29 | 0.06 |
| Average lbs/day = | 9.7 | 37.0 | 65.8 | 0.119 | 3.03 | 3.00 | 11179.37 | 0.88 | 0.19 |
| Normalized TPY = | *1.6* | *6.1* | *10.9* | *0.0* | *0.5* | *0.5* | *1844.6* | *0.1* | *0.031* |

| | |
|---|---|
| CO2e, tons/period | 3715.1 |
| CO2e, tons/yr: | 1857.5 |

Other Assumptions and References:

1. Trench construction times per: Southern Regional Water Pipeline Alliance, 3/08.
   Optimum trench construction progress rate is 80m (260ft) per day.
   Non-optimum trench construction progress rate is 30m (100 ft) per day.
   An average progress of 180 ft/day is used where applicable.
2. Paving speeds can range from 3 to 15 m/min depending on asphalt delivery rates and required compaction thickness.
   A minium paving speed of 3 m/min (10 ft/min or 600 ft/hr) was used where applicable.
   The minimum speed is based upon a 3" compacted layer, 12 ft lane width, with an asphalt delivery rate of ~ 140 tons/hr.
   Ref: Asphalt Paving Speed, Pavement Worktip No. 31, AAPA, 11/2001.
3. Estimation of maximum daily emissions is extremely variable, and these values are not required by SJVAPCD.
4. Construction schedule note: applicant data indicates a construction work day period of 8 hours
   The equipment use rates provided by the applicant are consistent with an 8 hour workday.
5. GWP values: CH4=25, N2O=298, ref: 40 CFR 98 Subpart A, Table A-1.
6. CARB-CEIDARS, Updated Size Fractions for PM Profiles: PM2.5 = 0.991 of PM10 : Diesel Vehicle Exhaust

**CONSTRUCTION PHASE - SGF 3**

| | | | | | |
|---|---|---|---|---|---|
| **MRI Level 2 Analysis (Refs 1, 3-7)** | | | Acres | 1059 | |
| Acres Subject to Construction Disturbance Activites: | | | | 105.9 | |
| Max Acres Subject to Construction Disturbance Activites on any day of this phase: | | | | 7.9 | note (10) |
| Emissions Factor for PM10 Uncontrolled, tons/acre/month: | | | | 0.12 | |
| PM2.5 fraction of PM10 (per CARB CEIDARS Profiles): | | | | 0.21 | |
| **Activity Levels:** | Hrs/Day: | | | 8 | |
| | Days/Wk: | | | 5 | |
| | Days/Month: | Applicant Data | | 22 | |
| | Phase Const Period, Months: | | | 23 | 1.92 years |
| | Phase Const Period, Days: | | | 506 | |

**Wet Season Adjustment:** (Per AP-42, Section 13.2.2, Figure 13.2.2-1, 12/03 or CalEEMod, Appendix D, Table 1.1.)

| | |
|---|---|
| Mean # days/year with rain >= 0.01 inch: | 40 |
| Mean # months/yr with rain >= 0.01 inch: | 1.33 |
| Adjusted Const Period, Months: | 23.00 |
| Adjusted Const Period, Days: | 429 |

**Controls for Fugitive Dust:** Proposed watering cycle: 3 times per day

3 watering cycles/8 hour construction shift yields a 68% reduction, use 68% for non-desert sites. (11)(12)
Speed control of onsite const traffic to <15 mph yields a 40-70% reduction (use 50% control as conservative for site). (11)(12)

| | | |
|---|---|---|
| Calculated % control based on mitigations proposed: | 84 | % control |
| Conservative control % used for emissions estimates: | 84 | % control |
| | 0.16 | release fraction |

| **Emissions: Controlled** | PM10 | PM2.5 |
|---|---|---|
| tons/month | 0.152 | 0.032 |
| tons/period | 3.507 | 0.737 |
| Max lbs/day | 13.863 | 2.911 |

**Soil Handling Emissions (Cut and Fill): (2)**

| | | | | | |
|---|---|---|---|---|---|
| Total cu.yds of soil handled: | 0 | Mean annual wind speed, mph: (8) | | | 8.03 |
| Total tons of soil handled: | 0.0 | Avg. Soil moisture, %: (9) | | | 5 |
| Total days soil handled: | 429 | Avg. Soil density, tons/cu.yd: | | | 1.3 |
| Tons soil/day: | 0 | k factor for PM10: | | | 0.35 |
| Control Eff, watering, % | 80 | Number of Drops per ton: | | | 4 |
| Release Fraction: | 0.2 | Calc 1 | wind | | 1.851 |
| | | Calc 2 | moisture | | 3.607 |
| | | Calc 3 | int | | 0.513 |
| | | Calc 4 | PM10 | lb/ton | 0.0006 |
| | | PM2.5 fraction of PM10: | | | 0.210 |

| Emissions: | PM10 | PM2.5 |
|---|---|---|
| tons/period | 0.000 | 0.000 |
| tons/month | 0.000 | 0.000 |
| max lbs/day | 0.000 | 0.000 |

| **Emissions Totals:** | **PM10** | **PM2.5** |
|---|---|---|
| **tons/period** | **3.507** | **0.737** |

**Methodology References:**

(1) MRI Report, South Coast AQMD Project No. 95040, March 1996, Level 2 Analysis Procedure.
MRI Report uncontrolled factor of 0.11 tons/acre/month is based on 168 hours per month of const activity.
For an activity rate of ~180 hrs/month, the adjusted EF would be 0.12 tons/acre/month (uncontrolled).
(2) Soil Handling (Cut and Fill), EPA, AP-42, Section 13.2.4., 11/06.
(3) URBEMIS, Version 9.2.4, User's Manual Appendix A, page A-6.
(4) CARB Area Source Methodology, Section 7.7, 9/02.
(5) WRAP Fugitive Dust Handbook, 9/06.
(6) USEPA, AP-42, Section 13.2.3, 2/10.
(7) Estimating PM Emissions from Construction Operations, USEPA, MRI, 9/99.
(8) Wind speed data for Lemoore met station. Annual avg wind speed = 8.03 mph, % calms = 3.44%.
(9) Soil Moisture; 5% assumed avg value
(10) adjusted applicant value based on 7.5% of total acreage disturbed on any given day
(11) SCAQMD CEQA Handbook 1993.
(12) SCAQMD, Sample Construction Scenarios for Projects Less than Five Acres, Fugitive Dust Mitigations, February 2005.

**OFFSITE PAVED ROAD FUGITIVE DUST EMISSIONS**
(associated with delivery truck and worker vehicle traffic on I-5 and plant access road)

| | | | |
|---|---|---|---|
| Average mileage for construction related vehicles: | | NA | miles, roundtrip distance*** |
| Avg weight of vehicular equipment on road: | | 4.1 | tons (range 2 - 42 tons) |
| Road surface silt loading factor: | | 0.015 | g/m2 (range 0.03 - 400 g/m2) |
| | | | Limited Access Freeway >10,000 ADT **(I-5)** |
| Particle size multiplier factors: | PM10 | 0.0022 | lb/VMT |
| | PM2.5 | 0.00054 | lb/VMT |
| C factors (brake and tire wear): | PM10 | 0.00047 | lb/VMT |
| | PM2.5 | 0.00036 | lb/VMT |
| Avg vehicle speed on road: | | 65 | mph |
| Avg. Number of vehicles per day: | | 195 | |
| | | | calculated per Applicant da |
| Avg. Number of work days per month: | | 22 | **VMT/period: 4887976.5** |
| | Total vehicles per month: | 4290 | |
| Number of work months: | | 21.33 | adjusted for precip events |
| | Total vehicles per const period: | 91505.7 | |

| | PM10 | |
|---|---|---|
| Calc 1 | 0.022 | |
| Calc 2 | 4.217 | |
| Calc 3 | 0.0007 | lb/VMT |

| **Emissions** | **PM10** | **PM2.5** |
|---|---|---|
| **lbs/period** | **3290.09** | **556.02** |
| **tons/period** | **1.645** | **0.278** |

EPA, AP-42, Section 13.2.1, March 2006, updated 9/2008.
PM2.5 fraction of PM10 per CARB CEIDARs is 0.169
*** Note: avg roundtrip distance traveled by delivery or worker vehicles on freeways (I-5) and other State Routes in the project area.
Vehicles per day: worker + deliveries+staff support vehciles (averages)

**ONSITE UNPAVED ROAD FUGITIVE DUST**

| | | | | |
|---|---|---|---|---|
| Length of Unpaved Roads on Construction site: | | 0.1 | miles* | |
| Avg weight of construction vehicular equipment on road: | | 4.1 | tons (range 2 - 42 tons) | |
| Road surface silt content: | | 8.5 | % (range 1.8 - 35%) | |
| Road surface material moisture content: | | 5 | % (range 0.03 - 13%) | |
| | | k | a | b |
| Particle size multiplier factors: | PM10 | 1.5 | 0.9 | 0.45 |
| | PM2.5 | 0.15 | 0.9 | 0.45 |
| C factors (brake and tire wear): | PM10 | 0.00047 | lb/VMT | |
| | PM2.5 | 0.00036 | lb/VMT | |
| Avg construction vehicle speed on road: | | 5 | mph (range 5-55 mph) | |
| Avg number of construction vehicles per day: | | 74 | ** | |
| Number of construction work days per month: | | 22 | **VMT/period:** | **4856.49** |
| Total vehicles per month: | | 1628 | | |
| Number of construction work months: | | 21.33 | adjusted for precipitation events | |
| Total vehicles per const period: | | 48564.9 | | |
| Control reduction due to watering, speed control, etc. = | | 80 | | |
| | | 0.8 | | |
| Release Fraction = | | 0.2 | | |

| | PM10 | PM2.5 |
|---|---|---|
| Calc 1 | 0.733 | 0.733 |
| Calc 2 | 1.151 | 1.151 |
| Calc 3 | 1.266 | 0.127 |
| Calc 4 | 1.266 | 0.127 |
| Controlled lb/VMT | 0.253 | 0.025 |

| **Emissions** | **PM10** | **PM2.5** |
|---|---|---|
| **lbs/period** | **1229.89** | **123.29** |
| **tons/period** | **0.615** | **0.062** |

EPA, AP-42, Section 13.2.2, March 2006
Soil Moisture; 5% avg
Soil silt content: 8.5% per AP-42 for construction site scraper routes
** const equipment plus site support pickups plus

**CONSTRUCTION PHASE - Truck Hauling/Delivery and Site Support Vehicle Emissions**

**All Phases**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Delivery/Hauling Vehicle Use Rates** | | | | | Emissions Factors (lbs/vmt) | | | | | |
| Delivery Roundtrip Distance: | 0 | miles | NOx | CO | VOC | SOx | PM10 | CO2 | | |
| Const Days per Period: | 0 | | 0.00625339 | 0.00051535 | 0.00011377 | 0.000026 | 3.9844E-05 | 3.10646173 | HDDT | |
| Avg Deliveries per Day: | 0 | | 0.00046982 | 0.00340025 | 7.8173E-05 | 0.000013 | 2.9202E-06 | 1.02361637 | MDGT | |
| Fraction of Deliveries-Diesel: | 0.95 | HDDT | | | **Daily Emissions (lbs)** | | | | | |
| Fraction of Deliveries-Gas: | 0.05 | MDGT | **NOx** | **CO** | **VOC** | **SOx** | **PM10** | **CO2** | **PM2.5** | |
| Total Delivery VMT: | **894677** | **per Applicant** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | HDDT |
| Total Daily VMT-Diesel | 0 | | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | MDGT |
| Total Daily VMT-Gasoline | 0 | | | | **Tons per Const Period** | | | | | |
| Total Period VMT-Diesel | 849942.675 | | 2.658 | 0.219 | 0.048 | 0.011 | 0.017 | 1320.2 | 0.014 | HDDT |
| Total Period VMT-Gasoline | 44733.825 | | 0.011 | 0.076 | 0.002 | 0.000 | 0.000 | 22.9 | 0.000 | MDGT |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Construction Site Support Vehicle Use Rates (LDTs)** | | | | | **Daily Emissions, lbs** | | | | | | |
| Gasoline Vehicle VMT Period: | 75900 | | **NOx** | **CO** | **VOC** | **SOx** | **PM10** | **CO2** | | | **PM2.5** |
| Avg Daily Gasoline VMT: | 300 | | 0.00040762 | 0.00359256 | 6.9991E-05 | 0.000008 | 5.0718E-06 | 0.6541839 | lbs/vmt* | LDT gasoline | |
| Avg Daily Diesel VMT: | 0 | | 0.1223 | 1.0778 | 0.0210 | 0.0024 | 0.0015 | 196.2552 | lbs/day | gasoline | 0.0010 |
| Total Phase Const Days: | 240 | | | | | | | | | | |
| | | | | | **Tons per Const Period** | | | | | | |
| Ref: EMFAC 2014, SJVAPCD Year 2016 | | | 0.0155 | 0.1363 | 0.0027 | 0.0003 | 0.0002 | 24.8 | **tons/period** | **gasoline** | 0.0001 |
| LDT1-gas, MDV-gas, HDDT-dsl | | | | | | | | | | | |
| See EF data in WSP Support Appendix | | | | | | | | | | | |

**Notes*****

VMT for delivery/hauling for all vehicles includes: (1) materials deliveries to site, (2) materials removal from site, other VMT as specified below.

Support Vehicle VMT: best estimate at time of filing, 10 LDT (gasoline) at 30 VMT/day

CARB-CEIDARS, Updated Fractions for PM Profiles: PM2.5 = 0.991 of PM10 for Diesel Exhaust, and 0.998 for Gasoline Vehicles.

**CONSTRUCTION PHASE - Worker Travel - Emissions**

Ref: SJVAPCD EMFAC 2014, Year 2016
LDA-gas
See EF data in WSP Support Appendix

**Worker Travel to Site**

| | |
|---|---|
| Avg Occupancy/Vehicle: | 0 |
| Avg Roundtrip Distance, miles: | 0.0 |
| Avg # of Worker Vehicles, per day: | 0 |
| Avg Daily Worker VMT: | 0 |
| Max # of Worker Vehicles, per day: | 0 |
| Max Daily Worker VMT: | 0 |
| Total Const Days: | 240 |
| **Total Const Period Worker VMT:** | **894677** |

**VMT data supplied by Applicant.**

Emissions Factors (lbs/VMT)

| NOx | CO | VOC | SOx | PM10 | CO2 |
|---|---|---|---|---|---|
| 0.00013058 | 0.001103197 | 2.504E-05 | 0.000007 | 0.000004 | 0.65463696 |

**Daily Emissions (lbs)**

| | NOx | CO | VOC | SOx | PM10 | CO2 | PM2.5 |
|---|---|---|---|---|---|---|---|
| Avg | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**Tons per Const Period**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Avg | 0.058 | 0.494 | 0.011 | 0.003 | 0.002 | 292.8 | 0.000 |

**Worker Travel by Busing from Staging Area**

| | |
|---|---|
| Total Bus VMT/Const Period: | 0 |
| Avg Bus VMT/Const Day: | 0 |
| Max Bus VMT/Const Day: | 0 |

| | | |
|---|---|---|
| Bus Round Trips/Day: | 0 | max |
| Bus Occupancy/Trip: | 0 | |

Ref: SJVAPCD EMFAC 2014, Year 2016
All other buses-DSL
See EF data in WSP Support Appendix

# buses supplied by Applicant.

Emissions Factors (lbs/VMT)

| NOx | CO | VOC | SOx | PM10 | CO2 |
|---|---|---|---|---|---|
| 0.012001 | 0.001203 | 0.000458 | 0.000026 | 0.00015 | 2.734838 |

**Daily Emissions (lbs)**

| | **NOx** | **CO** | **VOC** | **SOx** | **PM10** | **CO2** | **PM2.5** |
|---|---|---|---|---|---|---|---|
| Avg | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Max | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**Tons per Const Period**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Avg | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

**CONSTRUCTION PHASE - Trackout Emissions**

| | | | | | |
|---|---|---|---|---|---|
| Paved Road Length (miles): | 0.1 | estimated roundtrip trackout distance | | | |
| Daily # of Vehicles: | 74 | | | | |
| Avg Vehicle Weight (tons): | 6.8 | | **PM10** | **PM2.5*** | |
| Total Unadjusted VMT/day | 7.4 | | 0.361 | | |
| Particle Size Multipliers | PM10 | | 1.924 | | |
| lb/VMT | 0.023 | | 0.002 | 0.0004 | lb/VMT |
| C factor, lb/VMT | 0.00047 | | **0.129** | **0.0217** | **lbs/day** |
| Road Sfc Silt Loading (g/m^2): | 0.56 | local X 2 | **0.001** | **0.0002** | **tons/month** |
| # of Active Trackout Points: | 1 | ** | **0.03** | **0.0051** | **tons/period** |
| Added Trackout Miles: | PM10 | | | | |
| Trackout VMT/day: | 44 | *Default Silt Load Values for Paved Road Types* | | | |
| Final Adjusted VMT/day | 52 | | Freeway | 0.02 g/m2 | |
| Final Adjusted VMT/month | 1140 | | Arterial | 0.036 g/m2 | |
| Final Adjusted VMT/period | 24308 | | Collector | 0.036 g/m2 | |
| Construction days/month: | 22 | | Local | 0.28 g/m2 | |
| Adj. Construction months/period: | 21.33 | | Rural | 1.6 g/m2 | |
| Control Applied to Trackout: | Gravel entrance, metal cleaning grates, water washing, sweeping | | | | |
| Control Efficiency, % | 84 | 0.84 | Release Factor = | 0.16 | |

* PM2.5 fraction of PM10 assumed to be 0.169 (CARB CEIDARS updated fraction values) for paved roads.
** 1 controlled ingress/egress point is planned for site construction
EPA, AP-42, Section 13.2.1, Proposed revisions dated 9/2008.
Use silt loading factor from default values for road type if no site specific data is available.
Trackout effects approximately 0.05 mi. of roadway arriving and departing from the site access point.
Plant access road is already paved. Entrance will be gravelled with metal grates for take out control.
Vehicle count = delivery trucks plus site support trucks (see Unpaved Onsite tab)
Worker vehicles not counted for trackout, they will park on the site perimeter.

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## Tons/Period

| | NOx | CO | VOC | SOx | PM10 | CO2 | Fug PM10 | Fug PM2.5 |
|---|---|---|---|---|---|---|---|---|
| on-off site travel | 7.16 | 6.22 | 0.25 | 0.06 | 0.06 | 5885 | 9.86 | 1.74 |
| on-site equipment | 5.40 | 6.84 | 1.16 | 0.02 | 0.21 | 2227 | | |
| Total | 12.56 | 13.06 | 1.41 | 0.09 | 0.27 | 8111 | 9.86 | 1.74 |
| Months: | 15.5 | | | | | | | |
| Max Year Months: | 12 | | | | | | | |
| Total per Year: | 9.72 | 10.11 | 1.09 | 0.07 | 0.21 | 6279.70 | 7.63 | 1.35 |

CONSTRUCTION EQUIPMENT EXHAUST EMISSIONS

Project: WSP **Main Site Construction-SGF 4**

**Assumptions:**

1. The average engines employed in construction equipment use consumes fuel at a rate of: diesel 0.06 gal/hp-hr; gasoline 0.11 gal/hp-hr

Ref: EPA, NR-009b Publication, November 2002.
Ref: Sacramento County APCD Const. Program Data, V. 6.0.3, 3/2007.
Ref: EPA, NR-009c Publication, EPA 420-P-04-009, April 2004.
Ref: Niland Energy Project, IID, AFC Vol 2, App A.
Ref: South Coast AQMD PR XXI, Draft Staff Report, 3-15-95, and SCAQMD CEQA Manual, 11/03.
The above noted references present fuel consumption values which range from 0.050 to 0.064 gal/hp-hr for diesel engines used in construction related equipment. The value of 0.060 gal/hp-hr was chosen as a reasonable upper mid-range value for construction diesel emissions calculations.
For gasoline the mid-range value from SCAQMD of 0.11 gal/hp-hr was used.

2. Construction equipment exhaust emissions will be calculated on an annual basis using the site specific equipment list, HP ratings, hours of use, days of use, etc. Annual emissions will be apportioned to daily values based on the estimated construction period time on site.

3. The equipment list derived from the South Coast AQMD Offroad database (2016) will be used to establish the various equipment categories. Avg HP values were derived from SCAQMD and SacMetro AQMD construction resources.

4. Construction Schedule: 15.5 months; 8 hrs/day; 1.29 years

Construction Totals: 203.87097 hrs/month; 3160 hrs/const period; 395 days/const period

5. Anticipated Construction Start Year: 2020

6. Maximum anticipated equipment use month is: n/a

7. N2O EF diesel, lb/gal: 0.000183
N2O EF gasoline, lb/gal: 0.000164
CARB, Mandatory GHG Reporting Regulation
Table 4, Appendix A, 2007.

Equipment types and use rates supplied by the Applicant.

| Equipment Category** | Weighted Average HP | # of Units Used for Project | Avg Use Rate Hrs/day | # of Days On Site (each) | Total Hrs/Day | Total Hrs per Const Period | Total HP-Hrs Period |
|---|---|---|---|---|---|---|---|
| Aerial Lifts | 63 | 1 | 6 | 56 | 6 | 336 | 21168 |
| Air Compressors | 78 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bore-Drill Rigs | 206 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cement Mixers | 9 | 0 | 0 | 0 | 0 | 0 | 0 |
| Concrete/Industrial Saws | 81 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cranes | 226 | 1 | 2 | 56 | 2 | 112 | 25312 |
| Crawler Tractors/Dozers | 208 | 3 | 7 | 125 | 21 | 2625 | 546000 |
| Crushing/Processing Eq. | 85 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dumpers/Tenders/Water Trucks | 16 | 7 | 7 | 115 | 49 | 5635 | 90160 |
| Excavators | 163 | 0 | 0 | 0 | 0 | 0 | 0 |
| Forklifts | 89 | 8 | 6 | 120 | 48 | 5760 | 512640 |
| Generator Sets | 84 | 0 | 0 | 0 | 0 | 0 | 0 |
| Graders | 175 | 5 | 7 | 65 | 35 | 2275 | 398125 |
| Off-Highway Tractors | 123 | 0 | 0 | 0 | 0 | 0 | 0 |
| Off-Highway Trucks | 400 | 12 | 7 | 132 | 84 | 11088 | 4435200 |
| Other Diesel Construction Eq. | 172 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other General Industrial Eq. | 88 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Material Handling Eq. | 167 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pavers | 126 | 1 | 4 | 17 | 4 | 68 | 8568 |
| Paving Eq. Other | 131 | 0 | 0 | 0 | 0 | 0 | 0 |
| Plate Compactors | 8 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pressure Washers | 13 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pumps | 84 | 0 | 0 | 0 | 0 | 0 | 0 |
| Roller Compactors | 81 | 1 | 7 | 25 | 7 | 175 | 14175 |
| Rough Terrain Forklifts | 100 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber Tired Dozers | 255 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber Tires Loaders | 200 | 0 | 0 | 0 | 0 | 0 | 0 |
| Scrapers | 362 | 0 | 0 | 0 | 0 | 0 | 0 |
| Signal Boards | 6 | 0 | 0 | 0 | 0 | 0 | 0 |
| Skid Steer Loaders | 65 | 1 | 7 | 113 | 7 | 791 | 51415 |
| Surfacing Eq. | 254 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sweepers/Scrubbers | 64 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tractors (single category) | 98 | 2 | 7 | 147 | 14 | 2058 | 201684 |
| Front End Loaders (single category) | 98 | 1 | 7 | 50 | 7 | 350 | 34300 |
| Backhoes (single category) | 98 | 1 | 4 | 95 | 4 | 380 | 37240 |
| Trenchers | 81 | 10 | 4 | 141 | 40 | 5640 | 456840 |
| Welders | 46 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gasoline Const Eq. | 175 | 0 | 0 | 0 | 0 | 0 | 0 |

** diesel equipment unless otherwise specified.

Const Period Diesel Hp-Hrs = 6832827
Const Period Gasoline Hp-Hrs = 0
Const Period Diesel Fuel Use = 409970 gals
Const Period Gasoline Fuel Use = 0 gals

Offroad equipment emissions factors derived SCAQMD Off Road database for 2020.
The SCAQMD EFs as presented incorporate the average equipment load factors.
Emissions factors for each category of equipment represent the composite factors for the stated equipment category as derived from the SCAQMD Offroad database for the construction start year.

**2025 Equipment Emissions Factors**

| Equip. Type | lbs/hr VOC (ROG) | lbs/hr CO | lbs/hr NOx | lbs/hr SOx | lbs/hr PM10 | lbs/hr CO2 | lbs/hr CH4 |
|---|---|---|---|---|---|---|---|
| Aerial Lifts | 0.0184 | 0.1646 | 0.1366 | 0.0004 | 0.0048 | 34.7217 | 0.0017 |
| Air Compressors | 0.0349 | 0.3027 | 0.2104 | 0.0007 | 0.0088 | 63.6073 | 0.0031 |
| Bore-Drill Rigs | 0.0428 | 0.5007 | 0.2864 | 0.0017 | 0.0042 | 164.8678 | 0.0039 |
| Cement Mixers | 0.0085 | 0.0414 | 0.0534 | 0.0001 | 0.0021 | 7.2481 | 0.0008 |
| Concrete/Industrial Saws | 0.0337 | 0.3706 | 0.2471 | 0.0007 | 0.0093 | 58.4637 | 0.0030 |
| Cranes | 0.0681 | 0.3738 | 0.4223 | 0.0014 | 0.0143 | 128.6241 | 0.0061 |
| Crawler Tractors/Dozers | 0.0789 | 0.5065 | 0.4492 | 0.0013 | 0.0227 | 114.0167 | 0.0071 |
| Crushing/Processing Eq. | 0.0693 | 0.6187 | 0.3763 | 0.0015 | 0.0146 | 132.3077 | 0.0062 |
| Dumpers/Tenders | 0.0092 | 0.0314 | 0.0581 | 0.0001 | 0.0022 | 7.6244 | 0.0008 |
| Excavators | 0.0559 | 0.5086 | 0.2269 | 0.0013 | 0.0086 | 119.5792 | 0.0050 |
| Forklifts | 0.0236 | 0.2148 | 0.0860 | 0.0006 | 0.0025 | 54.3958 | 0.0021 |
| Generator Sets | 0.0288 | 0.2667 | 0.2329 | 0.0007 | 0.0081 | 60.9927 | 0.0026 |
| Graders | 0.0676 | 0.5696 | 0.3314 | 0.0015 | 0.0147 | 132.7431 | 0.0061 |
| Off-Highway Tractors | 0.1134 | 0.6101 | 0.7291 | 0.0017 | 0.0331 | 151.3869 | 0.0102 |
| Off-Highway Trucks | 0.1140 | 0.5385 | 0.4769 | 0.0027 | 0.0142 | 260.0652 | 0.0103 |
| Other Diesel Construction Eq. | 0.0442 | 0.3474 | 0.2021 | 0.0013 | 0.0069 | 122.5051 | 0.0040 |
| Other General Industrial Eq. | 0.0747 | 0.4438 | 0.3947 | 0.0016 | 0.0130 | 152.2399 | 0.0067 |
| Other Material Handling Eq. | 0.0696 | 0.4355 | 0.3844 | 0.0015 | 0.0124 | 141.1941 | 0.0063 |
| Pavers | 0.0717 | 0.4745 | 0.3858 | 0.0009 | 0.0220 | 77.9326 | 0.0065 |
| Paving Eq. Other | 0.0548 | 0.3993 | 0.3281 | 0.0008 | 0.0190 | 68.9364 | 0.0049 |
| Plate Compactors | 0.0050 | 0.0263 | 0.0314 | 0.0001 | 0.0012 | 4.3138 | 0.0005 |
| Pressure Washers | 0.0066 | 0.0531 | 0.0561 | 0.0001 | 0.0019 | 9.4135 | 0.0006 |
| Pumps | 0.0270 | 0.2617 | 0.2079 | 0.0006 | 0.0078 | 49.6066 | 0.0024 |
| Roller Compactors | 0.0410 | 0.3763 | 0.2501 | 0.0008 | 0.0122 | 67.0308 | 0.0037 |
| Rough Terrain Forklifts | 0.0396 | 0.4430 | 0.2336 | 0.0008 | 0.0090 | 70.2808 | 0.0036 |
| Rubber Tired Dozers | 0.1672 | 0.6620 | 1.0824 | 0.0025 | 0.0419 | 239.0780 | 0.0151 |
| Rubber Tires Loaders | 0.0559 | 0.4311 | 0.2835 | 0.0012 | 0.0121 | 108.6113 | 0.0050 |
| Scrapers | 0.1495 | 0.7187 | 0.8387 | 0.0027 | 0.0335 | 262.4827 | 0.0135 |
| Signal Boards | 0.0111 | 0.0909 | 0.0718 | 0.0002 | 0.0029 | 16.6983 | 0.0010 |
| Skid Steer Loaders | 0.0186 | 0.2104 | 0.1354 | 0.0004 | 0.0019 | 30.2740 | 0.0017 |
| Surfacing Eq. | 0.0638 | 0.3590 | 0.3924 | 0.0017 | 0.0142 | 165.9715 | 0.0058 |
| Sweepers/Scrubbers | 0.0410 | 0.4840 | 0.2255 | 0.0009 | 0.0061 | 78.5433 | 0.0037 |
| Tractors | 0.0336 | 0.3586 | 0.1857 | 0.0008 | 0.0059 | 66.7965 | 0.0030 |
| Front End Loaders | 0.0336 | 0.3586 | 0.1857 | 0.0008 | 0.0059 | 66.7965 | 0.0030 |
| Backhoes | 0.0336 | 0.3586 | 0.1857 | 0.0008 | 0.0059 | 66.7965 | 0.0030 |
| Trenchers | 0.0674 | 0.4085 | 0.3481 | 0.0007 | 0.0215 | 58.7116 | 0.0061 |
| Welders | 0.0214 | 0.1745 | 0.1373 | 0.0003 | 0.0052 | 25.6027 | 0.0019 |
| Gasoline Const Eq. (assumed 175 hp category) | 0.0771 | 0.3855 | 1.08 | 0.00014 | 0.1542 | 14.1565 | 0.00037 |

(gasoline EFs: EPA OMS-AMD Report NR-009A, 2-13-98, and SCAQMD EMFAC 2007 CEQA Tables, 2016.)

Construction Period Emissions, lbs

| **Equip. Type** | **VOC** | **CO** | **NOx** | **SOx** | **PM10** | **CO2** | **CH4** |
|---|---|---|---|---|---|---|---|
| Aerial Lifts | 6 | 55 | 46 | 0 | 2 | 11666 | 1 |
| Air Compressors | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bore-Drill Rigs | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cement Mixers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Concrete/Industrial Saws | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cranes | 8 | 42 | 47 | 0 | 2 | 14406 | 1 |
| Crawler Tractors/Dozers | 207 | 1330 | 1179 | 3 | 60 | 299294 | 19 |
| Crushing/Processing Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dumpers/Tenders | 52 | 177 | 327 | 1 | 12 | 42963 | 5 |
| Excavators | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Forklifts | 136 | 1237 | 495 | 3 | 14 | 313320 | 12 |
| Generator Sets | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Graders | 154 | 1296 | 754 | 3 | 33 | 301991 | 14 |
| Off-Highway Tractors | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Off-Highway Trucks | 1264 | 5971 | 5288 | 30 | 157 | 2883603 | 114 |
| Other Diesel Construction Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other General Industrial Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Material Handling Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pavers | 5 | 32 | 26 | 0 | 1 | 5299 | 0 |
| Paving Eq. Other | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Plate Compactors | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pressure Washers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pumps | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Roller Compactors | 7 | 66 | 44 | 0 | 2 | 11730 | 1 |
| Rough Terrain Forklifts | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber Tired Dozers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber Tires Loaders | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Scrapers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Signal Boards | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Skid Steer Loaders | 15 | 166 | 107 | 0 | 2 | 23947 | 1 |
| Surfacing Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sweepers/Scrubbers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tractors | 69 | 738 | 382 | 2 | 12 | 137467 | 6 |
| Front End Loaders | 12 | 126 | 65 | 0 | 2 | 23379 | 1 |
| Backhoes | 13 | 136 | 71 | 0 | 2 | 25383 | 1 |
| Trenchers | 380 | 2304 | 1963 | 4 | 121 | 331133 | 34 |
| Welders | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gasoline Const Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| **Totals** | **VOC** | **CO** | **NOx** | **SOx** | **PM10** | **PM2.5** | **CO2** | **CH4** | **N2O** |
|---|---|---|---|---|---|---|---|---|---|
| lbs per const. period | 2327 | 13676 | 10795 | 48 | 423 | 419.52 | 4425582 | 210 | 75 |
| tons per const. period | 1.2 | 6.8 | 5.4 | 0.024 | 0.21 | 0.21 | 2212.79 | 0.10 | 0.04 |
| Average lbs/day = | 5.9 | 34.6 | 27.3 | 0.121 | 1.07 | 1.06 | 11204.00 | 0.53 | 0.19 |
| Normalized TPY = | *0.9* | *5.3* | *4.2* | *0.0* | *0.2* | *0.2* | *1713.1* | *0.1* | *0.029* |

| | |
|---|---|
| CO2e, tons/period | 2226.6 |
| CO2e, tons/yr: | 1723.8 |

CARB-CEIDARS, Updated Size Fractions for PM Profiles: PM2.5 = 0.991 of PM10 : Diesel Vehicle Exhaust

Other Assumptions and References:

1. Trench construction times per: Southern Regional Water Pipeline Alliance, 3/08.
   Optimum trench construction progress rate is 80m (260ft) per day.
   Non-optimum trench construction progress rate is 30m (100 ft) per day.
   An average progress of 180 ft/day is used where applicable.
2. Paving speeds can range from 3 to 15 m/min depending on asphalt delivery rates and required compaction thickness.
   A minium paving speed of 3 m/min (10 ft/min or 600 ft/hr) was used where applicable.
   The minimum speed is based upon a 3" compacted layer, 12 ft lane width, with an asphalt delivery rate of ~ 140 tons/hr.
   Ref: Asphalt Paving Speed, Pavement Worktip No. 31, AAPA, 11/2001.
3. Estimation of maximum daily emissions is extremely variable, and these values are not required by SJVAPCD.
4. Construction schedule note: applicant data indicates a construction work day period of 8 hours
   The equipment use rates provided by the applicant are consistent with an 8 hour workday.
5. GWP values: CH4=25, N2O=298, ref: 40 CFR 98 Subpart A, Table A-1.

**CONSTRUCTION PHASE - SGF 4**

| | | | | |
|---|---|---|---|---|
| **MRI Level 2 Analysis (Refs 1, 3-7)** | | Acres | 2117 | |
| Acres Subject to Construction Disturbance Activites: | | | 211.7 | |
| Max Acres Subject to Construction Disturbance Activites on any day of this phase: | | | 15.9 | note (10) |
| Emissions Factor for PM10 Uncontrolled, tons/acre/month: | | | 0.12 | |
| PM2.5 fraction of PM10 (per CARB CEIDARS Profiles): | | | 0.21 | |
| **Activity Levels:** | Hrs/Day: | | 8 | |
| | Days/Wk: | | 5 | |
| | Days/Month: Applicant Data | | 22 | |
| | Phase Const Period, Months: | | 16 | 1.33 years |
| | Phase Const Period, Days: | | 395 | |

**Wet Season Adjustment:** (Per AP-42, Section 13.2.2, Figure 13.2.2-1, 12/03 or CalEEMod, Appendix D, Table 1.1.)

| | |
|---|---|
| Mean # days/year with rain >= 0.01 inch: | 40 |
| Mean # months/yr with rain >= 0.01 inch: | 1.33 |
| Adjusted Const Period, Months: | 14.22 |
| Adjusted Const Period, Days: | 342 |

**Controls for Fugitive Dust:** Proposed watering cycle: 3 times per day

3 watering cycles/8 hour construction shift yields a 68% reduction, use 68% for non-desert sites. (11)(12)
Speed control of onsite const traffic to <15 mph yields a 40-70% reduction (use 50% control as conservative for site). (11)(12)

| | | |
|---|---|---|
| Calculated % control based on mitigations proposed: | 84 | % control |
| Conservative control % used for emissions estimates: | 84 | % control |
| | 0.16 | release fraction |

| **Emissions: Controlled** | PM10 | PM2.5 |
|---|---|---|
| tons/month | 0.305 | 0.064 |
| tons/period | 4.336 | 0.910 |
| Max lbs/day | 27.713 | 5.820 |

**Soil Handling Emissions (Cut and Fill): (2)**

| | |
|---|---|
| Total cu.yds of soil handled: | 0 |
| Total tons of soil handled: | 0.0 |
| Total days soil handled: | 342 |
| Tons soil/day: | 0 |
| Control Eff, watering, % | 80 |
| Release Fraction: | 0.2 |

| | | | |
|---|---|---|---|
| Mean annual wind speed, mph: (8) | | | 8.03 |
| Avg. Soil moisture, %: (9) | | | 5 |
| Avg. Soil density, tons/cu.yd: | | | 1.3 |
| k factor for PM10: | | | 0.35 |
| Number of Drops per ton: | | | 4 |
| Calc 1 | wind | | 1.851 |
| Calc 2 | moisture | | 3.607 |
| Calc 3 | int | | 0.513 |
| Calc 4 | PM10 | lb/ton | 0.0006 |
| PM2.5 fraction of PM10: | | | 0.210 |

| Emissions: | PM10 | PM2.5 |
|---|---|---|
| tons/period | 0.000 | 0.000 |
| tons/month | 0.000 | 0.000 |
| max lbs/day | 0.000 | 0.000 |

| **Emissions Totals:** | **PM10** | **PM2.5** |
|---|---|---|
| **tons/period** | **4.336** | **0.910** |

**Methodology References:**

(1) MRI Report, South Coast AQMD Project No. 95040, March 1996, Level 2 Analysis Procedure.
MRI Report uncontrolled factor of 0.11 tons/acre/month is based on 168 hours per month of const activity.
For an activity rate of ~180 hrs/month, the adjusted EF would be 0.12 tons/acre/month (uncontrolled).
(2) Soil Handling (Cut and Fill), EPA, AP-42, Section 13.2.4., 11/06.
(3) URBEMIS, Version 9.2.4, User's Manual Appendix A, page A-6.
(4) CARB Area Source Methodology, Section 7.7, 9/02.
(5) WRAP Fugitive Dust Handbook, 9/06.
(6) USEPA, AP-42, Section 13.2.3, 2/10.
(7) Estimating PM Emissions from Construction Operations, USEPA, MRI, 9/99.
(8) Wind speed data for Lemoore met station. Annual avg wind speed = 8.03 mph, % calms = 3.44%.
(9) Soil Moisture; 5% assumed avg value
(10) adjusted applicant value based on 7.5% of total acreage disturbed on any given day
(11) SCAQMD CEQA Handbook 1993.
(12) SCAQMD, Sample Construction Scenarios for Projects Less than Five Acres, Fugitive Dust Mitigations, February 2005.

**OFFSITE PAVED ROAD FUGITIVE DUST EMISSIONS**
(associated with delivery truck and worker vehicle traffic on I-5 and plant access road)

| | | | |
|---|---|---|---|
| Average mileage for construction related vehicles: | | NA | miles, roundtrip distance*** |
| Avg weight of vehicular equipment on road: | | 4.1 | tons (range 2 - 42 tons) |
| Road surface silt loading factor: | | 0.015 | g/m2 (range 0.03 - 400 g/m2) |
| | | | Limited Access Freeway >10,000 ADT **(I-5)** |
| Particle size multiplier factors: | PM10 | 0.0022 | lb/VMT |
| | PM2.5 | 0.00054 | lb/VMT |
| C factors (brake and tire wear): | PM10 | 0.00047 | lb/VMT |
| | PM2.5 | 0.00036 | lb/VMT |
| Avg vehicle speed on road: | | 65 | mph |
| Avg. Number of vehicles per day: | | 195 | |
| | | | calculated per Applicant da |
| Avg. Number of work days per month: | | 22 | **VMT/period: 11909669** |
| | Total vehicles per month: | 4290 | |
| Number of work months: | | 42.67 | adjusted for precip events |
| | Total vehicles per const period: | 183054.3 | |

| | PM10 | |
|---|---|---|
| Calc 1 | 0.022 | |
| Calc 2 | 4.217 | |
| Calc 3 | 0.0007 | lb/VMT |

| **Emissions** | **PM10** | **PM2.5** |
|---|---|---|
| **lbs/period** | **8016.37** | **1354.77** |
| **tons/period** | **4.008** | **0.677** |

EPA, AP-42, Section 13.2.1, March 2006, updated 9/2008.
PM2.5 fraction of PM10 per CARB CEIDARs is 0.169
*** Note: avg roundtrip distance traveled by delivery or worker vehicles on freeways (I-5) and other State Routes in the project area.
Vehicles per day: worker + deliveries+staff support vehciles (averages)

**ONSITE UNPAVED ROAD FUGITIVE DUST**

| | | | | | | |
|---|---|---|---|---|---|---|
| Length of Unpaved Roads on Construction site: | | 0.1 | miles* | | | |
| Avg weight of construction vehicular equipment on road: | | 4.1 | tons (range 2 - 42 tons) | | | |
| Road surface silt content: | | 8.5 | % (range 1.8 - 35%) | | | |
| Road surface material moisture content: | | 5 | % (range 0.03 - 13%) | | | |
| | | k | a | b | | |
| Particle size multiplier factors: | PM10 | 1.5 | 0.9 | 0.45 | | |
| | PM2.5 | 0.15 | 0.9 | 0.45 | | |
| C factors (brake and tire wear): | PM10 | 0.00047 | lb/VMT | | | |
| | PM2.5 | 0.00036 | lb/VMT | | | |
| Avg construction vehicle speed on road: | | 5 | mph (range 5-55 mph) | | | |
| Avg number of construction vehicles per day: | | 74 | ** | | | |
| Number of construction work days per month: | | 22 | | | **VMT/period:** | **11826.848** |
| Total vehicles per month: | | 1628 | | | | |
| Number of construction work months: | | 14.22 | adjusted for precipitation events | | | |
| Total vehicles per const period: | | 118268.48 | | | | |
| Control reduction due to watering, speed control, etc. = | | 80 | | | | |
| | | 0.8 | | | | |
| Release Fraction = | | 0.2 | | | | |

| | PM10 | PM2.5 |
|---|---|---|
| Calc 1 | 0.733 | 0.733 |
| Calc 2 | 1.151 | 1.151 |
| Calc 3 | 1.266 | 0.127 |
| Calc 4 | 1.266 | 0.127 |
| Controlled lb/VMT | 0.253 | 0.025 |

| **Emissions** | **PM10** | **PM2.5** |
|---|---|---|
| **lbs/period** | **2995.12** | **300.25** |
| **tons/period** | **1.498** | **0.150** |

EPA, AP-42, Section 13.2.2, March 2006
Soil Moisture; 5% avg
Soil silt content: 8.5% per AP-42 for construction site scraper routes
** const equipment plus site support pickups plus

**CONSTRUCTION PHASE - Truck Hauling/Delivery and Site Support Vehicle Emissions**

**All Phases**

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Delivery/Hauling Vehicle Use Rates** | | | | | Emissions Factors (lbs/vmt) | | | | | | |
| Delivery Roundtrip Distance: | 0 | miles | NOx | CO | VOC | SOx | PM10 | CO2 | | | |
| Const Days per Period: | 0 | | 0.00625339 | 0.00051535 | 0.00011377 | 0.000026 | 3.9844E-05 | 3.10646173 | HDDT | | |
| Avg Deliveries per Day: | 0 | | 0.00046982 | 0.00340025 | 7.8173E-05 | 0.000013 | 2.9202E-06 | 1.02361637 | MDGT | | |
| Fraction of Deliveries-Diesel: | 0.95 | HDDT | | | **Daily Emissions (lbs)** | | | | | | |
| Fraction of Deliveries-Gas: | 0.05 | MDGT | **NOx** | **CO** | **VOC** | **SOx** | **PM10** | **CO2** | **PM2.5** | | |
| Total Delivery VMT: | **2183909** | **per Applicant** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | HDDT | |
| Total Daily VMT-Diesel | 0 | | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | MDGT | |
| Total Daily VMT-Gasoline | 0 | | | | **Tons per Const Period** | | | | | | |
| Total Period VMT-Diesel | 2074713.74 | | 6.487 | 0.535 | 0.118 | 0.027 | 0.041 | 3222.5 | 0.034 | HDDT | |
| Total Period VMT-Gasoline | 109195.46 | | 0.026 | 0.186 | 0.004 | 0.001 | 0.000 | 55.9 | 0.000 | MDGT | |
| | | | | | | | | | | | |
| **Construction Site Support Vehicle Use Rates (LDTs)** | | | | | **Daily Emissions, lbs** | | | | | | |
| Gasoline Vehicle VMT Period: | 75900 | | **NOx** | **CO** | **VOC** | **SOx** | **PM10** | **CO2** | | | **PM2.5** |
| Avg Daily Gasoline VMT: | 300 | | 0.00040762 | 0.00359256 | 6.9991E-05 | 0.000008 | 5.0718E-06 | 0.6541839 | lbs/vmt* | LDT gasoline | |
| Avg Daily Diesel VMT: | 0 | | 0.1223 | 1.0778 | 0.0210 | 0.0024 | 0.0015 | 196.2552 | lbs/day | gasoline | 0.0010 |
| Total Phase Const Days: | 240 | | | | | | | | | | |
| | | | | | **Tons per Const Period** | | | | | | |
| Ref: EMFAC 2014, SJVAPCD Year 2016 | | | 0.0155 | 0.1363 | 0.0027 | 0.0003 | 0.0002 | 24.8 | **tons/period** | **gasoline** | 0.0001 |
| LDT1-gas, MDV-gas, HDDT-dsl | | | | | | | | | | | |
| See EF data in WSP Support Appendix | | | | | | | | | | | |

**Notes*****

VMT for delivery/hauling for all vehicles includes: (1) materials deliveries to site, (2) materials removal from site, other VMT as specified below.

Support Vehicle VMT: best estimate at time of filing, 10 LDT (gasoline) at 30 VMT/day

CARB-CEIDARS, Updated Fractions for PM Profiles: PM2.5 = 0.991 of PM10 for Diesel Exhaust, and 0.998 for Gasoline Vehicles.

**CONSTRUCTION PHASE - Worker Travel - Emissions**

Ref: SJVAPCD EMFAC 2014, Year 2020
LDA-gas
See EF data in WSP Support Appendix

**Worker Travel to Site**

| | |
|---|---|
| Avg Occupancy/Vehicle: | 0 |
| Avg Roundtrip Distance, miles: | 0.0 |
| Avg # of Worker Vehicles, per day: | 0 |
| Avg Daily Worker VMT: | 0 |
| Max # of Worker Vehicles, per day: | 0 |
| Max Daily Worker VMT: | 0 |
| Total Const Days: | 240 |
| **Total Const Period Worker VMT:** | **9725760** |

**VMT data supplied by Applicant.**

Emissions Factors (lbs/VMT)

| NOx | CO | VOC | SOx | PM10 | CO2 |
|---|---|---|---|---|---|
| 0.00013058 | 0.001103197 | 2.504E-05 | 0.000007 | 0.000004 | 0.65463696 |

**Daily Emissions (lbs)**

| | NOx | CO | VOC | SOx | PM10 | CO2 | PM2.5 |
|---|---|---|---|---|---|---|---|
| Avg | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**Tons per Const Period**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Avg | 0.635 | 5.365 | 0.122 | 0.034 | 0.019 | 3183.4 | 0.000 |

**Worker Travel by Busing from Staging Area**

| | |
|---|---|
| Total Bus VMT/Const Period: | 0 |
| Avg Bus VMT/Const Day: | 0 |
| Max Bus VMT/Const Day: | 0 |

| | | |
|---|---|---|
| Bus Round Trips/Day: | 0 | max |
| Bus Occupancy/Trip: | 0 | |

Ref: SJVAPCD EMFAC 2014, Year 2016
All other buses-DSL
See EF data in WSP Support Appendix

# buses supplied by Applicant.

Emissions Factors (lbs/VMT)

| NOx | CO | VOC | SOx | PM10 | CO2 |
|---|---|---|---|---|---|
| 0.012001 | 0.001203 | 0.000458 | 0.000026 | 0.00015 | 2.734838 |

**Daily Emissions (lbs)**

| | **NOx** | **CO** | **VOC** | **SOx** | **PM10** | **CO2** | **PM2.5** |
|---|---|---|---|---|---|---|---|
| Avg | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Max | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**Tons per Const Period**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Avg | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

**CONSTRUCTION PHASE - Trackout Emissions**

| | | | | | | |
|---|---|---|---|---|---|---|
| Paved Road Length (miles): | 0.1 | estimated roundtrip trackout distance | | | | |
| Daily # of Vehicles: | 74 | | | | | |
| Avg Vehicle Weight (tons): | 6.8 | | | **PM10** | **PM2.5*** | |
| Total Unadjusted VMT/day | 7.4 | | | 0.361 | | |
| Particle Size Multipliers | PM10 | | | 1.924 | | |
| lb/VMT | 0.023 | | | 0.002 | 0.0004 | lb/VMT |
| C factor, lb/VMT | 0.00047 | | | **0.129** | **0.0217** | **lbs/day** |
| Road Sfc Silt Loading (g/m^2): | 0.56 | local X 2 | | **0.001** | **0.0002** | **tons/month** |
| # of Active Trackout Points: | 1 | ** | | **0.02** | **0.0034** | **tons/period** |
| Added Trackout Miles: | PM10 | | | | | |
| Trackout VMT/day: | 44 | | *Default Silt Load Values for Paved Road Types* | | | |
| Final Adjusted VMT/day | 52 | | | Freeway | 0.02 g/m2 | |
| Final Adjusted VMT/month | 1140 | | | Arterial | 0.036 g/m2 | |
| Final Adjusted VMT/period | 16205 | | | Collector | 0.036 g/m2 | |
| Construction days/month: | 22 | | | Local | 0.28 g/m2 | |
| Adj. Construction months/period: | 14.22 | | | Rural | 1.6 g/m2 | |
| Control Applied to Trackout: | Gravel entrance, metal cleaning grates, water washing, sweeping | | | | | |
| Control Efficiency, % | 84 | 0.84 | Release Factor = | | 0.16 | |

* PM2.5 fraction of PM10 assumed to be 0.169 (CARB CEIDARS updated fraction values) for paved roads.
** 1 controlled ingress/egress point is planned for site construction
EPA, AP-42, Section 13.2.1, Proposed revisions dated 9/2008.
Use silt loading factor from default values for road type if no site specific data is available.
Trackout effects approximately 0.05 mi. of roadway arriving and departing from the site access point.
Plant access road is already paved. Entrance will be gravelled with metal grates for take out control.
Vehicle count = delivery trucks plus site support trucks (see Unpaved Onsite tab)
Worker vehicles not counted for trackout, they will park on the site perimeter.

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**Tons/Period**

| | NOx | CO | VOC | SOx | PM10 | CO2 | Fug PM10 | Fug PM2.5 |
|---|---|---|---|---|---|---|---|---|
| on-off site travel | 5.86 | 5.10 | 0.20 | 0.05 | 0.05 | 4813 | 6.72 | 1.14 |
| on-site equipment | 5.16 | 4.10 | 0.88 | 0.01 | 0.21 | 1406 | | |
| Total | 11.02 | 9.20 | 1.08 | 0.07 | 0.26 | 6219 | 6.72 | 1.14 |
| Months: | 10 | | | | | | | |
| Max Year Months: | 10 | | | | | | | |
| Total per Year: | 11.02 | 9.20 | 1.08 | 0.07 | 0.26 | 6218.92 | 6.72 | 1.14 |

CONSTRUCTION EQUIPMENT EXHAUST EMISSIONS

Project: WSP **Main Site Construction-SGF 5**

**Assumptions:**

1. The average engines employed in construction equipment use consumes fuel at a rate of: diesel 0.06 gal/hp-hr; gasoline 0.11 gal/hp-hr

Ref: EPA, NR-009b Publication, November 2002.
Ref: Sacramento County APCD Const. Program Data, V. 6.0.3, 3/2007.
Ref: EPA, NR-009c Publication, EPA 420-P-04-009, April 2004.
Ref: Niland Energy Project, IID, AFC Vol 2, App A.
Ref: South Coast AQMD PR XXI, Draft Staff Report, 3-15-95, and SCAQMD CEQA Manual, 11/03.
The above noted references present fuel consumption values which range from 0.050 to 0.064 gal/hp-hr for diesel engines used in construction related equipment. The value of 0.060 gal/hp-hr was chosen as a reasonable upper mid-range value for construction diesel emissions calculations.
For gasoline the mid-range value from SCAQMD of 0.11 gal/hp-hr was used.

2. Construction equipment exhaust emissions will be calculated on an annual basis using the site specific equipment list, HP ratings, hours of use, days of use, etc. Annual emissions will be apportioned to daily values based on the estimated construction period time on site.

3. The equipment list derived from the South Coast AQMD Offroad database (2016) will be used to establish the various equipment categories. Avg HP values were derived from SCAQMD and SacMetro AQMD construction resources.

4. Construction Schedule: 10 months; 8 hrs/day; 0.83 years

Construction Totals: 212 hrs/month; 2120 hrs/const period; 265 days/const period

5. Anticipated Construction Start Year: 2021

6. Maximum anticipated equipment use month is: n/a

7. N2O EF diesel, lb/gal: 0.000183
N2O EF gasoline, lb/gal: 0.000164
CARB, Mandatory GHG Reporting Regulation
Table 4, Appendix A, 2007.

Equipment types and use rates supplied by the Applicant.

| Equipment Category** | | Weighted Average HP | # of Units Used for Project | Avg Use Rate Hrs/day | # of Days On Site (each) | Total Hrs/Day | Total Hrs per Const Period | Total HP-Hrs Period |
|---|---|---|---|---|---|---|---|---|
| Aerial Lifts | | 63 | 1 | 6 | 38 | 6 | 228 | 14364 |
| Air Compressors | | 78 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bore-Drill Rigs | | 206 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cement Mixers | | 9 | 0 | 0 | 0 | 0 | 0 | 0 |
| Concrete/Industrial Saws | | 81 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cranes | | 226 | 1 | 2 | 38 | 2 | 76 | 17176 |
| Crawler Tractors/Dozers | | 208 | 3 | 7 | 85 | 21 | 1785 | 371280 |
| Crushing/Processing Eq. | | 85 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dumpers/Tenders/Water Trucks | | 16 | 7 | 7 | 78 | 49 | 3822 | 61152 |
| Excavators | | 163 | 0 | 0 | 0 | 0 | 0 | 0 |
| Forklifts | | 89 | 8 | 6 | 80 | 48 | 3840 | 341760 |
| Generator Sets | | 84 | 0 | 0 | 0 | 0 | 0 | 0 |
| Graders | | 175 | 5 | 7 | 43 | 35 | 1505 | 263375 |
| Off-Highway Tractors | | 123 | 0 | 0 | 0 | 0 | 0 | 0 |
| Off-Highway Trucks | | 400 | 12 | 7 | 88 | 84 | 7392 | 2956800 |
| Other Diesel Construction Eq. | | 172 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other General Industrial Eq. | | 88 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Material Handling Eq. | | 167 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pavers | | 126 | 1 | 4 | 11 | 4 | 44 | 5544 |
| Paving Eq. Other | | 131 | 0 | 0 | 0 | 0 | 0 | 0 |
| Plate Compactors | | 8 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pressure Washers | | 13 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pumps | | 84 | 0 | 0 | 0 | 0 | 0 | 0 |
| Roller Compactors | | 81 | 1 | 7 | 17 | 7 | 119 | 9639 |
| Rough Terrain Forklifts | | 100 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber Tired Dozers | | 255 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber Tires Loaders | | 200 | 0 | 0 | 0 | 0 | 0 | 0 |
| Scrapers | | 362 | 0 | 0 | 0 | 0 | 0 | 0 |
| Signal Boards | | 6 | 0 | 0 | 0 | 0 | 0 | 0 |
| Skid Steer Loaders | | 65 | 1 | 7 | 75 | 7 | 525 | 34125 |
| Surfacing Eq. | | 254 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sweepers/Scrubbers | | 64 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tractors | (single category) | 98 | 2 | 7 | 98 | 14 | 1372 | 134456 |
| Front End Loaders | (single category) | 98 | 1 | 7 | 33 | 7 | 231 | 22638 |
| Backhoes | (single category) | 98 | 1 | 4 | 63 | 4 | 252 | 24696 |
| Trenchers | | 81 | 3 | 4 | 86 | 12 | 1032 | 83592 |
| Welders | | 46 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gasoline Const Eq. | | 175 | 0 | 0 | 0 | 0 | 0 | 0 |

| | | |
|---|---|---|
| Const Period Diesel Hp-Hrs = | 4340597 | |
| Const Period Gasoline Hp-Hrs = | 0 | |
| Const Period Diesel Fuel Use = | 260436 | gals |
| Const Period Gasoline Fuel Use = | 0 | gals |

** diesel equipment unless otherwise specified.

Offroad equipment emissions factors derived SCAQMD Off Road database for 2020.
The SCAQMD EFs as presented incorporate the average equipment load factors.
Emissions factors for each category of equipment represent the composite factors for the stated equipment category as derived from the SCAQMD Offroad database for the construction start year.

**2020 Equipment Emissions Factors**

| Equip. Type | lbs/hr VOC (ROG) | lbs/hr CO | lbs/hr NOx | lbs/hr SOx | lbs/hr PM10 | lbs/hr CO2 | lbs/hr CH4 |
|---|---|---|---|---|---|---|---|
| Aerial Lifts | 0.0261 | 0.1696 | 0.1866 | 0.0004 | 0.0092 | 34.7217 | 0.0024 |
| Air Compressors | 0.0483 | 0.3077 | 0.3255 | 0.0007 | 0.0185 | 63.6073 | 0.0044 |
| Bore-Drill Rigs | 0.0480 | 0.5008 | 0.3439 | 0.0017 | 0.0062 | 164.8622 | 0.0043 |
| Cement Mixers | 0.0086 | 0.0415 | 0.0536 | 0.0001 | 0.0021 | 7.2481 | 0.0008 |
| Concrete/Industrial Saws | 0.0484 | 0.3783 | 0.3410 | 0.0007 | 0.0196 | 58.4636 | 0.0044 |
| Cranes | 0.0898 | 0.3917 | 0.6610 | 0.0014 | 0.0256 | 128.6305 | 0.0081 |
| Crawler Tractors/Dozers | 0.1049 | 0.5260 | 0.6772 | 0.0013 | 0.0378 | 114.0177 | 0.0095 |
| Crushing/Processing Eq. | 0.0934 | 0.6247 | 0.5983 | 0.0015 | 0.0310 | 132.3083 | 0.0084 |
| Dumpers/Tenders | 0.0092 | 0.0314 | 0.0582 | 0.0001 | 0.0022 | 7.6244 | 0.0008 |
| Excavators | 0.0733 | 0.5124 | 0.4042 | 0.0013 | 0.0184 | 119.5795 | 0.0066 |
| Forklifts | 0.0320 | 0.2160 | 0.1691 | 0.0006 | 0.0070 | 54.3958 | 0.0029 |
| Generator Sets | 0.0395 | 0.2732 | 0.3232 | 0.0007 | 0.0150 | 60.9927 | 0.0036 |
| Graders | 0.0919 | 0.5765 | 0.5823 | 0.0015 | 0.0280 | 132.7430 | 0.0083 |
| Off-Highway Tractors | 0.1470 | 0.6517 | 1.0657 | 0.0017 | 0.0497 | 151.4031 | 0.0133 |
| Off-Highway Trucks | 0.1443 | 0.5514 | 0.8306 | 0.0027 | 0.0280 | 260.0871 | 0.0130 |
| Other Diesel Construction Eq. | 0.0563 | 0.3508 | 0.3519 | 0.0013 | 0.0139 | 122.4967 | 0.0051 |
| Other General Industrial Eq. | 0.0983 | 0.4517 | 0.6661 | 0.0016 | 0.0262 | 152.2399 | 0.0089 |
| Other Material Handling Eq. | 0.0924 | 0.4429 | 0.6500 | 0.0015 | 0.0252 | 141.1941 | 0.0083 |
| Pavers | 0.0989 | 0.4920 | 0.5450 | 0.0009 | 0.0355 | 77.9332 | 0.0089 |
| Paving Eq. Other | 0.0757 | 0.4084 | 0.4807 | 0.0008 | 0.0315 | 68.9391 | 0.0068 |
| Plate Compactors | 0.0050 | 0.0263 | 0.0314 | 0.0001 | 0.0012 | 4.3138 | 0.0005 |
| Pressure Washers | 0.0085 | 0.0549 | 0.0650 | 0.0001 | 0.0030 | 9.4135 | 0.0008 |
| Pumps | 0.0376 | 0.2674 | 0.2854 | 0.0006 | 0.0147 | 49.6067 | 0.0034 |
| Roller Compactors | 0.0584 | 0.3837 | 0.3793 | 0.0008 | 0.0232 | 67.0402 | 0.0053 |
| Rough Terrain Forklifts | 0.0533 | 0.4464 | 0.3494 | 0.0008 | 0.0201 | 70.2808 | 0.0048 |
| Rubber Tired Dozers | 0.2118 | 0.8006 | 1.5773 | 0.0025 | 0.0630 | 239.0842 | 0.0191 |
| Rubber Tires Loaders | 0.0753 | 0.4406 | 0.4747 | 0.0012 | 0.0235 | 108.6109 | 0.0068 |
| Scrapers | 0.1914 | 0.7938 | 1.3434 | 0.0027 | 0.0541 | 262.4852 | 0.0173 |
| Signal Boards | 0.0129 | 0.0912 | 0.0912 | 0.0002 | 0.0042 | 16.6983 | 0.0012 |
| Skid Steer Loaders | 0.0222 | 0.2125 | 0.1614 | 0.0004 | 0.0050 | 30.2770 | 0.0020 |
| Surfacing Eq. | 0.0823 | 0.3953 | 0.6593 | 0.0017 | 0.0239 | 165.9635 | 0.0074 |
| Sweepers/Scrubbers | 0.0584 | 0.4916 | 0.3563 | 0.0009 | 0.0183 | 78.5433 | 0.0053 |
| Tractors | 0.0436 | 0.3616 | 0.2744 | 0.0008 | 0.0134 | 66.7988 | 0.0039 |
| Front End Loaders | 0.0436 | 0.3616 | 0.2744 | 0.0008 | 0.0134 | 66.7988 | 0.0039 |
| Backhoes | 0.0436 | 0.3616 | 0.2744 | 0.0008 | 0.0134 | 66.7988 | 0.0039 |
| Trenchers | 0.0933 | 0.4270 | 0.4575 | 0.0007 | 0.0336 | 58.7130 | 0.0084 |
| Welders | 0.0310 | 0.1816 | 0.1735 | 0.0003 | 0.0102 | 25.6027 | 0.0028 |
| Gasoline Const Eq. (assumed 175 hp category) | 0.0771 | 0.3855 | 1.08 | 0.00014 | 0.1542 | 14.1565 | 0.00037 |

(gasoline EFs: EPA OMS-AMD Report NR-009A, 2-13-98, and SCAQMD EMFAC 2007 CEQA Tables, 2016.)

Construction Period Emissions, lbs

| Equip. Type | VOC | CO | NOx | SOx | PM10 | CO2 | CH4 |
|---|---|---|---|---|---|---|---|
| Aerial Lifts | 6 | 39 | 43 | 0 | 2 | 7917 | 1 |
| Air Compressors | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bore-Drill Rigs | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cement Mixers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Concrete/Industrial Saws | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cranes | 7 | 30 | 50 | 0 | 2 | 9776 | 1 |
| Crawler Tractors/Dozers | 187 | 939 | 1209 | 2 | 67 | 203522 | 17 |
| Crushing/Processing Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dumpers/Tenders | 35 | 120 | 222 | 0 | 8 | 29140 | 3 |
| Excavators | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Forklifts | 123 | 829 | 649 | 2 | 27 | 208880 | 11 |
| Generator Sets | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Graders | 138 | 868 | 876 | 2 | 42 | 199778 | 12 |
| Off-Highway Tractors | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Off-Highway Trucks | 1067 | 4076 | 6140 | 20 | 207 | 1922564 | 96 |
| Other Diesel Construction Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other General Industrial Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Material Handling Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pavers | 4 | 22 | 24 | 0 | 2 | 3429 | 0 |
| Paving Eq. Other | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Plate Compactors | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pressure Washers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pumps | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Roller Compactors | 7 | 46 | 45 | 0 | 3 | 7978 | 1 |
| Rough Terrain Forklifts | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber Tired Dozers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber Tires Loaders | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Scrapers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Signal Boards | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Skid Steer Loaders | 12 | 112 | 85 | 0 | 3 | 15895 | 1 |
| Surfacing Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sweepers/Scrubbers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tractors | 60 | 496 | 376 | 1 | 18 | 91648 | 5 |
| Front End Loaders | 10 | 84 | 63 | 0 | 3 | 15431 | 1 |
| Backhoes | 11 | 91 | 69 | 0 | 3 | 16833 | 1 |
| Trenchers | 96 | 441 | 472 | 1 | 35 | 60592 | 9 |
| Welders | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gasoline Const Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| Totals | VOC | CO | NOx | SOx | PM10 | PM2.5 | CO2 | CH4 | N2O |
|---|---|---|---|---|---|---|---|---|---|
| lbs per const. period | 1763 | 8191 | 10325 | 30 | 422 | 418.60 | 2793382 | 159 | 48 |
| tons per const. period | 0.9 | 4.1 | 5.2 | 0.015 | 0.21 | 0.21 | 1396.69 | 0.08 | 0.02 |
| Average lbs/day = | 6.7 | 30.9 | 39.0 | 0.113 | 1.59 | 1.58 | 10541.07 | 0.60 | 0.18 |
| Normalized TPY = | *0.88* | *4.10* | *5.16* | *0.01* | *0.21* | *0.21* | *1396.69* | *0.08* | *0.02* |

| | |
|---|---|
| CO2e, tons/period | 1405.8 |
| CO2e, tons/yr: | 1405.8 |

CARB-CEIDARS, Updated Size Fractions for PM Profiles: PM2.5 = 0.991 of PM10 : Diesel Vehicle Exhaust

Other Assumptions and References:

1. Trench construction times per: Southern Regional Water Pipeline Alliance, 3/08.
   Optimum trench construction progress rate is 80m (260ft) per day.
   Non-optimum trench construction progress rate is 30m (100 ft) per day.
   An average progress of 180 ft/day is used where applicable.
2. Paving speeds can range from 3 to 15 m/min depending on asphalt delivery rates and required compaction thickness.
   A minium paving speed of 3 m/min (10 ft/min or 600 ft/hr) was used where applicable.
   The minimum speed is based upon a 3" compacted layer, 12 ft lane width, with an asphalt delivery rate of ~ 140 tons/hr.
   Ref: Asphalt Paving Speed, Pavement Worktip No. 31, AAPA, 11/2001.
3. Estimation of maximum daily emissions is extremely variable, and these values are not required by SJVAPCD.
4. Construction schedule note: applicant data indicates a construction work day period of 8 hours
   The equipment use rates provided by the applicant are consistent with an 8 hour workday.
5. GWP values: CH4=25, N2O=298, ref: 40 CFR 98 Subpart A, Table A-1.

**CONSTRUCTION PHASE - SGF 5**

| | | | | |
|---|---|---|---|---|
| **MRI Level 2 Analysis (Refs 1, 3-7)** | | Acres | 1726 | |
| Acres Subject to Construction Disturbance Activites: | | | 172.6 | |
| Max Acres Subject to Construction Disturbance Activites on any day of this phase: | | | 12.9 | note (10) |
| Emissions Factor for PM10 Uncontrolled, tons/acre/month: | | | 0.12 | |
| PM2.5 fraction of PM10 (per CARB CEIDARS Profiles): | | | 0.21 | |
| **Activity Levels:** | Hrs/Day: | | 8 | |
| | Days/Wk: | | 5 | |
| | Days/Month: Applicant Data | | 22 | |
| | Phase Const Period, Months: | | 10 | 0.83 years |
| | Phase Const Period, Days: | | 265 | |

**Wet Season Adjustment:** (Per AP-42, Section 13.2.2, Figure 13.2.2-1, 12/03 or CalEEMod, Appendix D, Table 1.1.)

| | |
|---|---|
| Mean # days/year with rain >= 0.01 inch: | 40 |
| Mean # months/yr with rain >= 0.01 inch: | 1.33 |
| Adjusted Const Period, Months: | 8.89 |
| Adjusted Const Period, Days: | 232 |

**Controls for Fugitive Dust:** Proposed watering cycle: 3 times per day

3 watering cycles/8 hour construction shift yields a 68% reduction, use 68% for non-desert sites. (11)(12)
Speed control of onsite const traffic to <15 mph yields a 40-70% reduction (use 50% control as conservative for site). (11)(12)

| | | |
|---|---|---|
| Calculated % control based on mitigations proposed: | 84 | % control |
| Conservative control % used for emissions estimates: | 84 | % control |
| | 0.16 | release fraction |

| **Emissions: Controlled** | PM10 | PM2.5 |
|---|---|---|
| tons/month | 0.249 | 0.052 |
| tons/period | 2.209 | 0.464 |
| Max lbs/day | 22.595 | 4.745 |

**Soil Handling Emissions (Cut and Fill): (2)**

| | | | | | |
|---|---|---|---|---|---|
| Total cu.yds of soil handled: | 0 | Mean annual wind speed, mph: (8) | | | 8.03 |
| Total tons of soil handled: | 0.0 | Avg. Soil moisture, %: (9) | | | 5 |
| Total days soil handled: | 232 | Avg. Soil density, tons/cu.yd: | | | 1.3 |
| Tons soil/day: | 0 | k factor for PM10: | | | 0.35 |
| Control Eff, watering, % | 80 | Number of Drops per ton: | | | 4 |
| Release Fraction: | 0.2 | Calc 1 | wind | | 1.851 |
| | | Calc 2 | moisture | | 3.607 |
| | | Calc 3 | int | | 0.513 |
| | | Calc 4 | PM10 | lb/ton | 0.0006 |
| | | PM2.5 fraction of PM10: | | | 0.210 |

| Emissions: | PM10 | PM2.5 |
|---|---|---|
| tons/period | 0.000 | 0.000 |
| tons/month | 0.000 | 0.000 |
| max lbs/day | 0.000 | 0.000 |

| **Emissions Totals:** | **PM10** | **PM2.5** |
|---|---|---|
| **tons/period** | **2.209** | **0.464** |

**Methodology References:**

(1) MRI Report, South Coast AQMD Project No. 95040, March 1996, Level 2 Analysis Procedure.
MRI Report uncontrolled factor of 0.11 tons/acre/month is based on 168 hours per month of const activity.
For an activity rate of ~180 hrs/month, the adjusted EF would be 0.12 tons/acre/month (uncontrolled).
(2) Soil Handling (Cut and Fill), EPA, AP-42, Section 13.2.4., 11/06.
(3) URBEMIS, Version 9.2.4, User's Manual Appendix A, page A-6.
(4) CARB Area Source Methodology, Section 7.7, 9/02.
(5) WRAP Fugitive Dust Handbook, 9/06.
(6) USEPA, AP-42, Section 13.2.3, 2/10.
(7) Estimating PM Emissions from Construction Operations, USEPA, MRI, 9/99.
(8) Wind speed data for Lemoore met station. Annual avg wind speed = 8.03 mph, % calms = 3.44%.
(9) Soil Moisture; 5% assumed avg value
(10) adjusted applicant value based on 7.5% of total acreage disturbed on any given day
(11) SCAQMD CEQA Handbook 1993.
(12) SCAQMD, Sample Construction Scenarios for Projects Less than Five Acres, Fugitive Dust Mitigations, February 2005.

**OFFSITE PAVED ROAD FUGITIVE DUST EMISSIONS**
(associated with delivery truck and worker vehicle traffic on I-5 and plant access road)

| | | | |
|---|---|---|---|
| Average mileage for construction related vehicles: | | NA | miles, roundtrip distance*** |
| Avg weight of vehicular equipment on road: | | 4.1 | tons (range 2 - 42 tons) |
| Road surface silt loading factor: | | 0.015 | g/m2 (range 0.03 - 400 g/m2) |
| | | | Limited Access Freeway >10,000 ADT **(I-5)** |
| Particle size multiplier factors: | PM10 | 0.0022 | lb/VMT |
| | PM2.5 | 0.00054 | lb/VMT |
| C factors (brake and tire wear): | PM10 | 0.00047 | lb/VMT |
| | PM2.5 | 0.00036 | lb/VMT |
| Avg vehicle speed on road: | | 65 | mph |
| Avg. Number of vehicles per day: | | 195 | |
| | | | calculated per Applicant da |
| Avg. Number of work days per month: | | 22 | **VMT/period:** **9724890** |
| | Total vehicles per month: | 4290 | |
| Number of work months: | | 42.67 | adjusted for precip events |
| | Total vehicles per const period: | 183054.3 | |

| | PM10 | |
|---|---|---|
| Calc 1 | 0.022 | |
| Calc 2 | 4.217 | |
| Calc 3 | 0.0007 | lb/VMT |

| **Emissions** | **PM10** | **PM2.5** |
|---|---|---|
| **lbs/period** | **6545.80** | **1106.24** |
| **tons/period** | **3.273** | **0.553** |

EPA, AP-42, Section 13.2.1, March 2006, updated 9/2008.
PM2.5 fraction of PM10 per CARB CEIDARs is 0.169
*** Note: avg roundtrip distance traveled by delivery or worker vehicles on freeways (I-5) and other State Routes in the project area.
Vehicles per day: worker + deliveries+staff support vehciles (averages)

**ONSITE UNPAVED ROAD FUGITIVE DUST**

| | | | | |
|---|---|---|---|---|
| Length of Unpaved Roads on Construction site: | | 0.1 | miles* | |
| Avg weight of construction vehicular equipment on road: | | 4.1 | tons (range 2 - 42 tons) | |
| Road surface silt content: | | 8.5 | % (range 1.8 - 35%) | |
| Road surface material moisture content: | | 5 | % (range 0.03 - 13%) | |
| | | k | a | b |
| Particle size multiplier factors: | PM10 | 1.5 | 0.9 | 0.45 |
| | PM2.5 | 0.15 | 0.9 | 0.45 |
| C factors (brake and tire wear): | PM10 | 0.00047 | lb/VMT | |
| | PM2.5 | 0.00036 | lb/VMT | |
| Avg construction vehicle speed on road: | | 5 | mph (range 5-55 mph) | |
| Avg number of construction vehicles per day: | | 74 | ** | |
| Number of construction work days per month: | | 22 | | |
| Total vehicles per month: | | 1628 | | |
| Number of construction work months: | | 14.22 | adjusted for precipitation events | |
| Total vehicles per const period: | | 96542.4 | | |
| Control reduction due to watering, speed control, etc. = | | 80 | | |
| | | 0.8 | | |
| Release Fraction = | | 0.2 | | |

**calculated per Applicant dat**
**VMT/period: 9654.24**

| | PM10 | PM2.5 |
|---|---|---|
| Calc 1 | 0.733 | 0.733 |
| Calc 2 | 1.151 | 1.151 |
| Calc 3 | 1.266 | 0.127 |
| Calc 4 | 1.266 | 0.127 |
| Controlled lb/VMT | 0.253 | 0.025 |

| **Emissions** | **PM10** | **PM2.5** |
|---|---|---|
| **lbs/period** | **2444.91** | **245.10** |
| **tons/period** | **1.222** | **0.123** |

EPA, AP-42, Section 13.2.2, March 2006
Soil Moisture; 5% avg
Soil silt content: 8.5% per AP-42 for construction site scraper routes
** const equipment plus site support pickups plus

**CONSTRUCTION PHASE - Truck Hauling/Delivery and Site Support Vehicle Emissions**

**All Phases**

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Delivery/Hauling Vehicle Use Rates** | | | | | Emissions Factors (lbs/vmt) | | | | | | |
| Delivery Roundtrip Distance: | 0 | miles | NOx | CO | VOC | SOx | PM10 | CO2 | | | |
| Const Days per Period: | 0 | | 0.00625339 | 0.00051535 | 0.00011377 | 0.000026 | 3.9844E-05 | 3.10646173 | HDDT | | |
| Avg Deliveries per Day: | 0 | | 0.00046982 | 0.00340025 | 7.8173E-05 | 0.000013 | 2.9202E-06 | 1.02361637 | MDGT | | |
| Fraction of Deliveries-Diesel: | 0.95 | HDDT | | | **Daily Emissions (lbs)** | | | | | | |
| Fraction of Deliveries-Gas: | 0.05 | MDGT | **NOx** | **CO** | **VOC** | **SOx** | **PM10** | **CO2** | **PM2.5** | | |
| Total Delivery VMT: | **1786890** | **per Applicant** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | HDDT | |
| Total Daily VMT-Diesel | 0 | | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | MDGT | |
| Total Daily VMT-Gasoline | 0 | | | | **Tons per Const Period** | | | | | | |
| Total Period VMT-Diesel | 1697545.5 | | 5.308 | 0.437 | 0.097 | 0.022 | 0.034 | 2636.7 | 0.028 | HDDT | |
| Total Period VMT-Gasoline | 89344.5 | | 0.021 | 0.152 | 0.003 | 0.001 | 0.000 | 45.7 | 0.000 | MDGT | |
| | | | | | | | | | | | |
| **Construction Site Support Vehicle Use Rates (LDTs)** | | | | | **Daily Emissions, lbs** | | | | | | |
| Gasoline Vehicle VMT Period: | 75900 | | **NOx** | **CO** | **VOC** | **SOx** | **PM10** | **CO2** | | | **PM2.5** |
| Avg Daily Gasoline VMT: | 300 | | 0.00040762 | 0.00359256 | 6.9991E-05 | 0.000008 | 5.0718E-06 | 0.6541839 | lbs/vmt* | LDT gasoline | |
| Avg Daily Diesel VMT: | 0 | | 0.1223 | 1.0778 | 0.0210 | 0.0024 | 0.0015 | 196.2552 | lbs/day | gasoline | 0.0010 |
| Total Phase Const Days: | 240 | | | | | | | | | | |
| | | | | | **Tons per Const Period** | | | | | | |
| Ref: EMFAC 2014, SJVAPCD Year 2016 | | | 0.0155 | 0.1363 | 0.0027 | 0.0003 | 0.0002 | 24.8 | **tons/period** | **gasoline** | 0.0001 |

LDT1-gas, MDV-gas, HDDT-dsl

See EF data in WSP Support Appendix

**Notes *****

VMT for delivery/hauling for all vehicles includes: (1) materials deliveries to site, (2) materials removal from site, other VMT as specified below.

Support Vehicle VMT: best estimate at time of filing, 10 LDT (gasoline) at 30 VMT/day

CARB-CEIDARS, Updated Fractions for PM Profiles: PM2.5 = 0.991 of PM10 for Diesel Exhaust, and 0.998 for Gasoline Vehicles.

**CONSTRUCTION PHASE - Worker Travel - Emissions**

Ref: SJVAPCD EMFAC 2014, Year 2020
LDA-gas
See EF data in WSP Support Appendix

**Worker Travel to Site**

| | |
|---|---|
| Avg Occupancy/Vehicle: | 0 |
| Avg Roundtrip Distance, miles: | 0.0 |
| Avg # of Worker Vehicles, per day: | 0 |
| Avg Daily Worker VMT: | 0 |
| Max # of Worker Vehicles, per day: | 0 |
| Max Daily Worker VMT: | 0 |
| Total Const Days: | 240 |
| **Total Const Period Worker VMT:** | **7938000** |

**VMT data supplied by Applicant.**

Emissions Factors (lbs/VMT)

| NOx | CO | VOC | SOx | PM10 | CO2 |
|---|---|---|---|---|---|
| 0.00013058 | 0.001103197 | 2.504E-05 | 0.000007 | 0.000004 | 0.65463696 |

**Daily Emissions (lbs)**

| | NOx | CO | VOC | SOx | PM10 | CO2 | PM2.5 |
|---|---|---|---|---|---|---|---|
| Avg | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**Tons per Const Period**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Avg | 0.518 | 4.379 | 0.099 | 0.028 | 0.016 | 2598.3 | 0.000 |

**Worker Travel by Busing from Staging Area**

| | |
|---|---|
| Total Bus VMT/Const Period: | 0 |
| Avg Bus VMT/Const Day: | 0 |
| Max Bus VMT/Const Day: | 0 |

| | | |
|---|---|---|
| Bus Round Trips/Day: | 0 | max |
| Bus Occupancy/Trip: | 0 | |

Ref: SJVAPCD EMFAC 2014, Year 2016
All other buses-DSL
See EF data in WSP Support Appendix

# buses supplied by Applicant.

Emissions Factors (lbs/VMT)

| NOx | CO | VOC | SOx | PM10 | CO2 |
|---|---|---|---|---|---|
| 0.012001 | 0.001203 | 0.000458 | 0.000026 | 0.00015 | 2.734838 |

**Daily Emissions (lbs)**

| | **NOx** | **CO** | **VOC** | **SOx** | **PM10** | **CO2** | **PM2.5** |
|---|---|---|---|---|---|---|---|
| Avg | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Max | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**Tons per Const Period**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Avg | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

**CONSTRUCTION PHASE - Trackout Emissions**

| | | | | | | |
|---|---|---|---|---|---|---|
| Paved Road Length (miles): | 0.1 | estimated roundtrip trackout distance | | | | |
| Daily # of Vehicles: | 74 | | | | | |
| Avg Vehicle Weight (tons): | 6.8 | | | **PM10** | **PM2.5*** | |
| Total Unadjusted VMT/day | 7.4 | | | 0.361 | | |
| Particle Size Multipliers | PM10 | | | 1.924 | | |
| lb/VMT | 0.023 | | | 0.002 | 0.0004 | lb/VMT |
| C factor, lb/VMT | 0.00047 | | | **0.129** | **0.0217** | **lbs/day** |
| Road Sfc Silt Loading (g/m^2): | 0.56 | local X 2 | | **0.001** | **0.0002** | **tons/month** |
| # of Active Trackout Points: | 1 | ** | | **0.01** | **0.0021** | **tons/period** |
| Added Trackout Miles: | PM10 | | | | | |
| Trackout VMT/day: | 44 | | *Default Silt Load Values for Paved Road Types* | | | |
| Final Adjusted VMT/day | 52 | | | Freeway | 0.02 g/m2 | |
| Final Adjusted VMT/month | 1140 | | | Arterial | 0.036 g/m2 | |
| Final Adjusted VMT/period | 10131 | | | Collector | 0.036 g/m2 | |
| Construction days/month: | 22 | | | Local | 0.28 g/m2 | |
| Adj. Construction months/period: | 8.89 | | | Rural | 1.6 g/m2 | |
| Control Applied to Trackout: | Gravel entrance, metal cleaning grates, water washing, sweeping | | | | | |
| Control Efficiency, % | 84 | 0.84 | Release Factor = | | 0.16 | |

* PM2.5 fraction of PM10 assumed to be 0.169 (CARB CEIDARS updated fraction values) for paved roads.
** 1 controlled ingress/egress point is planned for site construction
EPA, AP-42, Section 13.2.1, Proposed revisions dated 9/2008.
Use silt loading factor from default values for road type if no site specific data is available.
Trackout effects approximately 0.05 mi. of roadway arriving and departing from the site access point.
Plant access road is already paved. Entrance will be gravelled with metal grates for take out control.
Vehicle count = delivery trucks plus site support trucks (see Unpaved Onsite tab)
Worker vehicles not counted for trackout, they will park on the site perimeter.

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## Tons/Period

| | NOx | CO | VOC | SOx | PM10 | CO2 | Fug PM10 | Fug PM2.5 |
|---|---|---|---|---|---|---|---|---|
| on-off site travel | 5.54 | 4.83 | 0.19 | 0.05 | 0.05 | 4547 | 7.57 | 1.34 |
| on-site equipment | 8.66 | 7.01 | 1.51 | 0.02 | 0.38 | 2228 | | |
| Total | 14.20 | 11.83 | 1.70 | 0.07 | 0.43 | 6774 | 7.57 | 1.34 |
| Months: | 16 | | | | | | | |
| Max Year Months: | 12 | | | | | | | |
| Total per Year: | 10.65 | 8.88 | 1.28 | 0.05 | 0.32 | 5080.87 | 5.68 | 1.00 |

CONSTRUCTION EQUIPMENT EXHAUST EMISSIONS

Project: WSP **Main Site Construction-SGF 6**

**Assumptions:**

1. The average engines employed in construction equipment use consumes fuel at a rate of: diesel 0.06 gal/hp-hr; gasoline 0.11 gal/hp-hr

Ref: EPA, NR-009b Publication, November 2002.
Ref: Sacramento County APCD Const. Program Data, V. 6.0.3, 3/2007.
Ref: EPA, NR-009c Publication, EPA 420-P-04-009, April 2004.
Ref: Niland Energy Project, IID, AFC Vol 2, App A.
Ref: South Coast AQMD PR XXI, Draft Staff Report, 3-15-95, and SCAQMD CEQA Manual, 11/03.
The above noted references present fuel consumption values which range from 0.050 to 0.064 gal/hp-hr for diesel engines used in construction related equipment. The value of 0.060 gal/hp-hr was chosen as a reasonable upper mid-range value for construction diesel emissions calculations.
For gasoline the mid-range value from SCAQMD of 0.11 gal/hp-hr was used.

2. Construction equipment exhaust emissions will be calculated on an annual basis using the site specific equipment list, HP ratings, hours of use, days of use, etc. Annual emissions will be apportioned to daily values based on the estimated construction period time on site.

3. The equipment list derived from the South Coast AQMD Offroad database (2016) will be used to establish the various equipment categories. Avg HP values were derived from SCAQMD and SacMetro AQMD construction resources.

| | | | | | |
|---|---|---|---|---|---|
| 4. Construction Schedule: | 20.5 | months | Construction Totals: | 164 | hrs/month |
| | 8 | hrs/day | | 3360 | hrs/const period |
| | 1.71 | years | | 420 | days/const period |

5. Anticipated Construction Start Year: 2022

6. Maximum anticipated equipment use month is: n/a

7. N2O EF diesel, lb/gal: 0.000183
N2O EF gasoline, lb/gal: 0.000164
CARB, Mandatory GHG Reporting Regulation
Table 4, Appendix A, 2007.

Equipment types and use rates supplied by the Applicant.

| Equipment Category** | Weighted Average HP | # of Units Used for Project | Avg Use Rate Hrs/day | # of Days On Site (each) | Total Hrs/Day | Total Hrs per Const Period | Total HP-Hrs Period |
|---|---|---|---|---|---|---|---|
| Aerial Lifts | 63 | 1 | 6 | 56 | 6 | 336 | 21168 |
| Air Compressors | 78 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bore-Drill Rigs | 206 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cement Mixers | 9 | 0 | 0 | 0 | 0 | 0 | 0 |
| Concrete/Industrial Saws | 81 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cranes | 226 | 1 | 2 | 56 | 2 | 112 | 25312 |
| Crawler Tractors/Dozers | 208 | 3 | 7 | 125 | 21 | 2625 | 546000 |
| Crushing/Processing Eq. | 85 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dumpers/Tenders/Water Trucks | 16 | 7 | 7 | 115 | 49 | 5635 | 90160 |
| Excavators | 163 | 0 | 0 | 0 | 0 | 0 | 0 |
| Forklifts | 89 | 8 | 6 | 120 | 48 | 5760 | 512640 |
| Generator Sets | 84 | 0 | 0 | 0 | 0 | 0 | 0 |
| Graders | 175 | 5 | 7 | 65 | 35 | 2275 | 398125 |
| Off-Highway Tractors | 123 | 0 | 0 | 0 | 0 | 0 | 0 |
| Off-Highway Trucks | 400 | 12 | 7 | 132 | 84 | 11088 | 4435200 |
| Other Diesel Construction Eq. | 172 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other General Industrial Eq. | 88 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Material Handling Eq. | 167 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pavers | 126 | 1 | 4 | 17 | 4 | 68 | 8568 |
| Paving Eq. Other | 131 | 0 | 0 | 0 | 0 | 0 | 0 |
| Plate Compactors | 8 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pressure Washers | 13 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pumps | 84 | 0 | 0 | 0 | 0 | 0 | 0 |
| Roller Compactors | 81 | 1 | 7 | 25 | 7 | 175 | 14175 |
| Rough Terrain Forklifts | 100 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber Tired Dozers | 255 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber Tires Loaders | 200 | 0 | 0 | 0 | 0 | 0 | 0 |
| Scrapers | 362 | 0 | 0 | 0 | 0 | 0 | 0 |
| Signal Boards | 6 | 0 | 0 | 0 | 0 | 0 | 0 |
| Skid Steer Loaders | 65 | 1 | 7 | 113 | 7 | 791 | 51415 |
| Surfacing Eq. | 254 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sweepers/Scrubbers | 64 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tractors (single category) | 98 | 2 | 7 | 147 | 14 | 2058 | 201684 |
| Front End Loaders (single category) | 98 | 1 | 7 | 50 | 7 | 350 | 34300 |
| Backhoes (single category) | 98 | 1 | 4 | 95 | 4 | 380 | 37240 |
| Trenchers | 81 | 10 | 4 | 141 | 40 | 5640 | 456840 |
| Welders | 46 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gasoline Const Eq. | 175 | 0 | 0 | 0 | 0 | 0 | 0 |

| | | |
|---|---|---|
| Const Period Diesel Hp-Hrs = | 6832827 | |
| Const Period Gasoline Hp-Hrs = | 0 | |
| Const Period Diesel Fuel Use = | 409970 | gals |
| Const Period Gasoline Fuel Use = | 0 | gals |

** diesel equipment unless otherwise specified.

Offroad equipment emissions factors derived SCAQMD Off Road database for 2020.
The SCAQMD EFs as presented incorporate the average equipment load factors.
Emissions factors for each category of equipment represent the composite factors for the stated equipment category as derived from the SCAQMD Offroad database for the construction start year.

**2020 Equipment Emissions Factors**

| Equip. Type | lbs/hr VOC (ROG) | lbs/hr CO | lbs/hr NOx | lbs/hr SOx | lbs/hr PM10 | lbs/hr CO2 | lbs/hr CH4 |
|---|---|---|---|---|---|---|---|
| Aerial Lifts | 0.0261 | 0.1696 | 0.1866 | 0.0004 | 0.0092 | 34.7217 | 0.0024 |
| Air Compressors | 0.0483 | 0.3077 | 0.3255 | 0.0007 | 0.0185 | 63.6073 | 0.0044 |
| Bore-Drill Rigs | 0.0480 | 0.5008 | 0.3439 | 0.0017 | 0.0062 | 164.8622 | 0.0043 |
| Cement Mixers | 0.0086 | 0.0415 | 0.0536 | 0.0001 | 0.0021 | 7.2481 | 0.0008 |
| Concrete/Industrial Saws | 0.0484 | 0.3783 | 0.3410 | 0.0007 | 0.0196 | 58.4636 | 0.0044 |
| Cranes | 0.0898 | 0.3917 | 0.6610 | 0.0014 | 0.0256 | 128.6305 | 0.0081 |
| Crawler Tractors/Dozers | 0.1049 | 0.5260 | 0.6772 | 0.0013 | 0.0378 | 114.0177 | 0.0095 |
| Crushing/Processing Eq. | 0.0934 | 0.6247 | 0.5983 | 0.0015 | 0.0310 | 132.3083 | 0.0084 |
| Dumpers/Tenders | 0.0092 | 0.0314 | 0.0582 | 0.0001 | 0.0022 | 7.6244 | 0.0008 |
| Excavators | 0.0733 | 0.5124 | 0.4042 | 0.0013 | 0.0184 | 119.5795 | 0.0066 |
| Forklifts | 0.0320 | 0.2160 | 0.1691 | 0.0006 | 0.0070 | 54.3958 | 0.0029 |
| Generator Sets | 0.0395 | 0.2732 | 0.3232 | 0.0007 | 0.0150 | 60.9927 | 0.0036 |
| Graders | 0.0919 | 0.5765 | 0.5823 | 0.0015 | 0.0280 | 132.7430 | 0.0083 |
| Off-Highway Tractors | 0.1470 | 0.6517 | 1.0657 | 0.0017 | 0.0497 | 151.4031 | 0.0133 |
| Off-Highway Trucks | 0.1443 | 0.5514 | 0.8306 | 0.0027 | 0.0280 | 260.0871 | 0.0130 |
| Other Diesel Construction Eq. | 0.0563 | 0.3508 | 0.3519 | 0.0013 | 0.0139 | 122.4967 | 0.0051 |
| Other General Industrial Eq. | 0.0983 | 0.4517 | 0.6661 | 0.0016 | 0.0262 | 152.2399 | 0.0089 |
| Other Material Handling Eq. | 0.0924 | 0.4429 | 0.6500 | 0.0015 | 0.0252 | 141.1941 | 0.0083 |
| Pavers | 0.0989 | 0.4920 | 0.5450 | 0.0009 | 0.0355 | 77.9332 | 0.0089 |
| Paving Eq. Other | 0.0757 | 0.4084 | 0.4807 | 0.0008 | 0.0315 | 68.9391 | 0.0068 |
| Plate Compactors | 0.0050 | 0.0263 | 0.0314 | 0.0001 | 0.0012 | 4.3138 | 0.0005 |
| Pressure Washers | 0.0085 | 0.0549 | 0.0650 | 0.0001 | 0.0030 | 9.4135 | 0.0008 |
| Pumps | 0.0376 | 0.2674 | 0.2854 | 0.0006 | 0.0147 | 49.6067 | 0.0034 |
| Roller Compactors | 0.0584 | 0.3837 | 0.3793 | 0.0008 | 0.0232 | 67.0402 | 0.0053 |
| Rough Terrain Forklifts | 0.0533 | 0.4464 | 0.3494 | 0.0008 | 0.0201 | 70.2808 | 0.0048 |
| Rubber Tired Dozers | 0.2118 | 0.8006 | 1.5773 | 0.0025 | 0.0630 | 239.0842 | 0.0191 |
| Rubber Tires Loaders | 0.0753 | 0.4406 | 0.4747 | 0.0012 | 0.0235 | 108.6109 | 0.0068 |
| Scrapers | 0.1914 | 0.7938 | 1.3434 | 0.0027 | 0.0541 | 262.4852 | 0.0173 |
| Signal Boards | 0.0129 | 0.0912 | 0.0912 | 0.0002 | 0.0042 | 16.6983 | 0.0012 |
| Skid Steer Loaders | 0.0222 | 0.2125 | 0.1614 | 0.0004 | 0.0050 | 30.2770 | 0.0020 |
| Surfacing Eq. | 0.0823 | 0.3953 | 0.6593 | 0.0017 | 0.0239 | 165.9635 | 0.0074 |
| Sweepers/Scrubbers | 0.0584 | 0.4916 | 0.3563 | 0.0009 | 0.0183 | 78.5433 | 0.0053 |
| Tractors | 0.0436 | 0.3616 | 0.2744 | 0.0008 | 0.0134 | 66.7988 | 0.0039 |
| Front End Loaders | 0.0436 | 0.3616 | 0.2744 | 0.0008 | 0.0134 | 66.7988 | 0.0039 |
| Backhoes | 0.0436 | 0.3616 | 0.2744 | 0.0008 | 0.0134 | 66.7988 | 0.0039 |
| Trenchers | 0.0933 | 0.4270 | 0.4575 | 0.0007 | 0.0336 | 58.7130 | 0.0084 |
| Welders | 0.0310 | 0.1816 | 0.1735 | 0.0003 | 0.0102 | 25.6027 | 0.0028 |
| Gasoline Const Eq. (assumed 175 hp category) | 0.0771 | 0.3855 | 1.08 | 0.00014 | 0.1542 | 14.1565 | 0.00037 |

(gasoline EFs: EPA OMS-AMD Report NR-009A, 2-13-98, and SCAQMD EMFAC 2007 CEQA Tables, 2016.)

Construction Period Emissions, lbs

| **Equip. Type** | **VOC** | **CO** | **NOx** | **SOx** | **PM10** | **CO2** | **CH4** |
|---|---|---|---|---|---|---|---|
| Aerial Lifts | 9 | 57 | 63 | 0 | 3 | 11666 | 1 |
| Air Compressors | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bore-Drill Rigs | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cement Mixers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Concrete/Industrial Saws | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cranes | 10 | 44 | 74 | 0 | 3 | 14407 | 1 |
| Crawler Tractors/Dozers | 275 | 1381 | 1778 | 3 | 99 | 299296 | 25 |
| Crushing/Processing Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dumpers/Tenders | 52 | 177 | 328 | 1 | 12 | 42963 | 5 |
| Excavators | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Forklifts | 184 | 1244 | 974 | 3 | 40 | 313320 | 17 |
| Generator Sets | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Graders | 209 | 1312 | 1325 | 3 | 64 | 301990 | 19 |
| Off-Highway Tractors | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Off-Highway Trucks | 1600 | 6114 | 9210 | 30 | 310 | 2883846 | 144 |
| Other Diesel Construction Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other General Industrial Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Material Handling Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pavers | 7 | 33 | 37 | 0 | 2 | 5299 | 1 |
| Paving Eq. Other | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Plate Compactors | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pressure Washers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pumps | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Roller Compactors | 10 | 67 | 66 | 0 | 4 | 11732 | 1 |
| Rough Terrain Forklifts | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber Tired Dozers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber Tires Loaders | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Scrapers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Signal Boards | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Skid Steer Loaders | 18 | 168 | 128 | 0 | 4 | 23949 | 2 |
| Surfacing Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sweepers/Scrubbers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tractors | 90 | 744 | 565 | 2 | 28 | 137472 | 8 |
| Front End Loaders | 15 | 127 | 96 | 0 | 5 | 23380 | 1 |
| Backhoes | 17 | 137 | 104 | 0 | 5 | 25384 | 1 |
| Trenchers | 526 | 2408 | 2580 | 4 | 190 | 331141 | 47 |
| Welders | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gasoline Const Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| **Totals** | **VOC** | **CO** | **NOx** | **SOx** | **PM10** | **PM2.5** | **CO2** | **CH4** | **N2O** |
|---|---|---|---|---|---|---|---|---|---|
| lbs per const. period | 3022 | 14013 | 17327 | 48 | 769 | 762.43 | 4425846 | 272 | 75 |
| tons per const. period | 1.5 | 7.0 | 8.7 | 0.024 | 0.38 | 0.38 | 2212.92 | 0.14 | 0.04 |
| Average lbs/day = | 7.2 | 33.4 | 41.3 | 0.114 | 1.83 | 1.82 | 10537.73 | 0.65 | 0.18 |
| Normalized TPY = | *0.9* | *4.1* | *5.1* | *0.0* | *0.2* | *0.2* | *1295.4* | *0.1* | *0.022* |

| | |
|---|---|
| CO2e, tons/period | 2227.5 |
| CO2e, tons/yr: | 1303.9 |

CARB-CEIDARS, Updated Size Fractions for PM Profiles: PM2.5 = 0.991 of PM10 : Diesel Vehicle Exhaust

Other Assumptions and References:

1. Trench construction times per: Southern Regional Water Pipeline Alliance, 3/08.
   Optimum trench construction progress rate is 80m (260ft) per day.
   Non-optimum trench construction progress rate is 30m (100 ft) per day.
   An average progress of 180 ft/day is used where applicable.
2. Paving speeds can range from 3 to 15 m/min depending on asphalt delivery rates and required compaction thickness.
   A minium paving speed of 3 m/min (10 ft/min or 600 ft/hr) was used where applicable.
   The minimum speed is based upon a 3" compacted layer, 12 ft lane width, with an asphalt delivery rate of ~ 140 tons/hr.
   Ref: Asphalt Paving Speed, Pavement Worktip No. 31, AAPA, 11/2001.
3. Estimation of maximum daily emissions is extremely variable, and these values are not required by SJVAPCD.
4. Construction schedule note: applicant data indicates a construction work day period of 8 hours
   The equipment use rates provided by the applicant are consistent with an 8 hour workday.
5. GWP values: CH4=25, N2O=298, ref: 40 CFR 98 Subpart A, Table A-1.

**CONSTRUCTION PHASE - SGF 6**

**MRI Level 2 Analysis (Refs 1, 3-7)**

| | | | | |
|---|---|---|---|---|
| **MRI Level 2 Analysis (Refs 1, 3-7)** | | Acres | 1612 | |
| Acres Subject to Construction Disturbance Activites: | | | 161.2 | |
| Max Acres Subject to Construction Disturbance Activites on any day of this phase: | | | 12.1 | note (10) |
| Emissions Factor for PM10 Uncontrolled, tons/acre/month: | | | 0.12 | |
| PM2.5 fraction of PM10 (per CARB CEIDARS Profiles): | | | 0.21 | |
| **Activity Levels:** | Hrs/Day: | | 8 | |
| | Days/Wk: | | 5 | |
| | Days/Month: | Applicant Data | 22 | |
| | Phase Const Period, Months: | | 16 | 1.33 years |
| | Phase Const Period, Days: | | 352 | |

**Wet Season Adjustment:** (Per AP-42, Section 13.2.2, Figure 13.2.2-1, 12/03 or CalEEMod, Appendix D, Table 1.1.)

| | |
|---|---|
| Mean # days/year with rain >= 0.01 inch: | 40 |
| Mean # months/yr with rain >= 0.01 inch: | 1.33 |
| Adjusted Const Period, Months: | 14.22 |
| Adjusted Const Period, Days: | 299 |

**Controls for Fugitive Dust:** Proposed watering cycle: 3 times per day

3 watering cycles/8 hour construction shift yields a 68% reduction, use 68% for non-desert sites. (11)(12)

Speed control of onsite const traffic to <15 mph yields a 40-70% reduction (use 50% control as conservative for site). (11)(12)

| | | |
|---|---|---|
| Calculated % control based on mitigations proposed: | 84 | % control |
| Conservative control % used for emissions estimates: | 84 | % control |
| | 0.16 | release fraction |

| **Emissions: Controlled** | PM10 | PM2.5 |
|---|---|---|
| tons/month | 0.232 | 0.049 |
| tons/period | 3.301 | 0.693 |
| Max lbs/day | 21.103 | 4.432 |

**Soil Handling Emissions (Cut and Fill): (2)**

| | | | | | |
|---|---|---|---|---|---|
| Total cu.yds of soil handled: | 0 | Mean annual wind speed, mph: (8) | | | 8.03 |
| Total tons of soil handled: | 0.0 | Avg. Soil moisture, %: (9) | | | 5 |
| Total days soil handled: | 299 | Avg. Soil density, tons/cu.yd: | | | 1.3 |
| Tons soil/day: | 0 | k factor for PM10: | | | 0.35 |
| Control Eff, watering, % | 80 | Number of Drops per ton: | | | 4 |
| Release Fraction: | 0.2 | Calc 1 | wind | | 1.851 |
| | | Calc 2 | moisture | | 3.607 |
| | | Calc 3 | int | | 0.513 |
| | | Calc 4 | PM10 | lb/ton | 0.0006 |
| | | PM2.5 fraction of PM10: | | | 0.210 |

| Emissions: | PM10 | PM2.5 |
|---|---|---|
| tons/period | 0.000 | 0.000 |
| tons/month | 0.000 | 0.000 |
| max lbs/day | 0.000 | 0.000 |

| **Emissions Totals:** | **PM10** | **PM2.5** |
|---|---|---|
| **tons/period** | **3.301** | **0.693** |

**Methodology References:**

(1) MRI Report, South Coast AQMD Project No. 95040, March 1996, Level 2 Analysis Procedure.
MRI Report uncontrolled factor of 0.11 tons/acre/month is based on 168 hours per month of const activity.
For an activity rate of ~180 hrs/month, the adjusted EF would be 0.12 tons/acre/month (uncontrolled).
(2) Soil Handling (Cut and Fill), EPA, AP-42, Section 13.2.4., 11/06.
(3) URBEMIS, Version 9.2.4, User's Manual Appendix A, page A-6.
(4) CARB Area Source Methodology, Section 7.7, 9/02.
(5) WRAP Fugitive Dust Handbook, 9/06.
(6) USEPA, AP-42, Section 13.2.3, 2/10.
(7) Estimating PM Emissions from Construction Operations, USEPA, MRI, 9/99.
(8) Wind speed data for Lemoore met station. Annual avg wind speed = 8.03 mph, % calms = 3.44%.
(9) Soil Moisture; 5% assumed avg value
(10) adjusted applicant value based on 7.5% of total acreage disturbed on any given day
(11) SCAQMD CEQA Handbook 1993.
(12) SCAQMD, Sample Construction Scenarios for Projects Less than Five Acres, Fugitive Dust Mitigations, February 2005.

**OFFSITE PAVED ROAD FUGITIVE DUST EMISSIONS**
(associated with delivery truck and worker vehicle traffic on I-5 and plant access road)

| | | | |
|---|---|---|---|
| Average mileage for construction related vehicles: | | NA | miles, roundtrip distance*** |
| Avg weight of vehicular equipment on road: | | 4.1 | tons (range 2 - 42 tons) |
| Road surface silt loading factor: | | 0.015 | g/m2 (range 0.03 - 400 g/m2) |
| | | | Limited Access Freeway >10,000 ADT **(I-5)** |
| Particle size multiplier factors: | PM10 | 0.0022 | lb/VMT |
| | PM2.5 | 0.00054 | lb/VMT |
| C factors (brake and tire wear): | PM10 | 0.00047 | lb/VMT |
| | PM2.5 | 0.00036 | lb/VMT |
| Avg vehicle speed on road: | | 65 | mph |
| Avg. Number of vehicles per day: | | 195 | |
| | | | calculated per Applicant da |
| Avg. Number of work days per month: | | 22 | **VMT/period: 9184618.3** |
| | Total vehicles per month: | 4290 | |
| Number of work months: | | 18.22 | adjusted for precip events |
| | Total vehicles per const period: | 78163.8 | |

| | PM10 | |
|---|---|---|
| Calc 1 | 0.022 | |
| Calc 2 | 4.217 | |
| Calc 3 | 0.0007 | lb/VMT |

| **Emissions** | **PM10** | **PM2.5** |
|---|---|---|
| **lbs/period** | **6182.15** | **1044.78** |
| **tons/period** | **3.091** | **0.522** |

EPA, AP-42, Section 13.2.1, March 2006, updated 9/2008.
PM2.5 fraction of PM10 per CARB CEIDARs is 0.169
*** Note: avg roundtrip distance traveled by delivery or worker vehicles on freeways (I-5) and other State Routes in the project area.
Vehicles per day: worker + deliveries+staff support vehciles (averages)

## ONSITE UNPAVED ROAD FUGITIVE DUST

| | | | | | |
|---|---|---|---|---|---|
| Length of Unpaved Roads on Construction site: | | 0.1 | miles* | | |
| Avg weight of construction vehicular equipment on road: | | 4.1 | tons (range 2 - 42 tons) | | |
| Road surface silt content: | | 8.5 | % (range 1.8 - 35%) | | |
| Road surface material moisture content: | | 5 | % (range 0.03 - 13%) | | |
| | | k | a | b | |
| Particle size multiplier factors: | PM10 | 1.5 | 0.9 | 0.45 | |
| | PM2.5 | 0.15 | 0.9 | 0.45 | |
| C factors (brake and tire wear): | PM10 | 0.00047 | lb/VMT | | |
| | PM2.5 | 0.00036 | lb/VMT | | |
| Avg construction vehicle speed on road: | | 5 | mph (range 5-55 mph) | | |
| Avg number of construction vehicles per day: | | 74 | ** | | |
| Number of construction work days per month: | | 22 | | **VMT/period:** | **9117.8933** |
| Total vehicles per month: | | 1628 | | | |
| Number of construction work months: | | 18.22 | adjusted for precipitation events | | |
| Total vehicles per const period: | | 91178.933 | | | |
| Control reduction due to watering, speed control, etc. = | | 80 | | | |
| | | 0.8 | | | |
| Release Fraction = | | 0.2 | | | |

| | PM10 | PM2.5 |
|---|---|---|
| Calc 1 | 0.733 | 0.733 |
| Calc 2 | 1.151 | 1.151 |
| Calc 3 | 1.266 | 0.127 |
| Calc 4 | 1.266 | 0.127 |
| Controlled lb/VMT | 0.253 | 0.025 |

| **Emissions** | **PM10** | **PM2.5** |
|---|---|---|
| **lbs/period** | **2309.08** | **231.48** |
| **tons/period** | **1.155** | **0.116** |

EPA, AP-42, Section 13.2.2, March 2006
Soil Moisture; 5% avg
Soil silt content: 8.5% per AP-42 for construction site scraper routes
** const equipment plus site support pickups plus

**CONSTRUCTION PHASE - Truck Hauling/Delivery and Site Support Vehicle Emissions**

**All Phases**

| **Delivery/Hauling Vehicle Use Rates** | | | Emissions Factors (lbs/vmt) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Delivery Roundtrip Distance: | 0 | miles | NOx | CO | VOC | SOx | PM10 | CO2 | | | |
| Const Days per Period: | 0 | | 0.00625339 | 0.00051535 | 0.00011377 | 0.000026 | 3.9844E-05 | 3.10646173 | HDDT | | |
| Avg Deliveries per Day: | 0 | | 0.00046982 | 0.00340025 | 7.8173E-05 | 0.000013 | 2.9202E-06 | 1.02361637 | MDGT | | |
| Fraction of Deliveries-Diesel: | 0.95 | HDDT | | | **Daily Emissions (lbs)** | | | | | | |
| Fraction of Deliveries-Gas: | 0.05 | MDGT | **NOx** | **CO** | **VOC** | **SOx** | **PM10** | **CO2** | **PM2.5** | | |
| Total Delivery VMT: | **1687618** | **per Applicant** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | HDDT | |
| Total Daily VMT-Diesel | 0 | | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | MDGT | |
| Total Daily VMT-Gasoline | 0 | | | | **Tons per Const Period** | | | | | | |
| Total Period VMT-Diesel | 1603237.42 | | 5.013 | 0.413 | 0.091 | 0.021 | 0.032 | 2490.2 | 0.027 | HDDT | |
| Total Period VMT-Gasoline | 84380.9167 | | 0.020 | 0.143 | 0.003 | 0.001 | 0.000 | 43.2 | 0.000 | MDGT | |
| | | | | | | | | | | | |
| **Construction Site Support Vehicle Use Rates (LDTs)** | | | | | **Daily Emissions, lbs** | | | | | | |
| Gasoline Vehicle VMT Period: | 75900 | | **NOx** | **CO** | **VOC** | **SOx** | **PM10** | **CO2** | | | **PM2.5** |
| Avg Daily Gasoline VMT: | 300 | | 0.00040762 | 0.00359256 | 6.9991E-05 | 0.000008 | 5.0718E-06 | 0.6541839 | lbs/vmt* | LDT gasoline | |
| Avg Daily Diesel VMT: | 0 | | 0.1223 | 1.0778 | 0.0210 | 0.0024 | 0.0015 | 196.2552 | lbs/day | gasoline | 0.0010 |
| Total Phase Const Days: | 240 | | | | | | | | | | |
| | | | | | **Tons per Const Period** | | | | | | |
| Ref: EMFAC 2014, SJVAPCD Year 2016 | | | 0.0155 | 0.1363 | 0.0027 | 0.0003 | 0.0002 | 24.8 | **tons/period** | **gasoline** | 0.0001 |
| LDT1-gas, MDV-gas, HDDT-dsl | | | | | | | | | | | |
| See EF data in WSP Support Appendix | | | | | | | | | | | |

**Notes *****

VMT for delivery/hauling for all vehicles includes: (1) materials deliveries to site, (2) materials removal from site, other VMT as specified below.

Support Vehicle VMT: best estimate at time of filing, 10 LDT (gasoline) at 30 VMT/day

CARB-CEIDARS, Updated Fractions for PM Profiles: PM2.5 = 0.991 of PM10 for Diesel Exhaust, and 0.998 for Gasoline Vehicles.

**CONSTRUCTION PHASE - Worker Travel - Emissions**

Ref: SJVAPCD EMFAC 2014, Year 2020
LDA-gas
See EF data in WSP Support Appendix

**Worker Travel to Site**

| | |
|---|---|
| Avg Occupancy/Vehicle: | 0 |
| Avg Roundtrip Distance, miles: | 0.0 |
| Avg # of Worker Vehicles, per day: | 0 |
| Avg Daily Worker VMT: | 0 |
| Max # of Worker Vehicles, per day: | 0 |
| Max Daily Worker VMT: | 0 |
| Total Const Days: | 240 |
| **Total Const Period Worker VMT:** | **7497000** |

**VMT data supplied by Applicant.**

Emissions Factors (lbs/VMT)

| NOx | CO | VOC | SOx | PM10 | CO2 |
|---|---|---|---|---|---|
| 0.00013058 | 0.001103197 | 2.504E-05 | 0.000007 | 0.000004 | 0.65463696 |

**Daily Emissions (lbs)**

| | NOx | CO | VOC | SOx | PM10 | CO2 | PM2.5 |
|---|---|---|---|---|---|---|---|
| Avg | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**Tons per Const Period**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Avg | 0.489 | 4.135 | 0.094 | 0.026 | 0.015 | 2453.9 | 0.000 |

**Worker Travel by Busing from Staging Area**

| | |
|---|---|
| Total Bus VMT/Const Period: | 0 |
| Avg Bus VMT/Const Day: | 0 |
| Max Bus VMT/Const Day: | 0 |

| | | |
|---|---|---|
| Bus Round Trips/Day: | 0 | max |
| Bus Occupancy/Trip: | 0 | |

Ref: SJVAPCD EMFAC 2014, Year 2016
All other buses-DSL
See EF data in WSP Support Appendix

# buses supplied by Applicant.

Emissions Factors (lbs/VMT)

| NOx | CO | VOC | SOx | PM10 | CO2 |
|---|---|---|---|---|---|
| 0.012001 | 0.001203 | 0.000458 | 0.000026 | 0.00015 | 2.734838 |

**Daily Emissions (lbs)**

| | **NOx** | **CO** | **VOC** | **SOx** | **PM10** | **CO2** | **PM2.5** |
|---|---|---|---|---|---|---|---|
| Avg | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Max | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**Tons per Const Period**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Avg | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

**CONSTRUCTION PHASE - Trackout Emissions**

| | | | | | | |
|---|---|---|---|---|---|---|
| Paved Road Length (miles): | 0.1 | estimated roundtrip trackout distance | | | | |
| Daily # of Vehicles: | 74 | | | | | |
| Avg Vehicle Weight (tons): | 6.8 | | | **PM10** | **PM2.5*** | |
| Total Unadjusted VMT/day | 7.4 | | | 0.361 | | |
| Particle Size Multipliers | PM10 | | | 1.924 | | |
| lb/VMT | 0.023 | | | 0.002 | 0.0004 | lb/VMT |
| C factor, lb/VMT | 0.00047 | | | **0.129** | **0.0217** | **lbs/day** |
| Road Sfc Silt Loading (g/m^2): | 0.56 | local X 2 | | **0.001** | **0.0002** | **tons/month** |
| # of Active Trackout Points: | 1 | ** | | **0.03** | **0.0044** | **tons/period** |
| Added Trackout Miles: | PM10 | | | | | |
| Trackout VMT/day: | 44 | | *Default Silt Load Values for Paved Road Types* | | | |
| Final Adjusted VMT/day | 52 | | | Freeway | 0.02 g/m2 | |
| Final Adjusted VMT/month | 1140 | | | Arterial | 0.036 g/m2 | |
| Final Adjusted VMT/period | 20764 | | | Collector | 0.036 g/m2 | |
| Construction days/month: | 22 | | | Local | 0.28 g/m2 | |
| Adj. Construction months/period: | 18.22 | | | Rural | 1.6 g/m2 | |
| Control Applied to Trackout: | Gravel entrance, metal cleaning grates, water washing, sweeping | | | | | |
| Control Efficiency, % | 84 | 0.84 | Release Factor = | | 0.16 | |

* PM2.5 fraction of PM10 assumed to be 0.169 (CARB CEIDARS updated fraction values) for paved roads.
** 1 controlled ingress/egress point is planned for site construction
EPA, AP-42, Section 13.2.1, Proposed revisions dated 9/2008.
Use silt loading factor from default values for road type if no site specific data is available.
Trackout effects approximately 0.05 mi. of roadway arriving and departing from the site access point.
Plant access road is already paved. Entrance will be gravelled with metal grates for take out control.
Vehicle count = delivery trucks plus site support trucks (see Unpaved Onsite tab)
Worker vehicles not counted for trackout, they will park on the site perimeter.

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## Tons/Period

| | NOx | CO | VOC | SOx | PM10 | CO2 | Fug PM10 | Fug PM2.5 |
|---|---|---|---|---|---|---|---|---|
| on-off site travel | 0.92 | 2.30 | 0.07 | 0.03 | 0.02 | 2656 | 4.92 | 0.87 |
| on-site equipment | 14.45 | 11.68 | 2.52 | 0.04 | 0.64 | 3714 | | |
| Total | 15.36 | 13.99 | 2.59 | 0.07 | 0.66 | 6370 | 4.92 | 0.87 |
| Months: | 15 | | | | | | | |
| Max Year Months: | 12 | | | | | | | |
| Total per Year: | 12.29 | 11.19 | 2.07 | 0.05 | 0.53 | 5095.83 | 3.94 | 0.69 |

CONSTRUCTION EQUIPMENT EXHAUST EMISSIONS

Project: WSP **Main Site Construction-SGF 7**

**Assumptions:**

1. The average engines employed in construction equipment use consumes fuel at a rate of: diesel 0.06 gal/hp-hr; gasoline 0.11 gal/hp-hr

Ref: EPA, NR-009b Publication, November 2002.
Ref: Sacramento County APCD Const. Program Data, V. 6.0.3, 3/2007.
Ref: EPA, NR-009c Publication, EPA 420-P-04-009, April 2004.
Ref: Niland Energy Project, IID, AFC Vol 2, App A.
Ref: South Coast AQMD PR XXI, Draft Staff Report, 3-15-95, and SCAQMD CEQA Manual, 11/03.
The above noted references present fuel consumption values which range from 0.050 to 0.064 gal/hp-hr for diesel engines used in construction related equipment. The value of 0.060 gal/hp-hr was chosen as a reasonable upper mid-range value for construction diesel emissions calculations.
For gasoline the mid-range value from SCAQMD of 0.11 gal/hp-hr was used.

2. Construction equipment exhaust emissions will be calculated on an annual basis using the site specific equipment list, HP ratings, hours of use, days of use, etc. Annual emissions will be apportioned to daily values based on the estimated construction period time on site.

3. The equipment list derived from the South Coast AQMD Offroad database (2016) will be used to establish the various equipment categories. Avg HP values were derived from SCAQMD and SacMetro AQMD construction resources.

4. Construction Schedule: 21.5 months; 8 hrs/day; 1.79 years

Construction Totals: 217.67442 hrs/month; 4680 hrs/const period; 585 days/const period

5. Anticipated Construction Start Year: 2023

6. Maximum anticipated equipment use month is: n/a

7. N2O EF diesel, lb/gal: 0.000183
N2O EF gasoline, lb/gal: 0.000164
CARB, Mandatory GHG Reporting Regulation
Table 4, Appendix A, 2007.

Equipment types and use rates supplied by the Applicant.

| Equipment Category** | Weighted Average HP | # of Units Used for Project | Avg Use Rate Hrs/day | # of Days On Site (each) | Total Hrs/Day | Total Hrs per Const Period | Total HP-Hrs Period |
|---|---|---|---|---|---|---|---|
| Aerial Lifts | 63 | 1 | 6 | 94 | 6 | 564 | 35532 |
| Air Compressors | 78 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bore-Drill Rigs | 206 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cement Mixers | 9 | 0 | 0 | 0 | 0 | 0 | 0 |
| Concrete/Industrial Saws | 81 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cranes | 226 | 1 | 2 | 94 | 2 | 188 | 42488 |
| Crawler Tractors/Dozers | 208 | 3 | 7 | 210 | 21 | 4410 | 917280 |
| Crushing/Processing Eq. | 85 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dumpers/Tenders/Water Trucks | 16 | 7 | 7 | 192 | 49 | 9408 | 150528 |
| Excavators | 163 | 0 | 0 | 0 | 0 | 0 | 0 |
| Forklifts | 89 | 8 | 6 | 200 | 48 | 9600 | 854400 |
| Generator Sets | 84 | 0 | 0 | 0 | 0 | 0 | 0 |
| Graders | 175 | 5 | 7 | 108 | 35 | 3780 | 661500 |
| Off-Highway Tractors | 123 | 0 | 0 | 0 | 0 | 0 | 0 |
| Off-Highway Trucks | 400 | 12 | 7 | 220 | 84 | 18480 | 7392000 |
| Other Diesel Construction Eq. | 172 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other General Industrial Eq. | 88 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Material Handling Eq. | 167 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pavers | 126 | 1 | 4 | 28 | 4 | 112 | 14112 |
| Paving Eq. Other | 131 | 0 | 0 | 0 | 0 | 0 | 0 |
| Plate Compactors | 8 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pressure Washers | 13 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pumps | 84 | 0 | 0 | 0 | 0 | 0 | 0 |
| Roller Compactors | 81 | 1 | 7 | 42 | 7 | 294 | 23814 |
| Rough Terrain Forklifts | 100 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber Tired Dozers | 255 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber Tires Loaders | 200 | 0 | 0 | 0 | 0 | 0 | 0 |
| Scrapers | 362 | 0 | 0 | 0 | 0 | 0 | 0 |
| Signal Boards | 6 | 0 | 0 | 0 | 0 | 0 | 0 |
| Skid Steer Loaders | 65 | 1 | 7 | 188 | 7 | 1316 | 85540 |
| Surfacing Eq. | 254 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sweepers/Scrubbers | 64 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tractors (single category) | 98 | 2 | 7 | 245 | 14 | 3430 | 336140 |
| Front End Loaders (single category) | 98 | 1 | 7 | 83 | 7 | 581 | 56938 |
| Backhoes (single category) | 98 | 1 | 4 | 158 | 4 | 632 | 61936 |
| Trenchers | 81 | 10 | 4 | 235 | 40 | 9400 | 761400 |
| Welders | 46 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gasoline Const Eq. | 175 | 0 | 0 | 0 | 0 | 0 | 0 |

** diesel equipment unless otherwise specified.

Const Period Diesel Hp-Hrs = 11393608
Const Period Gasoline Hp-Hrs = 0
Const Period Diesel Fuel Use = 683616 gals
Const Period Gasoline Fuel Use = 0 gals

Offroad equipment emissions factors derived SCAQMD Off Road database for 2020.
The SCAQMD EFs as presented incorporate the average equipment load factors.
Emissions factors for each category of equipment represent the composite factors for the stated equipment category as derived from the SCAQMD Offroad database for the construction start year.

**2020 Equipment Emissions Factors**

| Equip. Type | lbs/hr VOC (ROG) | lbs/hr CO | lbs/hr NOx | lbs/hr SOx | lbs/hr PM10 | lbs/hr CO2 | lbs/hr CH4 |
|---|---|---|---|---|---|---|---|
| Aerial Lifts | 0.0261 | 0.1696 | 0.1866 | 0.0004 | 0.0092 | 34.7217 | 0.0024 |
| Air Compressors | 0.0483 | 0.3077 | 0.3255 | 0.0007 | 0.0185 | 63.6073 | 0.0044 |
| Bore-Drill Rigs | 0.0480 | 0.5008 | 0.3439 | 0.0017 | 0.0062 | 164.8622 | 0.0043 |
| Cement Mixers | 0.0086 | 0.0415 | 0.0536 | 0.0001 | 0.0021 | 7.2481 | 0.0008 |
| Concrete/Industrial Saws | 0.0484 | 0.3783 | 0.3410 | 0.0007 | 0.0196 | 58.4636 | 0.0044 |
| Cranes | 0.0898 | 0.3917 | 0.6610 | 0.0014 | 0.0256 | 128.6305 | 0.0081 |
| Crawler Tractors/Dozers | 0.1049 | 0.5260 | 0.6772 | 0.0013 | 0.0378 | 114.0177 | 0.0095 |
| Crushing/Processing Eq. | 0.0934 | 0.6247 | 0.5983 | 0.0015 | 0.0310 | 132.3083 | 0.0084 |
| Dumpers/Tenders | 0.0092 | 0.0314 | 0.0582 | 0.0001 | 0.0022 | 7.6244 | 0.0008 |
| Excavators | 0.0733 | 0.5124 | 0.4042 | 0.0013 | 0.0184 | 119.5795 | 0.0066 |
| Forklifts | 0.0320 | 0.2160 | 0.1691 | 0.0006 | 0.0070 | 54.3958 | 0.0029 |
| Generator Sets | 0.0395 | 0.2732 | 0.3232 | 0.0007 | 0.0150 | 60.9927 | 0.0036 |
| Graders | 0.0919 | 0.5765 | 0.5823 | 0.0015 | 0.0280 | 132.7430 | 0.0083 |
| Off-Highway Tractors | 0.1470 | 0.6517 | 1.0657 | 0.0017 | 0.0497 | 151.4031 | 0.0133 |
| Off-Highway Trucks | 0.1443 | 0.5514 | 0.8306 | 0.0027 | 0.0280 | 260.0871 | 0.0130 |
| Other Diesel Construction Eq. | 0.0563 | 0.3508 | 0.3519 | 0.0013 | 0.0139 | 122.4967 | 0.0051 |
| Other General Industrial Eq. | 0.0983 | 0.4517 | 0.6661 | 0.0016 | 0.0262 | 152.2399 | 0.0089 |
| Other Material Handling Eq. | 0.0924 | 0.4429 | 0.6500 | 0.0015 | 0.0252 | 141.1941 | 0.0083 |
| Pavers | 0.0989 | 0.4920 | 0.5450 | 0.0009 | 0.0355 | 77.9332 | 0.0089 |
| Paving Eq. Other | 0.0757 | 0.4084 | 0.4807 | 0.0008 | 0.0315 | 68.9391 | 0.0068 |
| Plate Compactors | 0.0050 | 0.0263 | 0.0314 | 0.0001 | 0.0012 | 4.3138 | 0.0005 |
| Pressure Washers | 0.0085 | 0.0549 | 0.0650 | 0.0001 | 0.0030 | 9.4135 | 0.0008 |
| Pumps | 0.0376 | 0.2674 | 0.2854 | 0.0006 | 0.0147 | 49.6067 | 0.0034 |
| Roller Compactors | 0.0584 | 0.3837 | 0.3793 | 0.0008 | 0.0232 | 67.0402 | 0.0053 |
| Rough Terrain Forklifts | 0.0533 | 0.4464 | 0.3494 | 0.0008 | 0.0201 | 70.2808 | 0.0048 |
| Rubber Tired Dozers | 0.2118 | 0.8006 | 1.5773 | 0.0025 | 0.0630 | 239.0842 | 0.0191 |
| Rubber Tires Loaders | 0.0753 | 0.4406 | 0.4747 | 0.0012 | 0.0235 | 108.6109 | 0.0068 |
| Scrapers | 0.1914 | 0.7938 | 1.3434 | 0.0027 | 0.0541 | 262.4852 | 0.0173 |
| Signal Boards | 0.0129 | 0.0912 | 0.0912 | 0.0002 | 0.0042 | 16.6983 | 0.0012 |
| Skid Steer Loaders | 0.0222 | 0.2125 | 0.1614 | 0.0004 | 0.0050 | 30.2770 | 0.0020 |
| Surfacing Eq. | 0.0823 | 0.3953 | 0.6593 | 0.0017 | 0.0239 | 165.9635 | 0.0074 |
| Sweepers/Scrubbers | 0.0584 | 0.4916 | 0.3563 | 0.0009 | 0.0183 | 78.5433 | 0.0053 |
| Tractors | 0.0436 | 0.3616 | 0.2744 | 0.0008 | 0.0134 | 66.7988 | 0.0039 |
| Front End Loaders | 0.0436 | 0.3616 | 0.2744 | 0.0008 | 0.0134 | 66.7988 | 0.0039 |
| Backhoes | 0.0436 | 0.3616 | 0.2744 | 0.0008 | 0.0134 | 66.7988 | 0.0039 |
| Trenchers | 0.0933 | 0.4270 | 0.4575 | 0.0007 | 0.0336 | 58.7130 | 0.0084 |
| Welders | 0.0310 | 0.1816 | 0.1735 | 0.0003 | 0.0102 | 25.6027 | 0.0028 |
| Gasoline Const Eq. (assumed 175 hp category) | 0.0771 | 0.3855 | 1.08 | 0.00014 | 0.1542 | 14.1565 | 0.00037 |

(gasoline EFs: EPA OMS-AMD Report NR-009A, 2-13-98, and SCAQMD EMFAC 2007 CEQA Tables, 2016.)

Construction Period Emissions, lbs

| Equip. Type | VOC | CO | NOx | SOx | PM10 | CO2 | CH4 |
|---|---|---|---|---|---|---|---|
| Aerial Lifts | 15 | 96 | 105 | 0 | 5 | 19583 | 1 |
| Air Compressors | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bore-Drill Rigs | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cement Mixers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Concrete/Industrial Saws | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cranes | 17 | 74 | 124 | 0 | 5 | 24183 | 2 |
| Crawler Tractors/Dozers | 463 | 2320 | 2986 | 6 | 167 | 502818 | 42 |
| Crushing/Processing Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dumpers/Tenders | 87 | 295 | 548 | 1 | 21 | 71730 | 8 |
| Excavators | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Forklifts | 307 | 2074 | 1623 | 6 | 67 | 522200 | 28 |
| Generator Sets | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Graders | 347 | 2179 | 2201 | 6 | 106 | 501769 | 31 |
| Off-Highway Tractors | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Off-Highway Trucks | 2667 | 10190 | 15349 | 50 | 517 | 4806410 | 240 |
| Other Diesel Construction Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other General Industrial Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Material Handling Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pavers | 11 | 55 | 61 | 0 | 4 | 8729 | 1 |
| Paving Eq. Other | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Plate Compactors | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pressure Washers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pumps | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Roller Compactors | 17 | 113 | 112 | 0 | 7 | 19710 | 2 |
| Rough Terrain Forklifts | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber Tired Dozers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber Tires Loaders | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Scrapers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Signal Boards | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Skid Steer Loaders | 29 | 280 | 212 | 1 | 7 | 39845 | 3 |
| Surfacing Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sweepers/Scrubbers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tractors | 150 | 1240 | 941 | 3 | 46 | 229120 | 13 |
| Front End Loaders | 25 | 210 | 159 | 0 | 8 | 38810 | 2 |
| Backhoes | 28 | 229 | 173 | 1 | 8 | 42217 | 2 |
| Trenchers | 877 | 4014 | 4301 | 7 | 316 | 551902 | 79 |
| Welders | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gasoline Const Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| **Totals** | **VOC** | **CO** | **NOx** | **SOx** | **PM10** | **PM2.5** | **CO2** | **CH4** | **N2O** |
|---|---|---|---|---|---|---|---|---|---|
| lbs per const. period | 5039 | 23367 | 28897 | 80 | 1283 | 1271.76 | 7379024 | 454 | 125 |
| tons per const. period | 2.5 | 11.7 | 14.4 | 0.040 | 0.64 | 0.64 | 3689.51 | 0.23 | 0.06 |
| Average lbs/day = | 8.6 | 39.9 | 49.4 | 0.136 | 2.19 | 2.17 | 12613.72 | 0.78 | 0.21 |
| Normalized TPY = | *1.4* | *6.5* | *8.1* | *0.0* | *0.4* | *0.4* | *2059.3* | *0.1* | *0.035* |

| | |
|---|---|
| CO2e, tons/period | 3713.8 |
| CO2e, tons/yr: | 2072.8 |

Other Assumptions and References:

1. Trench construction times per: Southern Regional Water Pipeline Alliance, 3/08.
   Optimum trench construction progress rate is 80m (260ft) per day.
   Non-optimum trench construction progress rate is 30m (100 ft) per day.
   An average progress of 180 ft/day is used where applicable.
2. Paving speeds can range from 3 to 15 m/min depending on asphalt delivery rates and required compaction thickness.
   A minium paving speed of 3 m/min (10 ft/min or 600 ft/hr) was used where applicable.
   The minimum speed is based upon a 3" compacted layer, 12 ft lane width, with an asphalt delivery rate of ~ 140 tons/hr.
   Ref: Asphalt Paving Speed, Pavement Worktip No. 31, AAPA, 11/2001.
3. Estimation of maximum daily emissions is extremely variable, and these values are not required by SJVAPCD.
4. Construction schedule note: applicant data indicates a construction work day period of 8 hours
   The equipment use rates provided by the applicant are consistent with an 8 hour workday.
5. GWP values: CH4=25, N2O=298, ref: 40 CFR 98 Subpart A, Table A-1.
6. CARB-CEIDARS, Updated Size Fractions for PM Profiles: PM2.5 = 0.991 of PM10 : Diesel Vehicle Exhaust

**CONSTRUCTION PHASE - SGF 7**

| | | | | |
|---|---|---|---|---|
| **MRI Level 2 Analysis (Refs 1, 3-7)** | | Acres | 1109 | |
| Acres Subject to Construction Disturbance Activites: | | | 110.9 | |
| Max Acres Subject to Construction Disturbance Activites on any day of this phase: | | | 8.3 | note (10) |
| Emissions Factor for PM10 Uncontrolled, tons/acre/month: | | | 0.12 | |
| PM2.5 fraction of PM10 (per CARB CEIDARS Profiles): | | | 0.21 | |
| **Activity Levels:** | Hrs/Day: | | 8 | |
| | Days/Wk: | | 5 | |
| | Days/Month: Applicant Data | | 22 | |
| | Phase Const Period, Months: | | 15 | 1.25 years |
| | Phase Const Period, Days: | | 330 | |

**Wet Season Adjustment:** (Per AP-42, Section 13.2.2, Figure 13.2.2-1, 12/03 or CalEEMod, Appendix D, Table 1.1.)

| | |
|---|---|
| Mean # days/year with rain >= 0.01 inch: | 40 |
| Mean # months/yr with rain >= 0.01 inch: | 1.33 |
| Adjusted Const Period, Months: | 13.33 |
| Adjusted Const Period, Days: | 280 |

**Controls for Fugitive Dust:** Proposed watering cycle: 3 times per day

3 watering cycles/8 hour construction shift yields a 68% reduction, use 68% for non-desert sites. (11)(12)
Speed control of onsite const traffic to <15 mph yields a 40-70% reduction (use 50% control as conservative for site). (11)(12)

| | | |
|---|---|---|
| Calculated % control based on mitigations proposed: | 84 | % control |
| Conservative control % used for emissions estimates: | 84 | % control |
| | 0.16 | release fraction |

| **Emissions: Controlled** | PM10 | PM2.5 |
|---|---|---|
| tons/month | 0.160 | 0.034 |
| tons/period | 2.129 | 0.447 |
| Max lbs/day | 14.518 | 3.049 |

**Soil Handling Emissions (Cut and Fill): (2)**

| | | | | | |
|---|---|---|---|---|---|
| Total cu.yds of soil handled: | 0 | Mean annual wind speed, mph: (8) | | | 8.03 |
| Total tons of soil handled: | 0.0 | Avg. Soil moisture, %: (9) | | | 5 |
| Total days soil handled: | 280 | Avg. Soil density, tons/cu.yd: | | | 1.3 |
| Tons soil/day: | 0 | k factor for PM10: | | | 0.35 |
| Control Eff, watering, % | 80 | Number of Drops per ton: | | | 4 |
| Release Fraction: | 0.2 | Calc 1 | wind | | 1.851 |
| | | Calc 2 | moisture | | 3.607 |
| | | Calc 3 | int | | 0.513 |
| | | Calc 4 | PM10 | lb/ton | 0.0006 |
| | | PM2.5 fraction of PM10: | | | 0.210 |

| Emissions: | PM10 | PM2.5 |
|---|---|---|
| tons/period | 0.000 | 0.000 |
| tons/month | 0.000 | 0.000 |
| max lbs/day | 0.000 | 0.000 |

| **Emissions Totals:** | **PM10** | **PM2.5** |
|---|---|---|
| **tons/period** | **2.129** | **0.447** |

**Methodology References:**

(1) MRI Report, South Coast AQMD Project No. 95040, March 1996, Level 2 Analysis Procedure.
MRI Report uncontrolled factor of 0.11 tons/acre/month is based on 168 hours per month of const activity.
For an activity rate of ~180 hrs/month, the adjusted EF would be 0.12 tons/acre/month (uncontrolled).
(2) Soil Handling (Cut and Fill), EPA, AP-42, Section 13.2.4., 11/06.
(3) URBEMIS, Version 9.2.4, User's Manual Appendix A, page A-6.
(4) CARB Area Source Methodology, Section 7.7, 9/02.
(5) WRAP Fugitive Dust Handbook, 9/06.
(6) USEPA, AP-42, Section 13.2.3, 2/10.
(7) Estimating PM Emissions from Construction Operations, USEPA, MRI, 9/99.
(8) Wind speed data for Lemoore met station. Annual avg wind speed = 8.03 mph, % calms = 3.44%.
(9) Soil Moisture; 5% assumed avg value
(10) adjusted applicant value based on 7.5% of total acreage disturbed on any given day
(11) SCAQMD CEQA Handbook 1993.
(12) SCAQMD, Sample Construction Scenarios for Projects Less than Five Acres, Fugitive Dust Mitigations, February 2005.

**OFFSITE PAVED ROAD FUGITIVE DUST EMISSIONS**
(associated with delivery truck and worker vehicle traffic on I-5 and plant access road)

| | | | |
|---|---|---|---|
| Average mileage for construction related vehicles: | | NA | miles, roundtrip distance*** |
| Avg weight of vehicular equipment on road: | | 4.1 | tons (range 2 - 42 tons) |
| Road surface silt loading factor: | | 0.015 | g/m2 (range 0.03 - 400 g/m2)<br>Limited Access Freeway >10,000 ADT **(I-5)** |
| Particle size multiplier factors: | PM10 | 0.0022 | lb/VMT |
| | PM2.5 | 0.00054 | lb/VMT |
| C factors (brake and tire wear): | PM10 | 0.00047 | lb/VMT |
| | PM2.5 | 0.00036 | lb/VMT |
| Avg vehicle speed on road: | | 65 | mph |
| Avg. Number of vehicles per day: | | 195 | |
| Avg. Number of work days per month: | | 22 | calculated per Applicant da<br>**VMT/period: 5974193.5** |
| | Total vehicles per month: | 4290 | |
| Number of work months: | | 23.56 | adjusted for precip events |
| | Total vehicles per const period: | 101072.4 | |

| | PM10 | |
|---|---|---|
| Calc 1 | 0.022 | |
| Calc 2 | 4.217 | |
| Calc 3 | 0.0007 | lb/VMT |

| **Emissions** | **PM10** | **PM2.5** |
|---|---|---|
| **lbs/period** | **4021.22** | **679.59** |
| **tons/period** | **2.011** | **0.340** |

EPA, AP-42, Section 13.2.1, March 2006, updated 9/2008.
PM2.5 fraction of PM10 per CARB CEIDARs is 0.169
*** Note: avg roundtrip distance traveled by delivery or worker vehicles on freeways (I-5) and other State Routes in the project area.
Vehicles per day: worker + deliveries+staff support vehciles (averages)

**ONSITE UNPAVED ROAD FUGITIVE DUST**

| | | | | | |
|---|---|---|---|---|---|
| Length of Unpaved Roads on Construction site: | | 0.1 | miles* | | |
| Avg weight of construction vehicular equipment on road: | | 4.1 | tons (range 2 - 42 tons) | | |
| Road surface silt content: | | 8.5 | % (range 1.8 - 35%) | | |
| Road surface material moisture content: | | 5 | % (range 0.03 - 13%) | | |
| | | k | a | b | |
| Particle size multiplier factors: | PM10 | 1.5 | 0.9 | 0.45 | |
| | PM2.5 | 0.15 | 0.9 | 0.45 | |
| C factors (brake and tire wear): | PM10 | 0.00047 | lb/VMT | | |
| | PM2.5 | 0.00036 | lb/VMT | | |
| Avg construction vehicle speed on road: | | 5 | mph (range 5-55 mph) | | |
| Avg number of construction vehicles per day: | | 74 | ** | | |
| Number of construction work days per month: | | 22 | | **VMT/period:** | **5935.71** |
| Total vehicles per month: | | 1628 | | | |
| Number of construction work months: | | 23.56 | adjusted for precipitation events | | |
| Total vehicles per const period: | | 59357.1 | | | |
| Control reduction due to watering, speed control, etc. = | | 80 | | | |
| | | 0.8 | | | |
| Release Fraction = | | 0.2 | | | |

| | PM10 | PM2.5 |
|---|---|---|
| Calc 1 | 0.733 | 0.733 |
| Calc 2 | 1.151 | 1.151 |
| Calc 3 | 1.266 | 0.127 |
| Calc 4 | 1.266 | 0.127 |
| Controlled lb/VMT | 0.253 | 0.025 |

| **Emissions** | **PM10** | **PM2.5** |
|---|---|---|
| **lbs/period** | **1503.20** | **150.69** |
| **tons/period** | **0.752** | **0.075** |

EPA, AP-42, Section 13.2.2, March 2006
Soil Moisture; 5% avg
Soil silt content: 8.5% per AP-42 for construction site scraper routes
** const equipment plus site support pickups plus

**CONSTRUCTION PHASE - Truck Hauling/Delivery and Site Support Vehicle Emissions**
**All Phases**

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Delivery/Hauling Vehicle Use Rates** | | | | | Emissions Factors (lbs/vmt) | | | | | | | |
| Delivery Roundtrip Distance: | 0 | miles | NOx | CO | VOC | SOx | PM10 | CO2 | | | | |
| Const Days per Period: | 0 | | 0.00133459 | 0.00037027 | 6.2834E-05 | 0.000025 | 1.0747E-05 | 2.91617689 | HDDT | | | |
| Avg Deliveries per Day: | 0 | | 0.00026191 | 0.00201574 | 3.9247E-05 | 0.000011 | 2.7302E-06 | 0.8745735 | MDGT | | | |
| Fraction of Deliveries-Diesel: | 0.95 | HDDT | | | **Daily Emissions (lbs)** | | | | | | | |
| Fraction of Deliveries-Gas: | 0.05 | MDGT | **NOx** | **CO** | **VOC** | **SOx** | **PM10** | **CO2** | **PM2.5** | | | |
| Total Delivery VMT: | **1093494** | **per Applicant** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | HDDT | | |
| Total Daily VMT-Diesel | 0 | | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | MDGT | | |
| Total Daily VMT-Gasoline | 0 | | | | **Tons per Const Period** | | | | | | | |
| Total Period VMT-Diesel | 1038818.83 | | 0.693 | 0.192 | 0.033 | 0.013 | 0.006 | 1514.7 | 0.005 | HDDT | | |
| Total Period VMT-Gasoline | 54674.675 | | 0.007 | 0.055 | 0.001 | 0.000 | 0.000 | 23.9 | 0.000 | MDGT | | |
| | | | | | | | | | | | | |
| **Construction Site Support Vehicle Use Rates (LDTs)** | | | | | **Daily Emissions, lbs** | | | | | | | |
| Gasoline Vehicle VMT Period: | 75900 | | **NOx** | **CO** | **VOC** | **SOx** | **PM10** | **CO2** | | | **PM2.5** | |
| Avg Daily Gasoline VMT: | 300 | | 0.0002232 | 0.00204313 | 3.6203E-05 | 0.000007 | 3.782E-06 | 0.55087942 | lbs/vmt* | LDT gasoline | | |
| Avg Daily Diesel VMT: | 0 | | 0.0670 | 0.6129 | 0.0109 | 0.0021 | 0.0011 | 165.2638 | lbs/day | gasoline | 0.0007 | |
| Total Phase Const Days: | 240 | | | | | | | | | | | |
| | | | | | **Tons per Const Period** | | | | | | | |
| Ref: EMFAC 2014, SJVAPCD Year 2023 | | | 0.0085 | 0.0775 | 0.0014 | 0.0003 | 0.0001 | 20.9 | **tons/period** | **gasoline** | 0.0001 | |
| LDT1-gas, MDV-gas, HDDT-dsl | | | | | | | | | | | | |
| See EF data in WSP Support Appendix | | | | | | | | | | | | |

**Notes *****
VMT for delivery/hauling for all vehicles includes: (1) materials deliveries to site, (2) materials removal from site, other VMT as specified below.
Support Vehicle VMT: best estimate at time of filing, 10 LDT (gasoline) at 30 VMT/day
CARB-CEIDARS, Updated Fractions for PM Profiles: PM2.5 = 0.991 of PM10 for Diesel Exhaust, and 0.998 for Gasoline Vehicles.

**CONSTRUCTION PHASE - Worker Travel - Emissions**

Ref: SJVAPCD EMFAC 2014, Year 2025
LDA-gas
See EF data in WSP Support Appendix

**Worker Travel to Site**

| | |
|---|---|
| Avg Occupancy/Vehicle: | 0 |
| Avg Roundtrip Distance, miles: | 0.0 |
| Avg # of Worker Vehicles, per day: | 0 |
| Avg Daily Worker VMT: | 0 |
| Max # of Worker Vehicles, per day: | 0 |
| Max Daily Worker VMT: | 0 |
| Total Const Days: | 240 |
| **Total Const Period Worker VMT:** | **4880700** |

**VMT data supplied by Applicant.**

Emissions Factors (lbs/VMT)

| NOx | CO | VOC | SOx | PM10 | CO2 |
|---|---|---|---|---|---|
| 8.5075E-05 | 0.000810295 | 1.5737E-05 | 0.000006 | 0.000004 | 0.56063169 |

**Daily Emissions (lbs)**

| | NOx | CO | VOC | SOx | PM10 | CO2 | PM2.5 |
|---|---|---|---|---|---|---|---|
| Avg | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**Tons per Const Period**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Avg | 0.208 | 1.977 | 0.038 | 0.015 | 0.010 | 1368.1 | 0.000 |

**Worker Travel by Busing from Staging Area**

| | |
|---|---|
| Total Bus VMT/Const Period: | 0 |
| Avg Bus VMT/Const Day: | 0 |
| Max Bus VMT/Const Day: | 0 |

| | | |
|---|---|---|
| Bus Round Trips/Day: | 0 | max |
| Bus Occupancy/Trip: | 0 | |

Ref: SJVAPCD EMFAC 2014, Year 2025
All other buses-DSL
See EF data in WSP Support Appendix

# buses supplied by Applicant.

Emissions Factors (lbs/VMT)

| NOx | CO | VOC | SOx | PM10 | CO2 |
|---|---|---|---|---|---|
| 0.002933 | 0.00055 | 0.000105 | 0.000025 | 0.000007 | 2.661084 |

**Daily Emissions (lbs)**

| | **NOx** | **CO** | **VOC** | **SOx** | **PM10** | **CO2** | **PM2.5** |
|---|---|---|---|---|---|---|---|
| Avg | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Max | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**Tons per Const Period**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Avg | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

**CONSTRUCTION PHASE - Trackout Emissions**

| | | | | | | |
|---|---|---|---|---|---|---|
| Paved Road Length (miles): | 0.1 | estimated roundtrip trackout distance | | | | |
| Daily # of Vehicles: | 74 | | | | | |
| Avg Vehicle Weight (tons): | 6.8 | | | **PM10** | **PM2.5*** | |
| Total Unadjusted VMT/day | 7.4 | | | 0.361 | | |
| Particle Size Multipliers | PM10 | | | 1.924 | | |
| lb/VMT | 0.023 | | | 0.002 | 0.0004 | lb/VMT |
| C factor, lb/VMT | 0.00047 | | | **0.129** | **0.0217** | **lbs/day** |
| Road Sfc Silt Loading (g/m^2): | 0.56 | local X 2 | | **0.001** | **0.0002** | **tons/month** |
| # of Active Trackout Points: | 1 | ** | | **0.03** | **0.0056** | **tons/period** |
| Added Trackout Miles: | PM10 | | | | | |
| Trackout VMT/day: | 44 | | *Default Silt Load Values for Paved Road Types* | | | |
| Final Adjusted VMT/day | 52 | | | Freeway | 0.02 g/m2 | |
| Final Adjusted VMT/month | 1140 | | | Arterial | 0.036 g/m2 | |
| Final Adjusted VMT/period | 26849 | | | Collector | 0.036 g/m2 | |
| Construction days/month: | 22 | | | Local | 0.28 g/m2 | |
| Adj. Construction months/period: | 23.56 | | | Rural | 1.6 g/m2 | |
| Control Applied to Trackout: | Gravel entrance, metal cleaning grates, water washing, sweeping | | | | | |
| Control Efficiency, % | 84 | 0.84 | | Release Factor = | 0.16 | |

* PM2.5 fraction of PM10 assumed to be 0.169 (CARB CEIDARS updated fraction values) for paved roads.
** 1 controlled ingress/egress point is planned for site construction
EPA, AP-42, Section 13.2.1, Proposed revisions dated 9/2008.
Use silt loading factor from default values for road type if no site specific data is available.
Trackout effects approximately 0.05 mi. of roadway arriving and departing from the site access point.
Plant access road is already paved. Entrance will be gravelled with metal grates for take out control.
Vehicle count = delivery trucks plus site support trucks (see Unpaved Onsite tab)
Worker vehicles not counted for trackout, they will park on the site perimeter.

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## Tons/Period

| | NOx | CO | VOC | SOx | PM10 | CO2 | Fug PM10 | Fug PM2.5 |
|---|---|---|---|---|---|---|---|---|
| on-off site travel | 2.07 | 5.12 | 0.16 | 0.06 | 0.04 | 5997 | 14.56 | 2.68 |
| on-site equipment | 5.40 | 6.84 | 1.16 | 0.02 | 0.21 | 2227 | | |
| Total | 7.47 | 11.95 | 1.33 | 0.09 | 0.25 | 8224 | 14.56 | 2.68 |
| Months: | 20.5 | | | | | | | |
| Max Year Months: | 12 | | | | | | | |
| Total per Year: | 4.37 | 7.00 | 0.78 | 0.05 | 0.14 | 4814.02 | 8.52 | 1.57 |

CONSTRUCTION EQUIPMENT EXHAUST EMISSIONS

Project: WSP **Main Site Construction-SGF 8**

**Assumptions:**

1. The average engines employed in construction equipment use consumes fuel at a rate of:

| | | |
|---|---|---|
| diesel | 0.06 | gal/hp-hr |
| gasoline | 0.11 | gal/hp-hr |

Ref: EPA, NR-009b Publication, November 2002.
Ref: Sacramento County APCD Const. Program Data, V. 6.0.3, 3/2007.
Ref: EPA, NR-009c Publication, EPA 420-P-04-009, April 2004.
Ref: Niland Energy Project, IID, AFC Vol 2, App A.
Ref: South Coast AQMD PR XXI, Draft Staff Report, 3-15-95, and SCAQMD CEQA Manual, 11/03.
The above noted references present fuel consumption values which range from 0.050 to 0.064 gal/hp-hr for diesel engines used in construction related equipment. The value of 0.060 gal/hp-hr was chosen as a reasonable upper mid-range value for construction diesel emissions calculations.
For gasoline the mid-range value from SCAQMD of 0.11 gal/hp-hr was used.

2. Construction equipment exhaust emissions will be calculated on an annual basis using the site specific equipment list, HP ratings, hours of use, days of use, etc. Annual emissions will be apportioned to daily values based on the estimated construction period time on site.

3. The equipment list derived from the South Coast AQMD Offroad database (2016) will be used to establish the various equipment categories. Avg HP values were derived from SCAQMD and SacMetro AQMD construction resources.

| | | | | | |
|---|---|---|---|---|---|
| 4. Construction Schedule: | 9 | months | Construction Totals: | 422 | hrs/month |
| | 8 | hrs/day | | 3800 | hrs/const period |
| | 0.75 | years | | 475 | days/const period |

5. Anticipated Construction Start Year: 2025

6. Maximum anticipated equipment use month is: n/a

7.
N2O EF diesel, lb/gal: 0.000183
N2O EF gasoline, lb/gal: 0.000164
CARB, Mandatory GHG Reporting Regulation
Table 4, Appendix A, 2007.

Equipment types and use rates supplied by the Applicant.

| Equipment Category** | Weighted Average HP | # of Units Used for Project | Avg Use Rate Hrs/day | # of Days On Site (each) | Total Hrs/Day | Total Hrs per Const Period | Total HP-Hrs Period |
|---|---|---|---|---|---|---|---|
| Aerial Lifts | 63 | 1 | 6 | 56 | 6 | 336 | 21168 |
| Air Compressors | 78 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bore-Drill Rigs | 206 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cement Mixers | 9 | 0 | 0 | 0 | 0 | 0 | 0 |
| Concrete/Industrial Saws | 81 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cranes | 226 | 1 | 2 | 56 | 2 | 112 | 25312 |
| Crawler Tractors/Dozers | 208 | 3 | 7 | 125 | 21 | 2625 | 546000 |
| Crushing/Processing Eq. | 85 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dumpers/Tenders/Water Trucks | 16 | 7 | 7 | 115 | 49 | 5635 | 90160 |
| Excavators | 163 | 0 | 0 | 0 | 0 | 0 | 0 |
| Forklifts | 89 | 8 | 6 | 120 | 48 | 5760 | 512640 |
| Generator Sets | 84 | 0 | 0 | 0 | 0 | 0 | 0 |
| Graders | 175 | 5 | 7 | 65 | 35 | 2275 | 398125 |
| Off-Highway Tractors | 123 | 0 | 0 | 0 | 0 | 0 | 0 |
| Off-Highway Trucks | 400 | 12 | 7 | 132 | 84 | 11088 | 4435200 |
| Other Diesel Construction Eq. | 172 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other General Industrial Eq. | 88 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Material Handling Eq. | 167 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pavers | 126 | 1 | 4 | 17 | 4 | 68 | 8568 |
| Paving Eq. Other | 131 | 0 | 0 | 0 | 0 | 0 | 0 |
| Plate Compactors | 8 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pressure Washers | 13 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pumps | 84 | 0 | 0 | 0 | 0 | 0 | 0 |
| Roller Compactors | 81 | 1 | 7 | 25 | 7 | 175 | 14175 |
| Rough Terrain Forklifts | 100 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber Tired Dozers | 255 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber Tires Loaders | 200 | 0 | 0 | 0 | 0 | 0 | 0 |
| Scrapers | 362 | 0 | 0 | 0 | 0 | 0 | 0 |
| Signal Boards | 6 | 0 | 0 | 0 | 0 | 0 | 0 |
| Skid Steer Loaders | 65 | 1 | 7 | 113 | 7 | 791 | 51415 |
| Surfacing Eq. | 254 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sweepers/Scrubbers | 64 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tractors (single category) | 98 | 2 | 7 | 147 | 14 | 2058 | 201684 |
| Front End Loaders (single category) | 98 | 1 | 7 | 50 | 7 | 350 | 34300 |
| Backhoes (single category) | 98 | 1 | 4 | 95 | 4 | 380 | 37240 |
| Trenchers | 81 | 10 | 4 | 141 | 40 | 5640 | 456840 |
| Welders | 46 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gasoline Const Eq. | 175 | 0 | 0 | 0 | 0 | 0 | 0 |

** diesel equipment unless otherwise specified.

| | | |
|---|---|---|
| Const Period Diesel Hp-Hrs = | 6832827 | |
| Const Period Gasoline Hp-Hrs = | 0 | |
| Const Period Diesel Fuel Use = | 409970 | gals |
| Const Period Gasoline Fuel Use = | 0 | gals |

Offroad equipment emissions factors derived SCAQMD Off Road database for 2025.
The SCAQMD EFs as presented incorporate the average equipment load factors.
Emissions factors for each category of equipment represent the composite factors for the stated equipment category as derived from the SCAQMD Offroad database for the construction start year.

**2025 Equipment Emissions Factors**

| Equip. Type | lbs/hr VOC (ROG) | lbs/hr CO | lbs/hr NOx | lbs/hr SOx | lbs/hr PM10 | lbs/hr CO2 | lbs/hr CH4 |
|---|---|---|---|---|---|---|---|
| Aerial Lifts | 0.0184 | 0.1646 | 0.1366 | 0.0004 | 0.0048 | 34.7217 | 0.0017 |
| Air Compressors | 0.0349 | 0.3027 | 0.2104 | 0.0007 | 0.0088 | 63.6073 | 0.0031 |
| Bore-Drill Rigs | 0.0428 | 0.5007 | 0.2864 | 0.0017 | 0.0042 | 164.8678 | 0.0039 |
| Cement Mixers | 0.0085 | 0.0414 | 0.0534 | 0.0001 | 0.0021 | 7.2481 | 0.0008 |
| Concrete/Industrial Saws | 0.0337 | 0.3706 | 0.2471 | 0.0007 | 0.0093 | 58.4637 | 0.0030 |
| Cranes | 0.0681 | 0.3738 | 0.4223 | 0.0014 | 0.0143 | 128.6241 | 0.0061 |
| Crawler Tractors/Dozers | 0.0789 | 0.5065 | 0.4492 | 0.0013 | 0.0227 | 114.0167 | 0.0071 |
| Crushing/Processing Eq. | 0.0693 | 0.6187 | 0.3763 | 0.0015 | 0.0146 | 132.3077 | 0.0062 |
| Dumpers/Tenders | 0.0092 | 0.0314 | 0.0581 | 0.0001 | 0.0022 | 7.6244 | 0.0008 |
| Excavators | 0.0559 | 0.5086 | 0.2269 | 0.0013 | 0.0086 | 119.5792 | 0.0050 |
| Forklifts | 0.0236 | 0.2148 | 0.0860 | 0.0006 | 0.0025 | 54.3958 | 0.0021 |
| Generator Sets | 0.0288 | 0.2667 | 0.2329 | 0.0007 | 0.0081 | 60.9927 | 0.0026 |
| Graders | 0.0676 | 0.5696 | 0.3314 | 0.0015 | 0.0147 | 132.7431 | 0.0061 |
| Off-Highway Tractors | 0.1134 | 0.6101 | 0.7291 | 0.0017 | 0.0331 | 151.3869 | 0.0102 |
| Off-Highway Trucks | 0.1140 | 0.5385 | 0.4769 | 0.0027 | 0.0142 | 260.0652 | 0.0103 |
| Other Diesel Construction Eq. | 0.0442 | 0.3474 | 0.2021 | 0.0013 | 0.0069 | 122.5051 | 0.0040 |
| Other General Industrial Eq. | 0.0747 | 0.4438 | 0.3947 | 0.0016 | 0.0130 | 152.2399 | 0.0067 |
| Other Material Handling Eq. | 0.0696 | 0.4355 | 0.3844 | 0.0015 | 0.0124 | 141.1941 | 0.0063 |
| Pavers | 0.0717 | 0.4745 | 0.3858 | 0.0009 | 0.0220 | 77.9326 | 0.0065 |
| Paving Eq. Other | 0.0548 | 0.3993 | 0.3281 | 0.0008 | 0.0190 | 68.9364 | 0.0049 |
| Plate Compactors | 0.0050 | 0.0263 | 0.0314 | 0.0001 | 0.0012 | 4.3138 | 0.0005 |
| Pressure Washers | 0.0066 | 0.0531 | 0.0561 | 0.0001 | 0.0019 | 9.4135 | 0.0006 |
| Pumps | 0.0270 | 0.2617 | 0.2079 | 0.0006 | 0.0078 | 49.6066 | 0.0024 |
| Roller Compactors | 0.0410 | 0.3763 | 0.2501 | 0.0008 | 0.0122 | 67.0308 | 0.0037 |
| Rough Terrain Forklifts | 0.0396 | 0.4430 | 0.2336 | 0.0008 | 0.0090 | 70.2808 | 0.0036 |
| Rubber Tired Dozers | 0.1672 | 0.6620 | 1.0824 | 0.0025 | 0.0419 | 239.0780 | 0.0151 |
| Rubber Tires Loaders | 0.0559 | 0.4311 | 0.2835 | 0.0012 | 0.0121 | 108.6113 | 0.0050 |
| Scrapers | 0.1495 | 0.7187 | 0.8387 | 0.0027 | 0.0335 | 262.4827 | 0.0135 |
| Signal Boards | 0.0111 | 0.0909 | 0.0718 | 0.0002 | 0.0029 | 16.6983 | 0.0010 |
| Skid Steer Loaders | 0.0186 | 0.2104 | 0.1354 | 0.0004 | 0.0019 | 30.2740 | 0.0017 |
| Surfacing Eq. | 0.0638 | 0.3590 | 0.3924 | 0.0017 | 0.0142 | 165.9715 | 0.0058 |
| Sweepers/Scrubbers | 0.0410 | 0.4840 | 0.2255 | 0.0009 | 0.0061 | 78.5433 | 0.0037 |
| Tractors | 0.0336 | 0.3586 | 0.1857 | 0.0008 | 0.0059 | 66.7965 | 0.0030 |
| Front End Loaders | 0.0336 | 0.3586 | 0.1857 | 0.0008 | 0.0059 | 66.7965 | 0.0030 |
| Backhoes | 0.0336 | 0.3586 | 0.1857 | 0.0008 | 0.0059 | 66.7965 | 0.0030 |
| Trenchers | 0.0674 | 0.4085 | 0.3481 | 0.0007 | 0.0215 | 58.7116 | 0.0061 |
| Welders | 0.0214 | 0.1745 | 0.1373 | 0.0003 | 0.0052 | 25.6027 | 0.0019 |
| Gasoline Const Eq. (assumed 175 hp category) | 0.0771 | 0.3855 | 1.08 | 0.00014 | 0.1542 | 14.1565 | 0.00037 |

(gasoline EFs: EPA OMS-AMD Report NR-009A, 2-13-98, and SCAQMD EMFAC 2007 CEQA Tables, 2016.)

Construction Period Emissions, lbs

| Equip. Type | VOC | CO | NOx | SOx | PM10 | CO2 | CH4 |
|---|---|---|---|---|---|---|---|
| Aerial Lifts | 6 | 55 | 46 | 0 | 2 | 11666 | 1 |
| Air Compressors | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bore-Drill Rigs | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cement Mixers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Concrete/Industrial Saws | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cranes | 8 | 42 | 47 | 0 | 2 | 14406 | 1 |
| Crawler Tractors/Dozers | 207 | 1329 | 1179 | 3 | 60 | 299294 | 19 |
| Crushing/Processing Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dumpers/Tenders | 52 | 177 | 328 | 1 | 12 | 42963 | 5 |
| Excavators | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Forklifts | 136 | 1237 | 495 | 3 | 14 | 313320 | 12 |
| Generator Sets | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Graders | 154 | 1296 | 754 | 3 | 34 | 301990 | 14 |
| Off-Highway Tractors | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Off-Highway Trucks | 1265 | 5970 | 5288 | 29 | 158 | 2883603 | 114 |
| Other Diesel Construction Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other General Industrial Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Material Handling Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pavers | 5 | 32 | 26 | 0 | 1 | 5299 | 0 |
| Paving Eq. Other | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Plate Compactors | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pressure Washers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pumps | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Roller Compactors | 7 | 66 | 44 | 0 | 2 | 11730 | 1 |
| Rough Terrain Forklifts | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber Tired Dozers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber Tires Loaders | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Scrapers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Signal Boards | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Skid Steer Loaders | 15 | 166 | 107 | 0 | 2 | 23947 | 1 |
| Surfacing Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sweepers/Scrubbers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tractors | 69 | 738 | 382 | 2 | 12 | 137467 | 6 |
| Front End Loaders | 12 | 126 | 65 | 0 | 2 | 23379 | 1 |
| Backhoes | 13 | 136 | 71 | 0 | 2 | 25383 | 1 |
| Trenchers | 380 | 2304 | 1963 | 4 | 121 | 331134 | 34 |
| Welders | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gasoline Const Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| Totals | VOC | CO | NOx | SOx | PM10 | PM2.5 | CO2 | CH4 | N2O |
|---|---|---|---|---|---|---|---|---|---|
| lbs per const. period | 2328 | 13675 | 10795 | 47 | 424 | 419.95 | 4425582 | 210 | 75 |
| tons per const. period | 1.2 | 6.8 | 5.4 | 0.024 | 0.21 | 0.21 | 2212.79 | 0.11 | 0.04 |
| Average lbs/day = | 4.9 | 28.8 | 22.7 | 0.099 | 0.89 | 0.88 | 9317.01 | 0.44 | 0.16 |
| Normalized TPY = | *1.2* | *6.8* | *5.4* | *0.024* | *0.2* | *0.2* | *2212.8* | *0.1* | *0.040* |

| | |
|---|---|
| CO2e, tons/period | 2226.6 |
| CO2e, tons/yr: | 2226.6 |

CARB-CEIDARS, Updated Size Fractions for PM Profiles: PM2.5 = 0.991 of PM10 : Diesel Vehicle Exhaust

Other Assumptions and References:

1. Trench construction times per: Southern Regional Water Pipeline Alliance, 3/08.
   Optimum trench construction progress rate is 80m (260ft) per day.
   Non-optimum trench construction progress rate is 30m (100 ft) per day.
   An average progress of 180 ft/day is used where applicable.
2. Paving speeds can range from 3 to 15 m/min depending on asphalt delivery rates and required compaction thickness.
   A minium paving speed of 3 m/min (10 ft/min or 600 ft/hr) was used where applicable.
   The minimum speed is based upon a 3" compacted layer, 12 ft lane width, with an asphalt delivery rate of ~ 140 tons/hr.
   Ref: Asphalt Paving Speed, Pavement Worktip No. 31, AAPA, 11/2001.
3. Estimation of maximum daily emissions is extremely variable, and these values are not required by SJVAPCD.
4. Construction schedule note: applicant data indicates a construction work day period of 8 hours
   The equipment use rates provided by the applicant are consistent with an 8 hour workday.
5. GWP values: CH4=25, N2O=298, ref: 40 CFR 98 Subpart A, Table A-1.

**CONSTRUCTION PHASE - SGF 8**

| | | | | |
|---|---|---|---|---|
| **MRI Level 2 Analysis (Refs 1, 3-7)** | | Acres | 3160 | |
| Acres Subject to Construction Disturbance Activites: | | | 316 | |
| Max Acres Subject to Construction Disturbance Activites on any day of this phase: | | | 23.7 | note (10) |
| Emissions Factor for PM10 Uncontrolled, tons/acre/month: | | | 0.12 | |
| PM2.5 fraction of PM10 (per CARB CEIDARS Profiles): | | | 0.21 | |
| **Activity Levels:** | Hrs/Day: | | 8 | |
| | Days/Wk: | | 5 | |
| | Days/Month: Applicant Data | | 22 | |
| | Phase Const Period, Months: | | 20.5 | 1.71 years |
| | Phase Const Period, Days: | | 451 | |

**Wet Season Adjustment:** (Per AP-42, Section 13.2.2, Figure 13.2.2-1, 12/03 or CalEEMod, Appendix D, Table 1.1.)

| | |
|---|---|
| Mean # days/year with rain >= 0.01 inch: | 40 |
| Mean # months/yr with rain >= 0.01 inch: | 1.33 |
| Adjusted Const Period, Months: | 18.22 |
| Adjusted Const Period, Days: | 383 |

**Controls for Fugitive Dust:** Proposed watering cycle: 3 times per day

3 watering cycles/8 hour construction shift yields a 68% reduction, use 68% for non-desert sites. (11)(12)
Speed control of onsite const traffic to <15 mph yields a 40-70% reduction (use 50% control as conservative for site). (11)(12)

| | | |
|---|---|---|
| Calculated % control based on mitigations proposed: | 84 | % control |
| Conservative control % used for emissions estimates: | 84 | % control |
| | 0.16 | release fraction |

| **Emissions: Controlled** | PM10 | PM2.5 |
|---|---|---|
| tons/month | 0.455 | 0.096 |
| tons/period | 8.292 | 1.741 |
| Max lbs/day | 41.367 | 8.687 |

**Soil Handling Emissions (Cut and Fill): (2)**

| | |
|---|---|
| Total cu.yds of soil handled: | 0 |
| Total tons of soil handled: | 0.0 |
| Total days soil handled: | 383 |
| Tons soil/day: | 0 |
| Control Eff, watering, % | 80 |
| Release Fraction: | 0.2 |

| Emissions: | PM10 | PM2.5 |
|---|---|---|
| tons/period | 0.000 | 0.000 |
| tons/month | 0.000 | 0.000 |
| max lbs/day | 0.000 | 0.000 |

| | | | |
|---|---|---|---|
| Mean annual wind speed, mph: (8) | | | 8.03 |
| Avg. Soil moisture, %: (9) | | | 5 |
| Avg. Soil density, tons/cu.yd: | | | 1.3 |
| k factor for PM10: | | | 0.35 |
| Number of Drops per ton: | | | 4 |
| Calc 1 | wind | | 1.851 |
| Calc 2 | moisture | | 3.607 |
| Calc 3 | int | | 0.513 |
| Calc 4 | PM10 | lb/ton | 0.0006 |
| PM2.5 fraction of PM10: | | | 0.210 |

| **Emissions Totals:** | **PM10** | **PM2.5** |
|---|---|---|
| **tons/period** | **8.292** | **1.741** |

**Methodology References:**

(1) MRI Report, South Coast AQMD Project No. 95040, March 1996, Level 2 Analysis Procedure.
MRI Report uncontrolled factor of 0.11 tons/acre/month is based on 168 hours per month of const activity.
For an activity rate of ~180 hrs/month, the adjusted EF would be 0.12 tons/acre/month (uncontrolled).
(2) Soil Handling (Cut and Fill), EPA, AP-42, Section 13.2.4., 11/06.
(3) URBEMIS, Version 9.2.4, User's Manual Appendix A, page A-6.
(4) CARB Area Source Methodology, Section 7.7, 9/02.
(5) WRAP Fugitive Dust Handbook, 9/06.
(6) USEPA, AP-42, Section 13.2.3, 2/10.
(7) Estimating PM Emissions from Construction Operations, USEPA, MRI, 9/99.
(8) Wind speed data for Lemoore met station. Annual avg wind speed = 8.03 mph, % calms = 3.44%.
(9) Soil Moisture; 5% assumed avg value
(10) adjusted applicant value based on 7.5% of total acreage disturbed on any given day
(11) SCAQMD CEQA Handbook 1993.
(12) SCAQMD, Sample Construction Scenarios for Projects Less than Five Acres, Fugitive Dust Mitigations, February 2005.

**OFFSITE PAVED ROAD FUGITIVE DUST EMISSIONS**
(associated with delivery truck and worker vehicle traffic on I-5 and plant access road)

| | | | |
|---|---|---|---|
| Average mileage for construction related vehicles: | | NA | miles, roundtrip distance*** |
| Avg weight of vehicular equipment on road: | | 4.1 | tons (range 2 - 42 tons) |
| Road surface silt loading factor: | | 0.015 | g/m2 (range 0.03 - 400 g/m2) |
| | | | Limited Access Freeway >10,000 ADT **(I-5)** |
| Particle size multiplier factors: | PM10 | 0.0022 | lb/VMT |
| | PM2.5 | 0.00054 | lb/VMT |
| C factors (brake and tire wear): | PM10 | 0.00047 | lb/VMT |
| | PM2.5 | 0.00036 | lb/VMT |
| Avg vehicle speed on road: | | 65 | mph |
| Avg. Number of vehicles per day: | | 195 | |
| | | | calculated per Applicant da |
| Avg. Number of work days per month: | | 22 | **VMT/period:** **13533715** |
| | Total vehicles per month: | 4290 | |
| Number of work months: | | 8 | adjusted for precip events |
| | Total vehicles per const period: | 34320 | |

| | PM10 | |
|---|---|---|
| Calc 1 | 0.022 | |
| Calc 2 | 4.217 | |
| Calc 3 | 0.0007 | lb/VMT |

| **Emissions** | **PM10** | **PM2.5** |
|---|---|---|
| **lbs/period** | **9109.51** | **1539.51** |
| **tons/period** | **4.555** | **0.770** |

EPA, AP-42, Section 13.2.1, March 2006, updated 9/2008.
PM2.5 fraction of PM10 per CARB CEIDARs is 0.169
*** Note: avg roundtrip distance traveled by delivery or worker vehicles on freeways (I-5) and other State Routes in the project area.
Vehicles per day: worker + deliveries+staff support vehciles (averages)

**ONSITE UNPAVED ROAD FUGITIVE DUST**

| | | | | | |
|---|---|---|---|---|---|
| Length of Unpaved Roads on Construction site: | | 0.1 | miles* | | |
| Avg weight of construction vehicular equipment on road: | | 4.1 | tons (range 2 - 42 tons) | | |
| Road surface silt content: | | 8.5 | % (range 1.8 - 35%) | | |
| Road surface material moisture content: | | 5 | % (range 0.03 - 13%) | | |
| | | k | a | b | |
| Particle size multiplier factors: | PM10 | 1.5 | 0.9 | 0.45 | |
| | PM2.5 | 0.15 | 0.9 | 0.45 | |
| C factors (brake and tire wear): | PM10 | 0.00047 | lb/VMT | | |
| | PM2.5 | 0.00036 | lb/VMT | | |
| Avg construction vehicle speed on road: | | 5 | mph (range 5-55 mph) | | |
| Avg number of construction vehicles per day: | | 74 | ** | | |
| Number of construction work days per month: | | 22 | | **VMT/period:** | **13439.6** |
| Total vehicles per month: | | 1628 | | | |
| Number of construction work months: | | 8 | adjusted for precipitation events | | |
| Total vehicles per const period: | | 134396 | | | |
| Control reduction due to watering, speed control, etc. = | | 80 | | | |
| | | 0.8 | | | |
| Release Fraction = | | 0.2 | | | |

| | PM10 | PM2.5 |
|---|---|---|
| Calc 1 | 0.733 | 0.733 |
| Calc 2 | 1.151 | 1.151 |
| Calc 3 | 1.266 | 0.127 |
| Calc 4 | 1.266 | 0.127 |
| Controlled lb/VMT | 0.253 | 0.025 |

| **Emissions** | **PM10** | **PM2.5** |
|---|---|---|
| **lbs/period** | **3403.54** | **341.20** |
| **tons/period** | **1.702** | **0.171** |

EPA, AP-42, Section 13.2.2, March 2006
Soil Moisture; 5% avg
Soil silt content: 8.5% per AP-42 for construction site scraper routes
** const equipment plus site support pickups plus

**CONSTRUCTION PHASE - Truck Hauling/Delivery and Site Support Vehicle Emissions**

**All Phases**

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Delivery/Hauling Vehicle Use Rates** | | | | | Emissions Factors (lbs/vmt) | | | | | | |
| Delivery Roundtrip Distance: | 0 | miles | NOx | CO | VOC | SOx | PM10 | CO2 | | | |
| Const Days per Period: | 0 | | 0.00133459 | 0.00037027 | 6.2834E-05 | 0.000025 | 1.0747E-05 | 2.91617689 | HDDT | | |
| Avg Deliveries per Day: | 0 | | 0.00026191 | 0.00201574 | 3.9247E-05 | 0.000011 | 2.7302E-06 | 0.8745735 | MDGT | | |
| Fraction of Deliveries-Diesel: | 0.95 | HDDT | | | **Daily Emissions (lbs)** | | | | | | |
| Fraction of Deliveries-Gas: | 0.05 | MDGT | **NOx** | **CO** | **VOC** | **SOx** | **PM10** | **CO2** | **PM2.5** | | |
| Total Delivery VMT: | **2481715** | **per Applicant** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | HDDT | |
| Total Daily VMT-Diesel | 0 | | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | MDGT | |
| Total Daily VMT-Gasoline | 0 | | | | **Tons per Const Period** | | | | | | |
| Total Period VMT-Diesel | 2357629.25 | | 1.573 | 0.436 | 0.074 | 0.029 | 0.013 | 3437.6 | 0.011 | HDDT | |
| Total Period VMT-Gasoline | 124085.75 | | 0.016 | 0.125 | 0.002 | 0.001 | 0.000 | 54.3 | 0.000 | MDGT | |
| | | | | | | | | | | | |
| **Construction Site Support Vehicle Use Rates (LDTs)** | | | | | **Daily Emissions, lbs** | | | | | | |
| Gasoline Vehicle VMT Period: | 75900 | | **NOx** | **CO** | **VOC** | **SOx** | **PM10** | **CO2** | | | **PM2.5** |
| Avg Daily Gasoline VMT: | 300 | | 0.0002232 | 0.00204313 | 3.6203E-05 | 0.000007 | 3.782E-06 | 0.55087942 | lbs/vmt* | LDT gasoline | |
| Avg Daily Diesel VMT: | 0 | | 0.0670 | 0.6129 | 0.0109 | 0.0021 | 0.0011 | 165.2638 | lbs/day | gasoline | 0.0007 |
| Total Phase Const Days: | 240 | | | | | | | | | | |
| | | | | | **Tons per Const Period** | | | | | | |
| Ref: EMFAC 2014, SJVAPCD Year 2023 | | | 0.0085 | 0.0775 | 0.0014 | 0.0003 | 0.0001 | 20.9 | **tons/period** | **gasoline** | 0.0001 |

LDT1-gas, MDV-gas, HDDT-dsl

See EF data in WSP Support Appendix

**Notes *****

VMT for delivery/hauling for all vehicles includes: (1) materials deliveries to site, (2) materials removal from site, other VMT as specified below.

Support Vehicle VMT: best estimate at time of filing, 10 LDT (gasoline) at 30 VMT/day

CARB-CEIDARS, Updated Fractions for PM Profiles: PM2.5 = 0.991 of PM10 for Diesel Exhaust, and 0.998 for Gasoline Vehicles.

**CONSTRUCTION PHASE - Worker Travel - Emissions**

Ref: SJVAPCD EMFAC 2014, Year 2025
LDA-gas
See EF data in WSP Support Appendix

**Worker Travel to Site**

| | |
|---|---|
| Avg Occupancy/Vehicle: | 0 |
| Avg Roundtrip Distance, miles: | 0.0 |
| Avg # of Worker Vehicles, per day: | 0 |
| Avg Daily Worker VMT: | 0 |
| Max # of Worker Vehicles, per day: | 0 |
| Max Daily Worker VMT: | 0 |
| Total Const Days: | 240 |
| **Total Const Period Worker VMT:** | **11052000** |

**VMT data supplied by Applicant.**

Emissions Factors (lbs/VMT)

| NOx | CO | VOC | SOx | PM10 | CO2 |
|---|---|---|---|---|---|
| 8.5075E-05 | 0.000810295 | 1.5737E-05 | 0.000006 | 0.000004 | 0.56063169 |

**Daily Emissions (lbs)**

| | NOx | CO | VOC | SOx | PM10 | CO2 | PM2.5 |
|---|---|---|---|---|---|---|---|
| Avg | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**Tons per Const Period**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Avg | 0.470 | 4.478 | 0.087 | 0.033 | 0.022 | 3098.1 | 0.000 |

**Worker Travel by Busing from Staging Area**

| | |
|---|---|
| Total Bus VMT/Const Period: | 0 |
| Avg Bus VMT/Const Day: | 0 |
| Max Bus VMT/Const Day: | 0 |

| | | |
|---|---|---|
| Bus Round Trips/Day: | 0 | max |
| Bus Occupancy/Trip: | 0 | |

Ref: SJVAPCD EMFAC 2014, Year 2025
All other buses-DSL
See EF data in WSP Support Appendix

# buses supplied by Applicant.

Emissions Factors (lbs/VMT)

| NOx | CO | VOC | SOx | PM10 | CO2 |
|---|---|---|---|---|---|
| 0.002933 | 0.00055 | 0.000105 | 0.000025 | 0.000007 | 2.661084 |

**Daily Emissions (lbs)**

| | **NOx** | **CO** | **VOC** | **SOx** | **PM10** | **CO2** | **PM2.5** |
|---|---|---|---|---|---|---|---|
| Avg | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Max | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**Tons per Const Period**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Avg | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

## CONSTRUCTION PHASE - Trackout Emissions

| | | | | | | |
|---|---|---|---|---|---|---|
| Paved Road Length (miles): | 0.1 | estimated roundtrip trackout distance | | | | |
| Daily # of Vehicles: | 74 | | | | | |
| Avg Vehicle Weight (tons): | 6.8 | | | **PM10** | **PM2.5*** | |
| Total Unadjusted VMT/day | 7.4 | | | 0.361 | | |
| Particle Size Multipliers | PM10 | | | 1.924 | | |
| lb/VMT | 0.023 | | | 0.002 | 0.0004 | lb/VMT |
| C factor, lb/VMT | 0.00047 | | | **0.129** | **0.0217** | **lbs/day** |
| Road Sfc Silt Loading (g/m^2): | 0.56 | local X 2 | | **0.001** | **0.0002** | **tons/month** |
| # of Active Trackout Points: | 1 | ** | | **0.01** | **0.0019** | **tons/period** |
| Added Trackout Miles: | PM10 | | | | | |
| Trackout VMT/day: | 44 | | *Default Silt Load Values for Paved Road Types* | | | |
| Final Adjusted VMT/day | 52 | | | Freeway | 0.02 g/m2 | |
| Final Adjusted VMT/month | 1140 | | | Arterial | 0.036 g/m2 | |
| Final Adjusted VMT/period | 9117 | | | Collector | 0.036 g/m2 | |
| Construction days/month: | 22 | | | Local | 0.28 g/m2 | |
| Adj. Construction months/period: | 8.00 | | | Rural | 1.6 g/m2 | |
| Control Applied to Trackout: | Gravel entrance, metal cleaning grates, water washing, sweeping | | | | | |
| Control Efficiency, % | 84 | 0.84 | Release Factor = | | 0.16 | |

* PM2.5 fraction of PM10 assumed to be 0.169 (CARB CEIDARS updated fraction values) for paved roads.
** 1 controlled ingress/egress point is planned for site construction
EPA, AP-42, Section 13.2.1, Proposed revisions dated 9/2008.
Use silt loading factor from default values for road type if no site specific data is available.
Trackout effects approximately 0.05 mi. of roadway arriving and departing from the site access point.
Plant access road is already paved. Entrance will be gravelled with metal grates for take out control.
Vehicle count = delivery trucks plus site support trucks (see Unpaved Onsite tab)
Worker vehicles not counted for trackout, they will park on the site perimeter.

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## Tons/Period

| | NOx | CO | VOC | SOx | PM10 | CO2 | Fug PM10 | Fug PM2.5 |
|---|---|---|---|---|---|---|---|---|
| on-off site travel | 2.07 | 5.12 | 0.16 | 0.06 | 0.04 | 5997 | 11.53 | 2.05 |
| on-site equipment | 5.40 | 6.84 | 1.16 | 0.02 | 0.21 | 2227 | | |
| Total | 7.47 | 11.95 | 1.33 | 0.09 | 0.25 | 8224 | 11.53 | 2.05 |
| Months: | 16 | | | | | | | |
| Max Year Months: | 12 | | | | | | | |
| Total per Year: | 5.60 | 8.97 | 1.00 | 0.07 | 0.19 | 6167.97 | 8.65 | 1.54 |

CONSTRUCTION EQUIPMENT EXHAUST EMISSIONS

Project: WSP **Main Site Construction-SGF 9**

**Assumptions:**

1. The average engines employed in construction equipment use consumes fuel at a rate of: diesel 0.06 gal/hp-hr; gasoline 0.11 gal/hp-hr

Ref: EPA, NR-009b Publication, November 2002.
Ref: Sacramento County APCD Const. Program Data, V. 6.0.3, 3/2007.
Ref: EPA, NR-009c Publication, EPA 420-P-04-009, April 2004.
Ref: Niland Energy Project, IID, AFC Vol 2, App A.
Ref: South Coast AQMD PR XXI, Draft Staff Report, 3-15-95, and SCAQMD CEQA Manual, 11/03.
The above noted references present fuel consumption values which range from 0.050 to 0.064 gal/hp-hr for diesel engines used in construction related equipment. The value of 0.060 gal/hp-hr was chosen as a reasonable upper mid-range value for construction diesel emissions calculations.
For gasoline the mid-range value from SCAQMD of 0.11 gal/hp-hr was used.

2. Construction equipment exhaust emissions will be calculated on an annual basis using the site specific equipment list, HP ratings, hours of use, days of use, etc. Annual emissions will be apportioned to daily values based on the estimated construction period time on site.

3. The equipment list derived from the South Coast AQMD Offroad database (2016) will be used to establish the various equipment categories. Avg HP values were derived from SCAQMD and SacMetro AQMD construction resources.

4. Construction Schedule: 16 months; 8 hrs/day; 1.33 years

Construction Totals: 225 hrs/month; 3600 hrs/const period; 450 days/const period

5. Anticipated Construction Start Year: 2026

6. Maximum anticipated equipment use month is: n/a

7. N2O EF diesel, lb/gal: 0.000183
N2O EF gasoline, lb/gal: 0.000164
CARB, Mandatory GHG Reporting Regulation
Table 4, Appendix A, 2007.

Equipment types and use rates supplied by the Applicant.

| Equipment Category** | Weighted Average HP | # of Units Used for Project | Avg Use Rate Hrs/day | # of Days On Site (each) | Total Hrs/Day | Total Hrs per Const Period | Total HP-Hrs Period |
|---|---|---|---|---|---|---|---|
| Aerial Lifts | 63 | 1 | 6 | 56 | 6 | 336 | 21168 |
| Air Compressors | 78 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bore-Drill Rigs | 206 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cement Mixers | 9 | 0 | 0 | 0 | 0 | 0 | 0 |
| Concrete/Industrial Saws | 81 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cranes | 226 | 1 | 2 | 56 | 2 | 112 | 25312 |
| Crawler Tractors/Dozers | 208 | 3 | 7 | 125 | 21 | 2625 | 546000 |
| Crushing/Processing Eq. | 85 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dumpers/Tenders/Water Trucks | 16 | 7 | 7 | 115 | 49 | 5635 | 90160 |
| Excavators | 163 | 0 | 0 | 0 | 0 | 0 | 0 |
| Forklifts | 89 | 8 | 6 | 120 | 48 | 5760 | 512640 |
| Generator Sets | 84 | 0 | 0 | 0 | 0 | 0 | 0 |
| Graders | 175 | 5 | 7 | 65 | 35 | 2275 | 398125 |
| Off-Highway Tractors | 123 | 0 | 0 | 0 | 0 | 0 | 0 |
| Off-Highway Trucks | 400 | 12 | 7 | 132 | 84 | 11088 | 4435200 |
| Other Diesel Construction Eq. | 172 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other General Industrial Eq. | 88 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Material Handling Eq. | 167 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pavers | 126 | 1 | 4 | 17 | 4 | 68 | 8568 |
| Paving Eq. Other | 131 | 0 | 0 | 0 | 0 | 0 | 0 |
| Plate Compactors | 8 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pressure Washers | 13 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pumps | 84 | 0 | 0 | 0 | 0 | 0 | 0 |
| Roller Compactors | 81 | 1 | 7 | 25 | 7 | 175 | 14175 |
| Rough Terrain Forklifts | 100 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber Tired Dozers | 255 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber Tires Loaders | 200 | 0 | 0 | 0 | 0 | 0 | 0 |
| Scrapers | 362 | 0 | 0 | 0 | 0 | 0 | 0 |
| Signal Boards | 6 | 0 | 0 | 0 | 0 | 0 | 0 |
| Skid Steer Loaders | 65 | 1 | 7 | 113 | 7 | 791 | 51415 |
| Surfacing Eq. | 254 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sweepers/Scrubbers | 64 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tractors (single category) | 98 | 2 | 7 | 147 | 14 | 2058 | 201684 |
| Front End Loaders (single category) | 98 | 1 | 7 | 50 | 7 | 350 | 34300 |
| Backhoes (single category) | 98 | 1 | 4 | 95 | 4 | 380 | 37240 |
| Trenchers | 81 | 10 | 4 | 141 | 40 | 5640 | 456840 |
| Welders | 46 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gasoline Const Eq. | 175 | 0 | 0 | 0 | 0 | 0 | 0 |

** diesel equipment unless otherwise specified.

Const Period Diesel Hp-Hrs = 6832827
Const Period Gasoline Hp-Hrs = 0
Const Period Diesel Fuel Use = 409970 gals
Const Period Gasoline Fuel Use = 0 gals

Offroad equipment emissions factors derived SCAQMD Off Road database for 2025.
The SCAQMD EFs as presented incorporate the average equipment load factors.
Emissions factors for each category of equipment represent the composite factors for the stated equipment category as derived from the SCAQMD Offroad database for the construction start year.

**2025 Equipment Emissions Factors**

| Equip. Type | lbs/hr VOC (ROG) | lbs/hr CO | lbs/hr NOx | lbs/hr SOx | lbs/hr PM10 | lbs/hr CO2 | lbs/hr CH4 |
|---|---|---|---|---|---|---|---|
| Aerial Lifts | 0.0184 | 0.1646 | 0.1366 | 0.0004 | 0.0048 | 34.7217 | 0.0017 |
| Air Compressors | 0.0349 | 0.3027 | 0.2104 | 0.0007 | 0.0088 | 63.6073 | 0.0031 |
| Bore-Drill Rigs | 0.0428 | 0.5007 | 0.2864 | 0.0017 | 0.0042 | 164.8678 | 0.0039 |
| Cement Mixers | 0.0085 | 0.0414 | 0.0534 | 0.0001 | 0.0021 | 7.2481 | 0.0008 |
| Concrete/Industrial Saws | 0.0337 | 0.3706 | 0.2471 | 0.0007 | 0.0093 | 58.4637 | 0.0030 |
| Cranes | 0.0681 | 0.3738 | 0.4223 | 0.0014 | 0.0143 | 128.6241 | 0.0061 |
| Crawler Tractors/Dozers | 0.0789 | 0.5065 | 0.4492 | 0.0013 | 0.0227 | 114.0167 | 0.0071 |
| Crushing/Processing Eq. | 0.0693 | 0.6187 | 0.3763 | 0.0015 | 0.0146 | 132.3077 | 0.0062 |
| Dumpers/Tenders | 0.0092 | 0.0314 | 0.0581 | 0.0001 | 0.0022 | 7.6244 | 0.0008 |
| Excavators | 0.0559 | 0.5086 | 0.2269 | 0.0013 | 0.0086 | 119.5792 | 0.0050 |
| Forklifts | 0.0236 | 0.2148 | 0.0860 | 0.0006 | 0.0025 | 54.3958 | 0.0021 |
| Generator Sets | 0.0288 | 0.2667 | 0.2329 | 0.0007 | 0.0081 | 60.9927 | 0.0026 |
| Graders | 0.0676 | 0.5696 | 0.3314 | 0.0015 | 0.0147 | 132.7431 | 0.0061 |
| Off-Highway Tractors | 0.1134 | 0.6101 | 0.7291 | 0.0017 | 0.0331 | 151.3869 | 0.0102 |
| Off-Highway Trucks | 0.1140 | 0.5385 | 0.4769 | 0.0027 | 0.0142 | 260.0652 | 0.0103 |
| Other Diesel Construction Eq. | 0.0442 | 0.3474 | 0.2021 | 0.0013 | 0.0069 | 122.5051 | 0.0040 |
| Other General Industrial Eq. | 0.0747 | 0.4438 | 0.3947 | 0.0016 | 0.0130 | 152.2399 | 0.0067 |
| Other Material Handling Eq. | 0.0696 | 0.4355 | 0.3844 | 0.0015 | 0.0124 | 141.1941 | 0.0063 |
| Pavers | 0.0717 | 0.4745 | 0.3858 | 0.0009 | 0.0220 | 77.9326 | 0.0065 |
| Paving Eq. Other | 0.0548 | 0.3993 | 0.3281 | 0.0008 | 0.0190 | 68.9364 | 0.0049 |
| Plate Compactors | 0.0050 | 0.0263 | 0.0314 | 0.0001 | 0.0012 | 4.3138 | 0.0005 |
| Pressure Washers | 0.0066 | 0.0531 | 0.0561 | 0.0001 | 0.0019 | 9.4135 | 0.0006 |
| Pumps | 0.0270 | 0.2617 | 0.2079 | 0.0006 | 0.0078 | 49.6066 | 0.0024 |
| Roller Compactors | 0.0410 | 0.3763 | 0.2501 | 0.0008 | 0.0122 | 67.0308 | 0.0037 |
| Rough Terrain Forklifts | 0.0396 | 0.4430 | 0.2336 | 0.0008 | 0.0090 | 70.2808 | 0.0036 |
| Rubber Tired Dozers | 0.1672 | 0.6620 | 1.0824 | 0.0025 | 0.0419 | 239.0780 | 0.0151 |
| Rubber Tires Loaders | 0.0559 | 0.4311 | 0.2835 | 0.0012 | 0.0121 | 108.6113 | 0.0050 |
| Scrapers | 0.1495 | 0.7187 | 0.8387 | 0.0027 | 0.0335 | 262.4827 | 0.0135 |
| Signal Boards | 0.0111 | 0.0909 | 0.0718 | 0.0002 | 0.0029 | 16.6983 | 0.0010 |
| Skid Steer Loaders | 0.0186 | 0.2104 | 0.1354 | 0.0004 | 0.0019 | 30.2740 | 0.0017 |
| Surfacing Eq. | 0.0638 | 0.3590 | 0.3924 | 0.0017 | 0.0142 | 165.9715 | 0.0058 |
| Sweepers/Scrubbers | 0.0410 | 0.4840 | 0.2255 | 0.0009 | 0.0061 | 78.5433 | 0.0037 |
| Tractors | 0.0336 | 0.3586 | 0.1857 | 0.0008 | 0.0059 | 66.7965 | 0.0030 |
| Front End Loaders | 0.0336 | 0.3586 | 0.1857 | 0.0008 | 0.0059 | 66.7965 | 0.0030 |
| Backhoes | 0.0336 | 0.3586 | 0.1857 | 0.0008 | 0.0059 | 66.7965 | 0.0030 |
| Trenchers | 0.0674 | 0.4085 | 0.3481 | 0.0007 | 0.0215 | 58.7116 | 0.0061 |
| Welders | 0.0214 | 0.1745 | 0.1373 | 0.0003 | 0.0052 | 25.6027 | 0.0019 |
| Gasoline Const Eq. (assumed 175 hp category) | 0.0771 | 0.3855 | 1.08 | 0.00014 | 0.1542 | 14.1565 | 0.00037 |

(gasoline EFs: EPA OMS-AMD Report NR-009A, 2-13-98, and SCAQMD EMFAC 2007 CEQA Tables, 2016.)

Construction Period Emissions, lbs

| **Equip. Type** | **VOC** | **CO** | **NOx** | **SOx** | **PM10** | **CO2** | **CH4** |
|---|---|---|---|---|---|---|---|
| Aerial Lifts | 6 | 55 | 46 | 0 | 2 | 11666 | 1 |
| Air Compressors | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bore-Drill Rigs | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cement Mixers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Concrete/Industrial Saws | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cranes | 8 | 42 | 47 | 0 | 2 | 14406 | 1 |
| Crawler Tractors/Dozers | 207 | 1330 | 1179 | 3 | 60 | 299294 | 19 |
| Crushing/Processing Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dumpers/Tenders | 52 | 177 | 327 | 1 | 12 | 42963 | 5 |
| Excavators | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Forklifts | 136 | 1237 | 495 | 3 | 14 | 313320 | 12 |
| Generator Sets | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Graders | 154 | 1296 | 754 | 3 | 33 | 301991 | 14 |
| Off-Highway Tractors | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Off-Highway Trucks | 1264 | 5971 | 5288 | 30 | 157 | 2883603 | 114 |
| Other Diesel Construction Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other General Industrial Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Material Handling Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pavers | 5 | 32 | 26 | 0 | 1 | 5299 | 0 |
| Paving Eq. Other | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Plate Compactors | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pressure Washers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pumps | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Roller Compactors | 7 | 66 | 44 | 0 | 2 | 11730 | 1 |
| Rough Terrain Forklifts | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber Tired Dozers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber Tires Loaders | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Scrapers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Signal Boards | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Skid Steer Loaders | 15 | 166 | 107 | 0 | 2 | 23947 | 1 |
| Surfacing Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sweepers/Scrubbers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tractors | 69 | 738 | 382 | 2 | 12 | 137467 | 6 |
| Front End Loaders | 12 | 126 | 65 | 0 | 2 | 23379 | 1 |
| Backhoes | 13 | 136 | 71 | 0 | 2 | 25383 | 1 |
| Trenchers | 380 | 2304 | 1963 | 4 | 121 | 331133 | 34 |
| Welders | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gasoline Const Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| **Totals** | **VOC** | **CO** | **NOx** | **SOx** | **PM10** | **PM2.5** | **CO2** | **CH4** | **N2O** |
|---|---|---|---|---|---|---|---|---|---|
| lbs per const. period | 2327 | 13676 | 10795 | 48 | 423 | 419.52 | 4425582 | 210 | 75 |
| tons per const. period | 1.2 | 6.8 | 5.4 | 0.024 | 0.21 | 0.21 | 2212.79 | 0.10 | 0.04 |
| Average lbs/day = | 5.2 | 30.4 | 24.0 | 0.106 | 0.94 | 0.93 | 9834.63 | 0.47 | 0.17 |
| Normalized TPY = | *0.9* | *5.1* | *4.0* | *0.0* | *0.2* | *0.2* | *1659.6* | *0.1* | *0.028* |

| | |
|---|---|
| CO2e, tons/period | 2226.6 |
| CO2e, tons/yr: | 1669.9 |

CARB-CEIDARS, Updated Size Fractions for PM Profiles: PM2.5 = 0.991 of PM10 : Diesel Vehicle Exhaust

Other Assumptions and References:

1. Trench construction times per: Southern Regional Water Pipeline Alliance, 3/08.
   Optimum trench construction progress rate is 80m (260ft) per day.
   Non-optimum trench construction progress rate is 30m (100 ft) per day.
   An average progress of 180 ft/day is used where applicable.
2. Paving speeds can range from 3 to 15 m/min depending on asphalt delivery rates and required compaction thickness.
   A minium paving speed of 3 m/min (10 ft/min or 600 ft/hr) was used where applicable.
   The minimum speed is based upon a 3" compacted layer, 12 ft lane width, with an asphalt delivery rate of ~ 140 tons/hr.
   Ref: Asphalt Paving Speed, Pavement Worktip No. 31, AAPA, 11/2001.
3. Estimation of maximum daily emissions is extremely variable, and these values are not required by SJVAPCD.
4. Construction schedule note: applicant data indicates a construction work day period of 8 hours
   The equipment use rates provided by the applicant are consistent with an 8 hour workday.
5. GWP values: CH4=25, N2O=298, ref: 40 CFR 98 Subpart A, Table A-1.

**CONSTRUCTION PHASE - SGF 9**

| | | | | | |
|---|---|---|---|---|---|
| **MRI Level 2 Analysis (Refs 1, 3-7)** | | | Acres | 2565 | |
| Acres Subject to Construction Disturbance Activites: | | | | 256.5 | |
| Max Acres Subject to Construction Disturbance Activites on any day of this phase: | | | | 19.2 | note (10) |
| Emissions Factor for PM10 Uncontrolled, tons/acre/month: | | | | 0.12 | |
| PM2.5 fraction of PM10 (per CARB CEIDARS Profiles): | | | | 0.21 | |
| **Activity Levels:** | Hrs/Day: | | | 8 | |
| | Days/Wk: | | | 5 | |
| | Days/Month: | Applicant Data | | 22 | |
| | Phase Const Period, Months: | | | 16 | 1.33 years |
| | Phase Const Period, Days: | | | 450 | |

**Wet Season Adjustment:** (Per AP-42, Section 13.2.2, Figure 13.2.2-1, 12/03 or CalEEMod, Appendix D, Table 1.1.)

| | |
|---|---|
| Mean # days/year with rain >= 0.01 inch: | 40 |
| Mean # months/yr with rain >= 0.01 inch: | 1.33 |
| Adjusted Const Period, Months: | 14.22 |
| Adjusted Const Period, Days: | 397 |

**Controls for Fugitive Dust:** Proposed watering cycle: 3 times per day

3 watering cycles/8 hour construction shift yields a 68% reduction, use 68% for non-desert sites. (11)(12)
Speed control of onsite const traffic to <15 mph yields a 40-70% reduction (use 50% control as conservative for site). (11)(12)

| | | |
|---|---|---|
| Calculated % control based on mitigations proposed: | 84 | % control |
| Conservative control % used for emissions estimates: | 84 | % control |
| | 0.16 | release fraction |

| **Emissions: Controlled** | PM10 | PM2.5 |
|---|---|---|
| tons/month | 0.369 | 0.078 |
| tons/period | 5.253 | 1.103 |
| Max lbs/day | 33.578 | 7.051 |

**Soil Handling Emissions (Cut and Fill): (2)**

| | | | | | |
|---|---|---|---|---|---|
| Total cu.yds of soil handled: | 0 | Mean annual wind speed, mph: (8) | | | 8.03 |
| Total tons of soil handled: | 0.0 | Avg. Soil moisture, %: (9) | | | 5 |
| Total days soil handled: | 397 | Avg. Soil density, tons/cu.yd: | | | 1.3 |
| Tons soil/day: | 0 | k factor for PM10: | | | 0.35 |
| Control Eff, watering, % | 80 | Number of Drops per ton: | | | 4 |
| Release Fraction: | 0.2 | Calc 1 | wind | | 1.851 |
| | | Calc 2 | moisture | | 3.607 |
| | | Calc 3 | int | | 0.513 |
| | | Calc 4 | PM10 | lb/ton | 0.0006 |
| | | PM2.5 fraction of PM10: | | | 0.210 |

| Emissions: | PM10 | PM2.5 |
|---|---|---|
| tons/period | 0.000 | 0.000 |
| tons/month | 0.000 | 0.000 |
| max lbs/day | 0.000 | 0.000 |

| **Emissions Totals:** | **PM10** | **PM2.5** |
|---|---|---|
| **tons/period** | **5.253** | **1.103** |

**Methodology References:**

(1) MRI Report, South Coast AQMD Project No. 95040, March 1996, Level 2 Analysis Procedure.
MRI Report uncontrolled factor of 0.11 tons/acre/month is based on 168 hours per month of const activity.
For an activity rate of ~180 hrs/month, the adjusted EF would be 0.12 tons/acre/month (uncontrolled).
(2) Soil Handling (Cut and Fill), EPA, AP-42, Section 13.2.4., 11/06.
(3) URBEMIS, Version 9.2.4, User's Manual Appendix A, page A-6.
(4) CARB Area Source Methodology, Section 7.7, 9/02.
(5) WRAP Fugitive Dust Handbook, 9/06.
(6) USEPA, AP-42, Section 13.2.3, 2/10.
(7) Estimating PM Emissions from Construction Operations, USEPA, MRI, 9/99.
(8) Wind speed data for Lemoore met station. Annual avg wind speed = 8.03 mph, % calms = 3.44%.
(9) Soil Moisture; 5% assumed avg value
(10) adjusted applicant value based on 7.5% of total acreage disturbed on any given day
(11) SCAQMD CEQA Handbook 1993.
(12) SCAQMD, Sample Construction Scenarios for Projects Less than Five Acres, Fugitive Dust Mitigations, February 2005.

**OFFSITE PAVED ROAD FUGITIVE DUST EMISSIONS**
(associated with delivery truck and worker vehicle traffic on I-5 and plant access road)

| | | | |
|---|---|---|---|
| Average mileage for construction related vehicles: | | NA | miles, roundtrip distance*** |
| Avg weight of vehicular equipment on road: | | 4.1 | tons (range 2 - 42 tons) |
| Road surface silt loading factor: | | 0.015 | g/m2 (range 0.03 - 400 g/m2)<br>Limited Access Freeway >10,000 ADT **(I-5)** |
| Particle size multiplier factors: | PM10 | 0.0022 | lb/VMT |
| | PM2.5 | 0.00054 | lb/VMT |
| C factors (brake and tire wear): | PM10 | 0.00047 | lb/VMT |
| | PM2.5 | 0.00036 | lb/VMT |
| Avg vehicle speed on road: | | 65 | mph |
| Avg. Number of vehicles per day: | | 195 | |
| | | | calculated per Applicant da |
| Avg. Number of work days per month: | | 22 | **VMT/period: 13533715** |
| | Total vehicles per month: | 4290 | |
| Number of work months: | | 14.22 | adjusted for precip events |
| | Total vehicles per const period: | 61003.8 | |

| | PM10 | |
|---|---|---|
| Calc 1 | 0.022 | |
| Calc 2 | 4.217 | |
| Calc 3 | 0.0007 | lb/VMT |

| **Emissions** | **PM10** | **PM2.5** |
|---|---|---|
| **lbs/period** | **9109.51** | **1539.51** |
| **tons/period** | **4.555** | **0.770** |

EPA, AP-42, Section 13.2.1, March 2006, updated 9/2008.
PM2.5 fraction of PM10 per CARB CEIDARs is 0.169
*** Note: avg roundtrip distance traveled by delivery or worker vehicles on freeways (I-5) and other State Routes in the project area.
Vehicles per day: worker + deliveries+staff support vehciles (averages)

## ONSITE UNPAVED ROAD FUGITIVE DUST

| | | | | | |
|---|---|---|---|---|---|
| Length of Unpaved Roads on Construction site: | | 0.1 | miles* | | |
| Avg weight of construction vehicular equipment on road: | | 4.1 | tons (range 2 - 42 tons) | | |
| Road surface silt content: | | 8.5 | % (range 1.8 - 35%) | | |
| Road surface material moisture content: | | 5 | % (range 0.03 - 13%) | | |
| | | k | a | b | |
| Particle size multiplier factors: | PM10 | 1.5 | 0.9 | 0.45 | |
| | PM2.5 | 0.15 | 0.9 | 0.45 | |
| C factors (brake and tire wear): | PM10 | 0.00047 | lb/VMT | | |
| | PM2.5 | 0.00036 | lb/VMT | | |
| Avg construction vehicle speed on road: | | 5 | mph (range 5-55 mph) | | |
| Avg number of construction vehicles per day: | | 74 | ** | | |
| | | | | **calculated per Applicant dat** | |
| Number of construction work days per month: | | 22 | | **VMT/period:** | **13439.6** |
| Total vehicles per month: | | 1628 | | | |
| Number of construction work months: | | 14.22 | adjusted for precipitation events | | |
| Total vehicles per const period: | | 134396 | | | |
| Control reduction due to watering, speed control, etc. = | | 80 | | | |
| | | 0.8 | | | |
| Release Fraction = | | 0.2 | | | |

| | PM10 | PM2.5 |
|---|---|---|
| Calc 1 | 0.733 | 0.733 |
| Calc 2 | 1.151 | 1.151 |
| Calc 3 | 1.266 | 0.127 |
| Calc 4 | 1.266 | 0.127 |
| Controlled lb/VMT | 0.253 | 0.025 |

| **Emissions** | **PM10** | **PM2.5** |
|---|---|---|
| **lbs/period** | **3403.54** | **341.20** |
| **tons/period** | **1.702** | **0.171** |

EPA, AP-42, Section 13.2.2, March 2006
Soil Moisture; 5% avg
Soil silt content: 8.5% per AP-42 for construction site scraper routes
** const equipment plus site support pickups plus

**CONSTRUCTION PHASE - Truck Hauling/Delivery and Site Support Vehicle Emissions**

**All Phases**

| **Delivery/Hauling Vehicle Use Rates** | | | | | Emissions Factors (lbs/vmt) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Delivery Roundtrip Distance: | 0 | miles | NOx | CO | VOC | SOx | PM10 | CO2 | | |
| Const Days per Period: | 0 | | 0.00133459 | 0.00037027 | 6.2834E-05 | 0.000025 | 1.0747E-05 | 2.91617689 | HDDT | |
| Avg Deliveries per Day: | 0 | | 0.00026191 | 0.00201574 | 3.9247E-05 | 0.000011 | 2.7302E-06 | 0.8745735 | MDGT | |
| Fraction of Deliveries-Diesel: | 0.95 | HDDT | | | **Daily Emissions (lbs)** | | | | | |
| Fraction of Deliveries-Gas: | 0.05 | MDGT | **NOx** | **CO** | **VOC** | **SOx** | **PM10** | **CO2** | **PM2.5** | |
| Total Delivery VMT: | **2481715** | **per Applicant** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | HDDT |
| Total Daily VMT-Diesel | 0 | | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | MDGT |
| Total Daily VMT-Gasoline | 0 | | | | **Tons per Const Period** | | | | | |
| Total Period VMT-Diesel | 2357629.25 | | 1.573 | 0.436 | 0.074 | 0.029 | 0.013 | 3437.6 | 0.011 | HDDT |
| Total Period VMT-Gasoline | 124085.75 | | 0.016 | 0.125 | 0.002 | 0.001 | 0.000 | 54.3 | 0.000 | MDGT |

| **Construction Site Support Vehicle Use Rates (LDTs)** | | | | **Daily Emissions, lbs** | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Gasoline Vehicle VMT Period: | 75900 | **NOx** | **CO** | **VOC** | **SOx** | **PM10** | **CO2** | | | **PM2.5** |
| Avg Daily Gasoline VMT: | 300 | 0.0002232 | 0.00204313 | 3.6203E-05 | 0.000007 | 3.782E-06 | 0.55087942 | lbs/vmt* | LDT gasoline | |
| Avg Daily Diesel VMT: | 0 | 0.0670 | 0.6129 | 0.0109 | 0.0021 | 0.0011 | 165.2638 | lbs/day | gasoline | 0.0007 |
| Total Phase Const Days: | 240 | | | | | | | | | |
| | | | | **Tons per Const Period** | | | | | | |
| Ref: EMFAC 2014, SJVAPCD Year 2023 | | 0.0085 | 0.0775 | 0.0014 | 0.0003 | 0.0001 | 20.9 | **tons/period** | **gasoline** | 0.0001 |
| LDT1-gas, MDV-gas, HDDT-dsl | | | | | | | | | | |
| See EF data in WSP Support Appendix | | | | | | | | | | |

**Notes*****

VMT for delivery/hauling for all vehicles includes: (1) materials deliveries to site, (2) materials removal from site, other VMT as specified below.

Support Vehicle VMT: best estimate at time of filing, 10 LDT (gasoline) at 30 VMT/day

CARB-CEIDARS, Updated Fractions for PM Profiles: PM2.5 = 0.991 of PM10 for Diesel Exhaust, and 0.998 for Gasoline Vehicles.

**CONSTRUCTION PHASE - Worker Travel - Emissions**

Ref: SJVAPCD EMFAC 2014, Year 2025
LDA-gas
See EF data in WSP Support Appendix

**Worker Travel to Site**

| | |
|---|---|
| Avg Occupancy/Vehicle: | 0 |
| Avg Roundtrip Distance, miles: | 0.0 |
| Avg # of Worker Vehicles, per day: | 0 |
| Avg Daily Worker VMT: | 0 |
| Max # of Worker Vehicles, per day: | 0 |
| Max Daily Worker VMT: | 0 |
| Total Const Days: | 240 |
| **Total Const Period Worker VMT:** | **11052000** |

**VMT data supplied by Applicant.**

Emissions Factors (lbs/VMT)

| NOx | CO | VOC | SOx | PM10 | CO2 |
|---|---|---|---|---|---|
| 8.5075E-05 | 0.000810295 | 1.5737E-05 | 0.000006 | 0.000004 | 0.56063169 |

**Daily Emissions (lbs)**

| | NOx | CO | VOC | SOx | PM10 | CO2 | PM2.5 |
|---|---|---|---|---|---|---|---|
| Avg | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**Tons per Const Period**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Avg | 0.470 | 4.478 | 0.087 | 0.033 | 0.022 | 3098.1 | 0.000 |

**Worker Travel by Busing from Staging Area**

| | |
|---|---|
| Total Bus VMT/Const Period: | 0 |
| Avg Bus VMT/Const Day: | 0 |
| Max Bus VMT/Const Day: | 0 |

| | | |
|---|---|---|
| Bus Round Trips/Day: | 0 | max |
| Bus Occupancy/Trip: | 0 | |

Ref: SJVAPCD EMFAC 2014, Year 2025
All other buses-DSL
See EF data in WSP Support Appendix

# buses supplied by Applicant.

Emissions Factors (lbs/VMT)

| NOx | CO | VOC | SOx | PM10 | CO2 |
|---|---|---|---|---|---|
| 0.002933 | 0.00055 | 0.000105 | 0.000025 | 0.000007 | 2.661084 |

**Daily Emissions (lbs)**

| | **NOx** | **CO** | **VOC** | **SOx** | **PM10** | **CO2** | **PM2.5** |
|---|---|---|---|---|---|---|---|
| Avg | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Max | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**Tons per Const Period**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Avg | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

**CONSTRUCTION PHASE - Trackout Emissions**

| | | | | | |
|---|---|---|---|---|---|
| Paved Road Length (miles): | 0.1 | estimated roundtrip trackout distance | | | |
| Daily # of Vehicles: | 74 | | | | |
| Avg Vehicle Weight (tons): | 6.8 | | **PM10** | **PM2.5*** | |
| Total Unadjusted VMT/day | 7.4 | | 0.361 | | |
| Particle Size Multipliers | PM10 | | 1.924 | | |
| lb/VMT | 0.023 | | 0.002 | 0.0004 | lb/VMT |
| C factor, lb/VMT | 0.00047 | | **0.129** | **0.0217** | **lbs/day** |
| Road Sfc Silt Loading (g/m^2): | 0.56 | local X 2 | **0.001** | **0.0002** | **tons/month** |
| # of Active Trackout Points: | 1 | ** | **0.02** | **0.0034** | **tons/period** |
| Added Trackout Miles: | PM10 | | | | |
| Trackout VMT/day: | 44 | | | | |
| Final Adjusted VMT/day | 52 | | | | |
| Final Adjusted VMT/month | 1140 | | | | |
| Final Adjusted VMT/period | 16205 | | | | |
| Construction days/month: | 22 | | | | |
| Adj. Construction months/period: | 14.22 | | | | |
| Control Applied to Trackout: | Gravel entrance, metal cleaning grates, water washing, sweeping | | | | |
| Control Efficiency, % | 84 | 0.84 | Release Factor = | 0.16 | |

*Default Silt Load Values for Paved Road Types*

| | |
|---|---|
| Freeway | 0.02 g/m2 |
| Arterial | 0.036 g/m2 |
| Collector | 0.036 g/m2 |
| Local | 0.28 g/m2 |
| Rural | 1.6 g/m2 |

* PM2.5 fraction of PM10 assumed to be 0.169 (CARB CEIDARS updated fraction values) for paved roads.
** 1 controlled ingress/egress point is planned for site construction
EPA, AP-42, Section 13.2.1, Proposed revisions dated 9/2008.
Use silt loading factor from default values for road type if no site specific data is available.
Trackout effects approximately 0.05 mi. of roadway arriving and departing from the site access point.
Plant access road is already paved. Entrance will be gravelled with metal grates for take out control.
Vehicle count = delivery trucks plus site support trucks (see Unpaved Onsite tab)
Worker vehicles not counted for trackout, they will park on the site perimeter.

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## Tons/Period

| | NOx | CO | VOC | SOx | PM10 | CO2 | Fug PM10 | Fug PM2.5 |
|---|---|---|---|---|---|---|---|---|
| on-off site travel | 1.24 | 3.09 | 0.10 | 0.04 | 0.02 | 3602 | 5.76 | 1.02 |
| on-site equipment | 3.13 | 4.01 | 0.69 | 0.01 | 0.11 | 1405 | | |
| Total | 4.38 | 7.10 | 0.78 | 0.05 | 0.13 | 5007 | 5.76 | 1.02 |
| Months: | 10.25 | | | | | | | |
| Max Year Months: | 10.25 | | | | | | | |
| Total per Year: | 4.38 | 7.10 | 0.78 | 0.05 | 0.13 | 5007.19 | 5.76 | 1.02 |

CONSTRUCTION EQUIPMENT EXHAUST EMISSIONS

Project: WSP **Main Site Construction-SGF 10**

**Assumptions:**

1. The average engines employed in construction equipment use consumes fuel at a rate of: diesel 0.06 gal/hp-hr; gasoline 0.11 gal/hp-hr

Ref: EPA, NR-009b Publication, November 2002.
Ref: Sacramento County APCD Const. Program Data, V. 6.0.3, 3/2007.
Ref: EPA, NR-009c Publication, EPA 420-P-04-009, April 2004.
Ref: Niland Energy Project, IID, AFC Vol 2, App A.
Ref: South Coast AQMD PR XXI, Draft Staff Report, 3-15-95, and SCAQMD CEQA Manual, 11/03.
The above noted references present fuel consumption values which range from 0.050 to 0.064 gal/hp-hr for diesel engines used in construction related equipment. The value of 0.060 gal/hp-hr was chosen as a reasonable upper mid-range value for construction diesel emissions calculations.
For gasoline the mid-range value from SCAQMD of 0.11 gal/hp-hr was used.

2. Construction equipment exhaust emissions will be calculated on an annual basis using the site specific equipment list, HP ratings, hours of use, days of use, etc. Annual emissions will be apportioned to daily values based on the estimated construction period time on site.

3. The equipment list derived from the South Coast AQMD Offroad database (2016) will be used to establish the various equipment categories. Avg HP values were derived from SCAQMD and SacMetro AQMD construction resources.

4. Construction Schedule: 9 months; 8 hrs/day; 0.75 years

Construction Totals: 257.77778 hrs/month; 2320 hrs/const period; 290 days/const period

5. Anticipated Construction Start Year: 2027

6. Maximum anticipated equipment use month is: n/a

7. N2O EF diesel, lb/gal: 0.000183
N2O EF gasoline, lb/gal: 0.000164
CARB, Mandatory GHG Reporting Regulation Table 4, Appendix A, 2007.

Equipment types and use rates supplied by the Applicant.

| Equipment Category** | | Weighted Average HP | # of Units Used for Project | Avg Use Rate Hrs/day | # of Days On Site (each) | Total Hrs/Day | Total Hrs per Const Period | Total HP-Hrs Period |
|---|---|---|---|---|---|---|---|---|
| Aerial Lifts | | 63 | 1 | 6 | 38 | 6 | 228 | 14364 |
| Air Compressors | | 78 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bore-Drill Rigs | | 206 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cement Mixers | | 9 | 0 | 0 | 0 | 0 | 0 | 0 |
| Concrete/Industrial Saws | | 81 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cranes | | 226 | 1 | 2 | 38 | 2 | 76 | 17176 |
| Crawler Tractors/Dozers | | 208 | 3 | 7 | 85 | 21 | 1785 | 371280 |
| Crushing/Processing Eq. | | 85 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dumpers/Tenders/Water Trucks | | 16 | 7 | 7 | 78 | 49 | 3822 | 61152 |
| Excavators | | 163 | 0 | 0 | 0 | 0 | 0 | 0 |
| Forklifts | | 89 | 8 | 6 | 80 | 48 | 3840 | 341760 |
| Generator Sets | | 84 | 0 | 0 | 0 | 0 | 0 | 0 |
| Graders | | 175 | 5 | 7 | 43 | 35 | 1505 | 263375 |
| Off-Highway Tractors | | 123 | 0 | 0 | 0 | 0 | 0 | 0 |
| Off-Highway Trucks | | 400 | 12 | 7 | 88 | 84 | 7392 | 2956800 |
| Other Diesel Construction Eq. | | 172 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other General Industrial Eq. | | 88 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Material Handling Eq. | | 167 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pavers | | 126 | 1 | 4 | 11 | 4 | 44 | 5544 |
| Paving Eq. Other | | 131 | 0 | 0 | 0 | 0 | 0 | 0 |
| Plate Compactors | | 8 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pressure Washers | | 13 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pumps | | 84 | 0 | 0 | 0 | 0 | 0 | 0 |
| Roller Compactors | | 81 | 1 | 7 | 17 | 7 | 119 | 9639 |
| Rough Terrain Forklifts | | 100 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber Tired Dozers | | 255 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber Tires Loaders | | 200 | 0 | 0 | 0 | 0 | 0 | 0 |
| Scrapers | | 362 | 0 | 0 | 0 | 0 | 0 | 0 |
| Signal Boards | | 6 | 0 | 0 | 0 | 0 | 0 | 0 |
| Skid Steer Loaders | | 65 | 1 | 7 | 75 | 7 | 525 | 34125 |
| Surfacing Eq. | | 254 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sweepers/Scrubbers | | 64 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tractors | (single category) | 98 | 2 | 7 | 98 | 14 | 1372 | 134456 |
| Front End Loaders | (single category) | 98 | 1 | 7 | 33 | 7 | 231 | 22638 |
| Backhoes | (single category) | 98 | 1 | 4 | 63 | 4 | 252 | 24696 |
| Trenchers | | 81 | 3 | 4 | 86 | 12 | 1032 | 83592 |
| Welders | | 46 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gasoline Const Eq. | | 175 | 0 | 0 | 0 | 0 | 0 | 0 |

** diesel equipment unless otherwise specified.

Const Period Diesel Hp-Hrs = 4340597
Const Period Gasoline Hp-Hrs = 0
Const Period Diesel Fuel Use = 260436 gals
Const Period Gasoline Fuel Use = 0 gals

Offroad equipment emissions factors derived SCAQMD Off Road database for 2025.
The SCAQMD EFs as presented incorporate the average equipment load factors.
Emissions factors for each category of equipment represent the composite factors for the stated equipment category as derived from the SCAQMD Offroad database for the construction start year.

**2025 Equipment Emissions Factors**

| Equip. Type | lbs/hr VOC (ROG) | lbs/hr CO | lbs/hr NOx | lbs/hr SOx | lbs/hr PM10 | lbs/hr CO2 | lbs/hr CH4 |
|---|---|---|---|---|---|---|---|
| Aerial Lifts | 0.0184 | 0.1646 | 0.1366 | 0.0004 | 0.0048 | 34.7217 | 0.0017 |
| Air Compressors | 0.0349 | 0.3027 | 0.2104 | 0.0007 | 0.0088 | 63.6073 | 0.0031 |
| Bore-Drill Rigs | 0.0428 | 0.5007 | 0.2864 | 0.0017 | 0.0042 | 164.8678 | 0.0039 |
| Cement Mixers | 0.0085 | 0.0414 | 0.0534 | 0.0001 | 0.0021 | 7.2481 | 0.0008 |
| Concrete/Industrial Saws | 0.0337 | 0.3706 | 0.2471 | 0.0007 | 0.0093 | 58.4637 | 0.0030 |
| Cranes | 0.0681 | 0.3738 | 0.4223 | 0.0014 | 0.0143 | 128.6241 | 0.0061 |
| Crawler Tractors/Dozers | 0.0789 | 0.5065 | 0.4492 | 0.0013 | 0.0227 | 114.0167 | 0.0071 |
| Crushing/Processing Eq. | 0.0693 | 0.6187 | 0.3763 | 0.0015 | 0.0146 | 132.3077 | 0.0062 |
| Dumpers/Tenders | 0.0092 | 0.0314 | 0.0581 | 0.0001 | 0.0022 | 7.6244 | 0.0008 |
| Excavators | 0.0559 | 0.5086 | 0.2269 | 0.0013 | 0.0086 | 119.5792 | 0.0050 |
| Forklifts | 0.0236 | 0.2148 | 0.0860 | 0.0006 | 0.0025 | 54.3958 | 0.0021 |
| Generator Sets | 0.0288 | 0.2667 | 0.2329 | 0.0007 | 0.0081 | 60.9927 | 0.0026 |
| Graders | 0.0676 | 0.5696 | 0.3314 | 0.0015 | 0.0147 | 132.7431 | 0.0061 |
| Off-Highway Tractors | 0.1134 | 0.6101 | 0.7291 | 0.0017 | 0.0331 | 151.3869 | 0.0102 |
| Off-Highway Trucks | 0.1140 | 0.5385 | 0.4769 | 0.0027 | 0.0142 | 260.0652 | 0.0103 |
| Other Diesel Construction Eq. | 0.0442 | 0.3474 | 0.2021 | 0.0013 | 0.0069 | 122.5051 | 0.0040 |
| Other General Industrial Eq. | 0.0747 | 0.4438 | 0.3947 | 0.0016 | 0.0130 | 152.2399 | 0.0067 |
| Other Material Handling Eq. | 0.0696 | 0.4355 | 0.3844 | 0.0015 | 0.0124 | 141.1941 | 0.0063 |
| Pavers | 0.0717 | 0.4745 | 0.3858 | 0.0009 | 0.0220 | 77.9326 | 0.0065 |
| Paving Eq. Other | 0.0548 | 0.3993 | 0.3281 | 0.0008 | 0.0190 | 68.9364 | 0.0049 |
| Plate Compactors | 0.0050 | 0.0263 | 0.0314 | 0.0001 | 0.0012 | 4.3138 | 0.0005 |
| Pressure Washers | 0.0066 | 0.0531 | 0.0561 | 0.0001 | 0.0019 | 9.4135 | 0.0006 |
| Pumps | 0.0270 | 0.2617 | 0.2079 | 0.0006 | 0.0078 | 49.6066 | 0.0024 |
| Roller Compactors | 0.0410 | 0.3763 | 0.2501 | 0.0008 | 0.0122 | 67.0308 | 0.0037 |
| Rough Terrain Forklifts | 0.0396 | 0.4430 | 0.2336 | 0.0008 | 0.0090 | 70.2808 | 0.0036 |
| Rubber Tired Dozers | 0.1672 | 0.6620 | 1.0824 | 0.0025 | 0.0419 | 239.0780 | 0.0151 |
| Rubber Tires Loaders | 0.0559 | 0.4311 | 0.2835 | 0.0012 | 0.0121 | 108.6113 | 0.0050 |
| Scrapers | 0.1495 | 0.7187 | 0.8387 | 0.0027 | 0.0335 | 262.4827 | 0.0135 |
| Signal Boards | 0.0111 | 0.0909 | 0.0718 | 0.0002 | 0.0029 | 16.6983 | 0.0010 |
| Skid Steer Loaders | 0.0186 | 0.2104 | 0.1354 | 0.0004 | 0.0019 | 30.2740 | 0.0017 |
| Surfacing Eq. | 0.0638 | 0.3590 | 0.3924 | 0.0017 | 0.0142 | 165.9715 | 0.0058 |
| Sweepers/Scrubbers | 0.0410 | 0.4840 | 0.2255 | 0.0009 | 0.0061 | 78.5433 | 0.0037 |
| Tractors | 0.0336 | 0.3586 | 0.1857 | 0.0008 | 0.0059 | 66.7965 | 0.0030 |
| Front End Loaders | 0.0336 | 0.3586 | 0.1857 | 0.0008 | 0.0059 | 66.7965 | 0.0030 |
| Backhoes | 0.0336 | 0.3586 | 0.1857 | 0.0008 | 0.0059 | 66.7965 | 0.0030 |
| Trenchers | 0.0674 | 0.4085 | 0.3481 | 0.0007 | 0.0215 | 58.7116 | 0.0061 |
| Welders | 0.0214 | 0.1745 | 0.1373 | 0.0003 | 0.0052 | 25.6027 | 0.0019 |
| Gasoline Const Eq. (assumed 175 hp category) | 0.0771 | 0.3855 | 1.08 | 0.00014 | 0.1542 | 14.1565 | 0.00037 |

(gasoline EFs: EPA OMS-AMD Report NR-009A, 2-13-98, and SCAQMD EMFAC 2007 CEQA Tables, 2016.)

Construction Period Emissions, lbs

| Equip. Type | VOC | CO | NOx | SOx | PM10 | CO2 | CH4 |
|---|---|---|---|---|---|---|---|
| Aerial Lifts | 4 | 38 | 31 | 0 | 1 | 7917 | 0 |
| Air Compressors | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bore-Drill Rigs | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cement Mixers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Concrete/Industrial Saws | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cranes | 5 | 28 | 32 | 0 | 1 | 9775 | 0 |
| Crawler Tractors/Dozers | 141 | 904 | 802 | 2 | 41 | 203520 | 13 |
| Crushing/Processing Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dumpers/Tenders | 35 | 120 | 222 | 0 | 8 | 29140 | 3 |
| Excavators | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Forklifts | 91 | 825 | 330 | 2 | 10 | 208880 | 8 |
| Generator Sets | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Graders | 102 | 857 | 499 | 2 | 22 | 199778 | 9 |
| Off-Highway Tractors | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Off-Highway Trucks | 843 | 3981 | 3525 | 20 | 105 | 1922402 | 76 |
| Other Diesel Construction Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other General Industrial Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Material Handling Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pavers | 3 | 21 | 17 | 0 | 1 | 3429 | 0 |
| Paving Eq. Other | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Plate Compactors | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pressure Washers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pumps | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Roller Compactors | 5 | 45 | 30 | 0 | 1 | 7977 | 0 |
| Rough Terrain Forklifts | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber Tired Dozers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber Tires Loaders | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Scrapers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Signal Boards | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Skid Steer Loaders | 10 | 110 | 71 | 0 | 1 | 15894 | 1 |
| Surfacing Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sweepers/Scrubbers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tractors | 46 | 492 | 255 | 1 | 8 | 91645 | 4 |
| Front End Loaders | 8 | 83 | 43 | 0 | 1 | 15430 | 1 |
| Backhoes | 8 | 90 | 47 | 0 | 1 | 16833 | 1 |
| Trenchers | 70 | 422 | 359 | 1 | 22 | 60590 | 6 |
| Welders | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gasoline Const Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| Totals | VOC | CO | NOx | SOx | PM10 | PM2.5 | CO2 | CH4 | N2O |
|---|---|---|---|---|---|---|---|---|---|
| lbs per const. period | 1370 | 8016 | 6263 | 30 | 224 | 222.33 | 2793210 | 123 | 48 |
| tons per const. period | 0.7 | 4.0 | 3.1 | 0.015 | 0.11 | 0.11 | 1396.60 | 0.06 | 0.02 |
| Average lbs/day = | 4.7 | 27.6 | 21.6 | 0.103 | 0.77 | 0.77 | 9631.76 | 0.43 | 0.16 |
| Normalized TPY = | *0.69* | *4.01* | *3.13* | *0.01* | *0.11* | *0.11* | *1396.60* | *0.06* | *0.02* |

| | |
|---|---|
| CO2e, tons/period | 1405.2 |
| CO2e, tons/yr: | 1405.2 |

CARB-CEIDARS, Updated Size Fractions for PM Profiles: PM2.5 = 0.991 of PM10 : Diesel Vehicle Exhaust

Other Assumptions and References:

1. Trench construction times per: Southern Regional Water Pipeline Alliance, 3/08.
   Optimum trench construction progress rate is 80m (260ft) per day.
   Non-optimum trench construction progress rate is 30m (100 ft) per day.
   An average progress of 180 ft/day is used where applicable.
2. Paving speeds can range from 3 to 15 m/min depending on asphalt delivery rates and required compaction thickness.
   A minium paving speed of 3 m/min (10 ft/min or 600 ft/hr) was used where applicable.
   The minimum speed is based upon a 3" compacted layer, 12 ft lane width, with an asphalt delivery rate of ~ 140 tons/hr.
   Ref: Asphalt Paving Speed, Pavement Worktip No. 31, AAPA, 11/2001.
3. Estimation of maximum daily emissions is extremely variable, and these values are not required by SJVAPCD.
4. Construction schedule note: applicant data indicates a construction work day period of 8 hours
   The equipment use rates provided by the applicant are consistent with an 8 hour workday.
5. GWP values: CH4=25, N2O=298, ref: 40 CFR 98 Subpart A, Table A-1.

**CONSTRUCTION PHASE - SGF 10**

| | | | |
|---|---|---|---|
| **MRI Level 2 Analysis (Refs 1, 3-7)** | Acres | 1956 | |
| Acres Subject to Construction Disturbance Activites: | | 195.6 | |
| Max Acres Subject to Construction Disturbance Activites on any day of this phase: | | 14.7 | note (10) |
| Emissions Factor for PM10 Uncontrolled, tons/acre/month: | | 0.12 | |
| PM2.5 fraction of PM10 (per CARB CEIDARS Profiles): | | 0.21 | |
| **Activity Levels:** Hrs/Day: | | 8 | |
| Days/Wk: | | 5 | |
| Days/Month: Applicant Data | | 22 | |
| Phase Const Period, Months: | | 10.25 | 0.85 years |
| Phase Const Period, Days: | | 225.5 | |

**Wet Season Adjustment:** (Per AP-42, Section 13.2.2, Figure 13.2.2-1, 12/03 or CalEEMod, Appendix D, Table 1.1.)

| | |
|---|---|
| Mean # days/year with rain >= 0.01 inch: | 40 |
| Mean # months/yr with rain >= 0.01 inch: | 1.33 |
| Adjusted Const Period, Months: | 9.11 |
| Adjusted Const Period, Days: | 191 |

**Controls for Fugitive Dust:** Proposed watering cycle: 3 times per day

3 watering cycles/8 hour construction shift yields a 68% reduction, use 68% for non-desert sites. (11)(12)
Speed control of onsite const traffic to <15 mph yields a 40-70% reduction (use 50% control as conservative for site). (11)(12)

| | | |
|---|---|---|
| Calculated % control based on mitigations proposed: | 84 | % control |
| Conservative control % used for emissions estimates: | 84 | % control |
| | 0.16 | release fraction |

| **Emissions: Controlled** | PM10 | PM2.5 |
|---|---|---|
| tons/month | 0.282 | 0.059 |
| tons/period | 2.566 | 0.539 |
| Max lbs/day | 25.606 | 5.377 |

**Soil Handling Emissions (Cut and Fill): (2)**

| | | | | | |
|---|---|---|---|---|---|
| Total cu.yds of soil handled: | 0 | Mean annual wind speed, mph: (8) | | | 8.03 |
| Total tons of soil handled: | 0.0 | Avg. Soil moisture, %: (9) | | | 5 |
| Total days soil handled: | 191 | Avg. Soil density, tons/cu.yd: | | | 1.3 |
| Tons soil/day: | 0 | k factor for PM10: | | | 0.35 |
| Control Eff, watering, % | 80 | Number of Drops per ton: | | | 4 |
| Release Fraction: | 0.2 | Calc 1 | wind | | 1.851 |
| | | Calc 2 | moisture | | 3.607 |
| | | Calc 3 | int | | 0.513 |
| | | Calc 4 | PM10 | lb/ton | 0.0006 |
| | | PM2.5 fraction of PM10: | | | 0.210 |

| Emissions: | PM10 | PM2.5 |
|---|---|---|
| tons/period | 0.000 | 0.000 |
| tons/month | 0.000 | 0.000 |
| max lbs/day | 0.000 | 0.000 |

| **Emissions Totals:** | **PM10** | **PM2.5** |
|---|---|---|
| **tons/period** | **2.566** | **0.539** |

**Methodology References:**

(1) MRI Report, South Coast AQMD Project No. 95040, March 1996, Level 2 Analysis Procedure.
MRI Report uncontrolled factor of 0.11 tons/acre/month is based on 168 hours per month of const activity.
For an activity rate of ~180 hrs/month, the adjusted EF would be 0.12 tons/acre/month (uncontrolled).
(2) Soil Handling (Cut and Fill), EPA, AP-42, Section 13.2.4., 11/06.
(3) URBEMIS, Version 9.2.4, User's Manual Appendix A, page A-6.
(4) CARB Area Source Methodology, Section 7.7, 9/02.
(5) WRAP Fugitive Dust Handbook, 9/06.
(6) USEPA, AP-42, Section 13.2.3, 2/10.
(7) Estimating PM Emissions from Construction Operations, USEPA, MRI, 9/99.
(8) Wind speed data for Lemoore met station. Annual avg wind speed = 8.03 mph, % calms = 3.44%.
(9) Soil Moisture; 5% assumed avg value
(10) adjusted applicant value based on 7.5% of total acreage disturbed on any given day
(11) SCAQMD CEQA Handbook 1993.
(12) SCAQMD, Sample Construction Scenarios for Projects Less than Five Acres, Fugitive Dust Mitigations, February 2005.

**OFFSITE PAVED ROAD FUGITIVE DUST EMISSIONS**
(associated with delivery truck and worker vehicle traffic on I-5 and plant access road)

| | | | |
|---|---|---|---|
| Average mileage for construction related vehicles: | | NA | miles, roundtrip distance*** |
| Avg weight of vehicular equipment on road: | | 2.4 | tons (range 2 - 42 tons) |
| Road surface silt loading factor: | | 0.015 | g/m2 (range 0.03 - 400 g/m2) |
| | | | Limited Access Freeway >10,000 ADT **(I-5)** |
| Particle size multiplier factors: | PM10 | 0.0022 | lb/VMT |
| | PM2.5 | 0.00054 | lb/VMT |
| C factors (brake and tire wear): | PM10 | 0.00047 | lb/VMT |
| | PM2.5 | 0.00036 | lb/VMT |
| Avg vehicle speed on road: | | 65 | mph |
| Avg. Number of vehicles per day: | | 195 | |
| | | | calculated per Applicant da |
| Avg. Number of work days per month: | | 22 | **VMT/period: 8104075** |
| | Total vehicles per month: | 4290 | |
| Number of work months: | | 8 | adjusted for precip events |
| | Total vehicles per const period: | 34320 | |

| | PM10 | |
|---|---|---|
| Calc 1 | 0.022 | |
| Calc 2 | 2.442 | |
| Calc 3 | 0.0006 | lb/VMT |

| **Emissions** | **PM10** | **PM2.5** |
|---|---|---|
| **lbs/period** | **4762.12** | **804.80** |
| **tons/period** | **2.381** | **0.402** |

EPA, AP-42, Section 13.2.1, March 2006, updated 9/2008.
PM2.5 fraction of PM10 per CARB CEIDARs is 0.169
*** Note: avg roundtrip distance traveled by delivery or worker vehicles on freeways (I-5) and other State Routes in the project area.
Vehicles per day: worker + deliveries+staff support vehciles (averages)

## ONSITE UNPAVED ROAD FUGITIVE DUST

| | | | | | | |
|---|---|---|---|---|---|---|
| Length of Unpaved Roads on Construction site: | | 0.1 | miles* | | | |
| Avg weight of construction vehicular equipment on road: | | 2.4 | tons (range 2 - 42 tons) | | | |
| Road surface silt content: | | 8.5 | % (range 1.8 - 35%) | | | |
| Road surface material moisture content: | | 5 | % (range 0.03 - 13%) | | | |
| | | k | a | b | | |
| Particle size multiplier factors: | PM10 | 1.5 | 0.9 | 0.45 | | |
| | PM2.5 | 0.15 | 0.9 | 0.45 | | |
| C factors (brake and tire wear): | PM10 | 0.00047 | lb/VMT | | | |
| | PM2.5 | 0.00036 | lb/VMT | | | |
| Avg construction vehicle speed on road: | | 5 | mph (range 5-55 mph) | | | |
| Avg number of construction vehicles per day: | | 74 | ** | | | |
| Number of construction work days per month: | | 22 | | | **VMT/period:** | **8045.2** |
| Total vehicles per month: | | 1628 | | | | |
| Number of construction work months: | | 8 | adjusted for precipitation events | | | |
| Total vehicles per const period: | | **80452** | | | | |
| Control reduction due to watering, speed control, etc. = | | 80 | | | | |
| | | 0.8 | | | | |
| Release Fraction = | | 0.2 | | | | |

| | PM10 | PM2.5 |
|---|---|---|
| Calc 1 | 0.733 | 0.733 |
| Calc 2 | 0.904 | 0.904 |
| Calc 3 | 0.995 | 0.099 |
| Calc 4 | 0.995 | 0.100 |
| Controlled lb/VMT | 0.199 | 0.020 |

| **Emissions** | **PM10** | **PM2.5** |
|---|---|---|
| **lbs/period** | **1601.28** | **160.63** |
| **tons/period** | **0.801** | **0.080** |

EPA, AP-42, Section 13.2.2, March 2006
Soil Moisture; 5% avg
Soil silt content: 8.5% per AP-42 for construction site scraper routes
** const equipment plus site support pickups plus

**CONSTRUCTION PHASE - Truck Hauling/Delivery and Site Support Vehicle Emissions**

**All Phases**

**Delivery/Hauling Vehicle Use Rates**

| | | |
|---|---|---|
| Delivery Roundtrip Distance: | 0 | miles |
| Const Days per Period: | 0 | |
| Avg Deliveries per Day: | 0 | |
| Fraction of Deliveries-Diesel: | 0.95 | HDDT |
| Fraction of Deliveries-Gas: | 0.05 | MDGT |
| Total Delivery VMT: | **1489075** | **per Applicant** |
| Total Daily VMT-Diesel | 0 | |
| Total Daily VMT-Gasoline | 0 | |
| Total Period VMT-Diesel | 1414621.25 | |
| Total Period VMT-Gasoline | 74453.75 | |

Emissions Factors (lbs/vmt)

| NOx | CO | VOC | SOx | PM10 | CO2 | |
|---|---|---|---|---|---|---|
| 0.00133459 | 0.00037027 | 6.2834E-05 | 0.000025 | 1.0747E-05 | 2.91617689 | HDDT |
| 0.00026191 | 0.00201574 | 3.9247E-05 | 0.000011 | 2.7302E-06 | 0.8745735 | MDGT |

**Daily Emissions (lbs)**

| **NOx** | **CO** | **VOC** | **SOx** | **PM10** | **CO2** | **PM2.5** | |
|---|---|---|---|---|---|---|---|
| 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | HDDT |
| 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | MDGT |

**Tons per Const Period**

| NOx | CO | VOC | SOx | PM10 | CO2 | PM2.5 | |
|---|---|---|---|---|---|---|---|
| 0.944 | 0.262 | 0.044 | 0.018 | 0.008 | 2062.6 | 0.006 | HDDT |
| 0.010 | 0.075 | 0.001 | 0.000 | 0.000 | 32.6 | 0.000 | MDGT |

**Construction Site Support Vehicle Use Rates (LDTs)**

| | |
|---|---|
| Gasoline Vehicle VMT Period: | 75900 |
| Avg Daily Gasoline VMT: | 300 |
| Avg Daily Diesel VMT: | 0 |
| Total Phase Const Days: | 240 |

**Daily Emissions, lbs**

| **NOx** | **CO** | **VOC** | **SOx** | **PM10** | **CO2** | | | **PM2.5** |
|---|---|---|---|---|---|---|---|---|
| 0.0002232 | 0.00204313 | 3.6203E-05 | 0.000007 | 3.782E-06 | 0.55087942 | lbs/vmt* | LDT gasoline | |
| 0.0670 | 0.6129 | 0.0109 | 0.0021 | 0.0011 | 165.2638 | lbs/day | gasoline | 0.0007 |

**Tons per Const Period**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 0.0085 | 0.0775 | 0.0014 | 0.0003 | 0.0001 | 20.9 | **tons/period** | **gasoline** | 0.0001 |

Ref: EMFAC 2014, SJVAPCD Year 2023
LDT1-gas, MDV-gas, HDDT-dsl
See EF data in WSP Support Appendix

**Notes*****

VMT for delivery/hauling for all vehicles includes: (1) materials deliveries to site, (2) materials removal from site, other VMT as specified below.

Support Vehicle VMT: best estimate at time of filing, 10 LDT (gasoline) at 30 VMT/day

CARB-CEIDARS, Updated Fractions for PM Profiles: PM2.5 = 0.991 of PM10 for Diesel Exhaust, and 0.998 for Gasoline Vehicles.

**CONSTRUCTION PHASE - Worker Travel - Emissions**

Ref: SJVAPCD EMFAC 2014, Year 2025
LDA-gas
See EF data in WSP Support Appendix

**Worker Travel to Site**

| | |
|---|---|
| Avg Occupancy/Vehicle: | 0 |
| Avg Roundtrip Distance, miles: | 0.0 |
| Avg # of Worker Vehicles, per day: | 0 |
| Avg Daily Worker VMT: | 0 |
| Max # of Worker Vehicles, per day: | 0 |
| Max Daily Worker VMT: | 0 |
| Total Const Days: | 240 |
| **Total Const Period Worker VMT:** | **6615000** |

**VMT data supplied by Applicant.**

Emissions Factors (lbs/VMT)

| NOx | CO | VOC | SOx | PM10 | CO2 |
|---|---|---|---|---|---|
| 8.5075E-05 | 0.000810295 | 1.5737E-05 | 0.000006 | 0.000004 | 0.56063169 |

**Daily Emissions (lbs)**

| | NOx | CO | VOC | SOx | PM10 | CO2 | PM2.5 |
|---|---|---|---|---|---|---|---|
| Avg | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**Tons per Const Period**

| | NOx | CO | VOC | SOx | PM10 | CO2 | PM2.5 |
|---|---|---|---|---|---|---|---|
| Avg | 0.281 | 2.680 | 0.052 | 0.020 | 0.013 | 1854.3 | 0.000 |

**Worker Travel by Busing from Staging Area**

| | |
|---|---|
| Total Bus VMT/Const Period: | 0 |
| Avg Bus VMT/Const Day: | 0 |
| Max Bus VMT/Const Day: | 0 |

| | | |
|---|---|---|
| Bus Round Trips/Day: | 0 | max |
| Bus Occupancy/Trip: | 0 | |

Ref: SJVAPCD EMFAC 2014, Year 2025
All other buses-DSL
See EF data in WSP Support Appendix

# buses supplied by Applicant.

Emissions Factors (lbs/VMT)

| NOx | CO | VOC | SOx | PM10 | CO2 |
|---|---|---|---|---|---|
| 0.002933 | 0.00055 | 0.000105 | 0.000025 | 0.000007 | 2.661084 |

**Daily Emissions (lbs)**

| | **NOx** | **CO** | **VOC** | **SOx** | **PM10** | **CO2** | **PM2.5** |
|---|---|---|---|---|---|---|---|
| Avg | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Max | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**Tons per Const Period**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Avg | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

**CONSTRUCTION PHASE - Trackout Emissions**

| | | | | | | |
|---|---|---|---|---|---|---|
| Paved Road Length (miles): | 0.1 | estimated roundtrip trackout distance | | | | |
| Daily # of Vehicles: | 74 | | | | | |
| Avg Vehicle Weight (tons): | 6.8 | | | **PM10** | **PM2.5*** | |
| Total Unadjusted VMT/day | 7.4 | | | 0.361 | | |
| Particle Size Multipliers | PM10 | | | 1.924 | | |
| lb/VMT | 0.023 | | | 0.002 | 0.0004 | lb/VMT |
| C factor, lb/VMT | 0.00047 | | | **0.129** | **0.0217** | **lbs/day** |
| Road Sfc Silt Loading (g/m^2): | 0.56 | local X 2 | | **0.001** | **0.0002** | **tons/month** |
| # of Active Trackout Points: | 1 | ** | | **0.01** | **0.0019** | **tons/period** |
| Added Trackout Miles: | PM10 | | | | | |
| Trackout VMT/day: | 44 | | *Default Silt Load Values for Paved Road Types* | | | |
| Final Adjusted VMT/day | 52 | | | Freeway | 0.02 g/m2 | |
| Final Adjusted VMT/month | 1140 | | | Arterial | 0.036 g/m2 | |
| Final Adjusted VMT/period | 9117 | | | Collector | 0.036 g/m2 | |
| Construction days/month: | 22 | | | Local | 0.28 g/m2 | |
| Adj. Construction months/period: | 8.00 | | | Rural | 1.6 g/m2 | |
| Control Applied to Trackout: | Gravel entrance, metal cleaning grates, water washing, sweeping | | | | | |
| Control Efficiency, % | 84 | 0.84 | Release Factor = | | 0.16 | |

* PM2.5 fraction of PM10 assumed to be 0.169 (CARB CEIDARS updated fraction values) for paved roads.
** 1 controlled ingress/egress point is planned for site construction
EPA, AP-42, Section 13.2.1, Proposed revisions dated 9/2008.
Use silt loading factor from default values for road type if no site specific data is available.
Trackout effects approximately 0.05 mi. of roadway arriving and departing from the site access point.
Plant access road is already paved. Entrance will be gravelled with metal grates for take out control.
Vehicle count = delivery trucks plus site support trucks (see Unpaved Onsite tab)
Worker vehicles not counted for trackout, they will park on the site perimeter.

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## Tons/Period

| | NOx | CO | VOC | SOx | PM10 | CO2 | Fug PM10 | Fug PM2.5 |
|---|---|---|---|---|---|---|---|---|
| on-off site travel | 1.66 | 4.11 | 0.13 | 0.05 | 0.03 | 4802 | 8.15 | 1.45 |
| on-site equipment | 9.00 | 11.40 | 1.94 | 0.04 | 0.35 | 3712 | | |
| Total | 10.66 | 15.51 | 2.07 | 0.09 | 0.38 | 8514 | 8.15 | 1.45 |
| | | | | | | | | |
| Months: | 13.5 | | | | | | | |
| Max Year Months: | 12 | | | | | | | |
| | | | | | | | | |
| Total per Year: | 9.47 | 13.79 | 1.84 | 0.08 | 0.34 | 7567.99 | 7.25 | 1.29 |

CONSTRUCTION EQUIPMENT EXHAUST EMISSIONS

Project: WSP **Main Site Construction-SGF 11**

**Assumptions:**

1. The average engines employed in construction equipment use consumes fuel at a rate of: diesel 0.06 gal/hp-hr
Ref: EPA, NR-009b Publication, November 2002. gasoline 0.11 gal/hp-hr
Ref: Sacramento County APCD Const. Program Data, V. 6.0.3, 3/2007.
Ref: EPA, NR-009c Publication, EPA 420-P-04-009, April 2004.
Ref: Niland Energy Project, IID, AFC Vol 2, App A.
Ref: South Coast AQMD PR XXI, Draft Staff Report, 3-15-95, and SCAQMD CEQA Manual, 11/03.
The above noted references present fuel consumption values which range from 0.050 to 0.064 gal/hp-hr for diesel engines used in construction related equipment. The value of 0.060 gal/hp-hr was chosen as a reasonable upper mid-range value for construction diesel emissions calculations.
For gasoline the mid-range value from SCAQMD of 0.11 gal/hp-hr was used.

2. Construction equipment exhaust emissions will be calculated on an annual basis using the site specific equipment list, HP ratings, hours of use, days of use, etc. Annual emissions will be apportioned to daily values based on the estimated construction period time on site.

3. The equipment list derived from the South Coast AQMD Offroad database (2016) will be used to establish the various equipment categories. Avg HP values were derived from SCAQMD and SacMetro AQMD construction resources.

| 4. Construction Schedule: | | | Construction Totals: | | |
|---|---|---|---|---|---|
| | 17 | months | | 249.41176 | hrs/month |
| | 8 | hrs/day | | 4240 | hrs/const period |
| | 1.42 | years | | 530 | days/const period |

5. Anticipated Construction Start Year: 2028

6. Maximum anticipated equipment use month is: n/a

7. N2O EF diesel, lb/gal: 0.000183
N2O EF gasoline, lb/gal: 0.000164
CARB, Mandatory GHG Reporting Regulation
Table 4, Appendix A, 2007.

Equipment types and use rates supplied by the Applicant.

| **Equipment Category**** | **Weighted Average HP** | **# of Units Used for Project** | **Avg Use Rate Hrs/day** | **# of Days On Site (each)** | **Total Hrs/Day** | **Total Hrs per Const Period** | **Total HP-Hrs Period** |
|---|---|---|---|---|---|---|---|
| Aerial Lifts | 63 | 1 | 6 | 94 | 6 | 564 | 35532 |
| Air Compressors | 78 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bore-Drill Rigs | 206 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cement Mixers | 9 | 0 | 0 | 0 | 0 | 0 | 0 |
| Concrete/Industrial Saws | 81 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cranes | 226 | 1 | 2 | 94 | 2 | 188 | 42488 |
| Crawler Tractors/Dozers | 208 | 3 | 7 | 210 | 21 | 4410 | 917280 |
| Crushing/Processing Eq. | 85 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dumpers/Tenders/Water Trucks | 16 | 7 | 7 | 192 | 49 | 9408 | 150528 |
| Excavators | 163 | 0 | 0 | 0 | 0 | 0 | 0 |
| Forklifts | 89 | 8 | 6 | 200 | 48 | 9600 | 854400 |
| Generator Sets | 84 | 0 | 0 | 0 | 0 | 0 | 0 |
| Graders | 175 | 5 | 7 | 108 | 35 | 3780 | 661500 |
| Off-Highway Tractors | 123 | 0 | 0 | 0 | 0 | 0 | 0 |
| Off-Highway Trucks | 400 | 12 | 7 | 220 | 84 | 18480 | 7392000 |
| Other Diesel Construction Eq. | 172 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other General Industrial Eq. | 88 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Material Handling Eq. | 167 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pavers | 126 | 1 | 4 | 28 | 4 | 112 | 14112 |
| Paving Eq. Other | 131 | 0 | 0 | 0 | 0 | 0 | 0 |
| Plate Compactors | 8 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pressure Washers | 13 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pumps | 84 | 0 | 0 | 0 | 0 | 0 | 0 |
| Roller Compactors | 81 | 1 | 7 | 42 | 7 | 294 | 23814 |
| Rough Terrain Forklifts | 100 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber Tired Dozers | 255 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber Tires Loaders | 200 | 0 | 0 | 0 | 0 | 0 | 0 |
| Scrapers | 362 | 0 | 0 | 0 | 0 | 0 | 0 |
| Signal Boards | 6 | 0 | 0 | 0 | 0 | 0 | 0 |
| Skid Steer Loaders | 65 | 1 | 7 | 188 | 7 | 1316 | 85540 |
| Surfacing Eq. | 254 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sweepers/Scrubbers | 64 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tractors (single category) | 98 | 2 | 7 | 245 | 14 | 3430 | 336140 |
| Front End Loaders (single category) | 98 | 1 | 7 | 83 | 7 | 581 | 56938 |
| Backhoes (single category) | 98 | 1 | 4 | 158 | 4 | 632 | 61936 |
| Trenchers | 81 | 10 | 4 | 235 | 40 | 9400 | 761400 |
| Welders | 46 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gasoline Const Eq. | 175 | 0 | 0 | 0 | 0 | 0 | 0 |

** diesel equipment unless otherwise specified.

| | | |
|---|---|---|
| Const Period Diesel Hp-Hrs = | 11393608 | |
| Const Period Gasoline Hp-Hrs = | 0 | |
| Const Period Diesel Fuel Use = | 683616 | gals |
| Const Period Gasoline Fuel Use = | 0 | gals |

Offroad equipment emissions factors derived SCAQMD Off Road database for 2025.
The SCAQMD EFs as presented incorporate the average equipment load factors.
Emissions factors for each category of equipment represent the composite factors for the stated equipment category as derived from the SCAQMD Offroad database for the construction start year.

**2025 Equipment Emissions Factors**

| Equip. Type | lbs/hr VOC (ROG) | lbs/hr CO | lbs/hr NOx | lbs/hr SOx | lbs/hr PM10 | lbs/hr CO2 | lbs/hr CH4 |
|---|---|---|---|---|---|---|---|
| Aerial Lifts | 0.0184 | 0.1646 | 0.1366 | 0.0004 | 0.0048 | 34.7217 | 0.0017 |
| Air Compressors | 0.0349 | 0.3027 | 0.2104 | 0.0007 | 0.0088 | 63.6073 | 0.0031 |
| Bore-Drill Rigs | 0.0428 | 0.5007 | 0.2864 | 0.0017 | 0.0042 | 164.8678 | 0.0039 |
| Cement Mixers | 0.0085 | 0.0414 | 0.0534 | 0.0001 | 0.0021 | 7.2481 | 0.0008 |
| Concrete/Industrial Saws | 0.0337 | 0.3706 | 0.2471 | 0.0007 | 0.0093 | 58.4637 | 0.0030 |
| Cranes | 0.0681 | 0.3738 | 0.4223 | 0.0014 | 0.0143 | 128.6241 | 0.0061 |
| Crawler Tractors/Dozers | 0.0789 | 0.5065 | 0.4492 | 0.0013 | 0.0227 | 114.0167 | 0.0071 |
| Crushing/Processing Eq. | 0.0693 | 0.6187 | 0.3763 | 0.0015 | 0.0146 | 132.3077 | 0.0062 |
| Dumpers/Tenders | 0.0092 | 0.0314 | 0.0581 | 0.0001 | 0.0022 | 7.6244 | 0.0008 |
| Excavators | 0.0559 | 0.5086 | 0.2269 | 0.0013 | 0.0086 | 119.5792 | 0.0050 |
| Forklifts | 0.0236 | 0.2148 | 0.0860 | 0.0006 | 0.0025 | 54.3958 | 0.0021 |
| Generator Sets | 0.0288 | 0.2667 | 0.2329 | 0.0007 | 0.0081 | 60.9927 | 0.0026 |
| Graders | 0.0676 | 0.5696 | 0.3314 | 0.0015 | 0.0147 | 132.7431 | 0.0061 |
| Off-Highway Tractors | 0.1134 | 0.6101 | 0.7291 | 0.0017 | 0.0331 | 151.3869 | 0.0102 |
| Off-Highway Trucks | 0.1140 | 0.5385 | 0.4769 | 0.0027 | 0.0142 | 260.0652 | 0.0103 |
| Other Diesel Construction Eq. | 0.0442 | 0.3474 | 0.2021 | 0.0013 | 0.0069 | 122.5051 | 0.0040 |
| Other General Industrial Eq. | 0.0747 | 0.4438 | 0.3947 | 0.0016 | 0.0130 | 152.2399 | 0.0067 |
| Other Material Handling Eq. | 0.0696 | 0.4355 | 0.3844 | 0.0015 | 0.0124 | 141.1941 | 0.0063 |
| Pavers | 0.0717 | 0.4745 | 0.3858 | 0.0009 | 0.0220 | 77.9326 | 0.0065 |
| Paving Eq. Other | 0.0548 | 0.3993 | 0.3281 | 0.0008 | 0.0190 | 68.9364 | 0.0049 |
| Plate Compactors | 0.0050 | 0.0263 | 0.0314 | 0.0001 | 0.0012 | 4.3138 | 0.0005 |
| Pressure Washers | 0.0066 | 0.0531 | 0.0561 | 0.0001 | 0.0019 | 9.4135 | 0.0006 |
| Pumps | 0.0270 | 0.2617 | 0.2079 | 0.0006 | 0.0078 | 49.6066 | 0.0024 |
| Roller Compactors | 0.0410 | 0.3763 | 0.2501 | 0.0008 | 0.0122 | 67.0308 | 0.0037 |
| Rough Terrain Forklifts | 0.0396 | 0.4430 | 0.2336 | 0.0008 | 0.0090 | 70.2808 | 0.0036 |
| Rubber Tired Dozers | 0.1672 | 0.6620 | 1.0824 | 0.0025 | 0.0419 | 239.0780 | 0.0151 |
| Rubber Tires Loaders | 0.0559 | 0.4311 | 0.2835 | 0.0012 | 0.0121 | 108.6113 | 0.0050 |
| Scrapers | 0.1495 | 0.7187 | 0.8387 | 0.0027 | 0.0335 | 262.4827 | 0.0135 |
| Signal Boards | 0.0111 | 0.0909 | 0.0718 | 0.0002 | 0.0029 | 16.6983 | 0.0010 |
| Skid Steer Loaders | 0.0186 | 0.2104 | 0.1354 | 0.0004 | 0.0019 | 30.2740 | 0.0017 |
| Surfacing Eq. | 0.0638 | 0.3590 | 0.3924 | 0.0017 | 0.0142 | 165.9715 | 0.0058 |
| Sweepers/Scrubbers | 0.0410 | 0.4840 | 0.2255 | 0.0009 | 0.0061 | 78.5433 | 0.0037 |
| Tractors | 0.0336 | 0.3586 | 0.1857 | 0.0008 | 0.0059 | 66.7965 | 0.0030 |
| Front End Loaders | 0.0336 | 0.3586 | 0.1857 | 0.0008 | 0.0059 | 66.7965 | 0.0030 |
| Backhoes | 0.0336 | 0.3586 | 0.1857 | 0.0008 | 0.0059 | 66.7965 | 0.0030 |
| Trenchers | 0.0674 | 0.4085 | 0.3481 | 0.0007 | 0.0215 | 58.7116 | 0.0061 |
| Welders | 0.0214 | 0.1745 | 0.1373 | 0.0003 | 0.0052 | 25.6027 | 0.0019 |
| Gasoline Const Eq. (assumed 175 hp category) | 0.0771 | 0.3855 | 1.08 | 0.00014 | 0.1542 | 14.1565 | 0.00037 |

(gasoline EFs: EPA OMS-AMD Report NR-009A, 2-13-98, and SCAQMD EMFAC 2007 CEQA Tables, 2016.)

Construction Period Emissions, lbs

| Equip. Type | VOC | CO | NOx | SOx | PM10 | CO2 | CH4 |
|---|---|---|---|---|---|---|---|
| Aerial Lifts | 10 | 93 | 77 | 0 | 3 | 19583 | 1 |
| Air Compressors | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bore-Drill Rigs | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cement Mixers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Concrete/Industrial Saws | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cranes | 13 | 70 | 79 | 0 | 3 | 24181 | 1 |
| Crawler Tractors/Dozers | 348 | 2234 | 1981 | 6 | 100 | 502814 | 31 |
| Crushing/Processing Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dumpers/Tenders | 87 | 295 | 547 | 1 | 21 | 71730 | 8 |
| Excavators | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Forklifts | 227 | 2062 | 826 | 6 | 24 | 522200 | 20 |
| Generator Sets | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Graders | 256 | 2153 | 1253 | 6 | 56 | 501769 | 23 |
| Off-Highway Tractors | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Off-Highway Trucks | 2107 | 9951 | 8813 | 50 | 262 | 4806005 | 190 |
| Other Diesel Construction Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other General Industrial Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Material Handling Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pavers | 8 | 53 | 43 | 0 | 2 | 8728 | 1 |
| Paving Eq. Other | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Plate Compactors | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pressure Washers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pumps | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Roller Compactors | 12 | 111 | 74 | 0 | 4 | 19707 | 1 |
| Rough Terrain Forklifts | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber Tired Dozers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber Tires Loaders | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Scrapers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Signal Boards | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Skid Steer Loaders | 24 | 277 | 178 | 1 | 3 | 39841 | 2 |
| Surfacing Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sweepers/Scrubbers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tractors | 115 | 1230 | 637 | 3 | 20 | 229112 | 10 |
| Front End Loaders | 20 | 208 | 108 | 0 | 3 | 38809 | 2 |
| Backhoes | 21 | 227 | 117 | 1 | 4 | 42215 | 2 |
| Trenchers | 634 | 3840 | 3272 | 7 | 202 | 551889 | 57 |
| Welders | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gasoline Const Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| Totals | VOC | CO | NOx | SOx | PM10 | PM2.5 | CO2 | CH4 | N2O |
|---|---|---|---|---|---|---|---|---|---|
| lbs per const. period | 3881 | 22804 | 18005 | 80 | 706 | 699.87 | 7378583 | 350 | 125 |
| tons per const. period | 1.9 | 11.4 | 9.0 | 0.040 | 0.35 | 0.35 | 3689.29 | 0.17 | 0.06 |
| Average lbs/day = | 7.3 | 43.0 | 34.0 | 0.150 | 1.33 | 1.32 | 13921.85 | 0.66 | 0.24 |
| Normalized TPY = | *1.4* | *8.0* | *6.4* | *0.0* | *0.2* | *0.2* | *2604.2* | *0.1* | *0.044* |

| | |
|---|---|
| CO2e, tons/period | 3712.3 |
| CO2e, tons/yr: | 2620.5 |

Other Assumptions and References:

1. Trench construction times per: Southern Regional Water Pipeline Alliance, 3/08.
   Optimum trench construction progress rate is 80m (260ft) per day.
   Non-optimum trench construction progress rate is 30m (100 ft) per day.
   An average progress of 180 ft/day is used where applicable.
2. Paving speeds can range from 3 to 15 m/min depending on asphalt delivery rates and required compaction thickness.
   A minium paving speed of 3 m/min (10 ft/min or 600 ft/hr) was used where applicable.
   The minimum speed is based upon a 3" compacted layer, 12 ft lane width, with an asphalt delivery rate of ~ 140 tons/hr.
   Ref: Asphalt Paving Speed, Pavement Worktip No. 31, AAPA, 11/2001.
3. Estimation of maximum daily emissions is extremely variable, and these values are not required by SJVAPCD.
4. Construction schedule note: applicant data indicates a construction work day period of 8 hours
   The equipment use rates provided by the applicant are consistent with an 8 hour workday.
5. GWP values: CH4=25, N2O=298, ref: 40 CFR 98 Subpart A, Table A-1.
6. CARB-CEIDARS, Updated Size Fractions for PM Profiles: PM2.5 = 0.991 of PM10 : Diesel Vehicle Exhaust

**CONSTRUCTION PHASE - SGF 11**

| | | | | |
|---|---|---|---|---|
| **MRI Level 2 Analysis (Refs 1, 3-7)** | | Acres | 2008 | |
| Acres Subject to Construction Disturbance Activites: | | | 200.8 | |
| Max Acres Subject to Construction Disturbance Activites on any day of this phase: | | | 15.1 | note (10) |
| Emissions Factor for PM10 Uncontrolled, tons/acre/month: | | | 0.12 | |
| PM2.5 fraction of PM10 (per CARB CEIDARS Profiles): | | | 0.21 | |
| **Activity Levels:** | Hrs/Day: | | 8 | |
| | Days/Wk: | | 5 | |
| | Days/Month: | Applicant Data | 22 | |
| | Phase Const Period, Months: | | 13.5 | 1.13 years |
| | Phase Const Period, Days: | | 297 | |

**Wet Season Adjustment:** (Per AP-42, Section 13.2.2, Figure 13.2.2-1, 12/03 or CalEEMod, Appendix D, Table 1.1.)

| | |
|---|---|
| Mean # days/year with rain >= 0.01 inch: | 40 |
| Mean # months/yr with rain >= 0.01 inch: | 1.33 |
| Adjusted Const Period, Months: | 12.00 |
| Adjusted Const Period, Days: | 252 |

**Controls for Fugitive Dust:** Proposed watering cycle: 3 times per day

3 watering cycles/8 hour construction shift yields a 68% reduction, use 68% for non-desert sites. (11)(12)
Speed control of onsite const traffic to <15 mph yields a 40-70% reduction (use 50% control as conservative for site). (11)(12)

| | | |
|---|---|---|
| Calculated % control based on mitigations proposed: | 84 | % control |
| Conservative control % used for emissions estimates: | 84 | % control |
| | 0.16 | release fraction |

| **Emissions: Controlled** | PM10 | PM2.5 |
|---|---|---|
| tons/month | 0.289 | 0.061 |
| tons/period | 3.470 | 0.729 |
| Max lbs/day | 26.287 | 5.520 |

**Soil Handling Emissions (Cut and Fill): (2)**

| | |
|---|---|
| Total cu.yds of soil handled: | 0 |
| Total tons of soil handled: | 0.0 |
| Total days soil handled: | 252 |
| Tons soil/day: | 0 |
| Control Eff, watering, % | 80 |
| Release Fraction: | 0.2 |

| | | | |
|---|---|---|---|
| Mean annual wind speed, mph: (8) | | | 8.03 |
| Avg. Soil moisture, %: (9) | | | 5 |
| Avg. Soil density, tons/cu.yd: | | | 1.3 |
| k factor for PM10: | | | 0.35 |
| Number of Drops per ton: | | | 4 |
| Calc 1 | wind | | 1.851 |
| Calc 2 | moisture | | 3.607 |
| Calc 3 | int | | 0.513 |
| Calc 4 | PM10 | lb/ton | 0.0006 |
| PM2.5 fraction of PM10: | | | 0.210 |

| Emissions: | PM10 | PM2.5 |
|---|---|---|
| tons/period | 0.000 | 0.000 |
| tons/month | 0.000 | 0.000 |
| max lbs/day | 0.000 | 0.000 |

| **Emissions Totals:** | **PM10** | **PM2.5** |
|---|---|---|
| **tons/period** | **3.470** | **0.729** |

**Methodology References:**

(1) MRI Report, South Coast AQMD Project No. 95040, March 1996, Level 2 Analysis Procedure.
MRI Report uncontrolled factor of 0.11 tons/acre/month is based on 168 hours per month of const activity.
For an activity rate of ~180 hrs/month, the adjusted EF would be 0.12 tons/acre/month (uncontrolled).
(2) Soil Handling (Cut and Fill), EPA, AP-42, Section 13.2.4., 11/06.
(3) URBEMIS, Version 9.2.4, User's Manual Appendix A, page A-6.
(4) CARB Area Source Methodology, Section 7.7, 9/02.
(5) WRAP Fugitive Dust Handbook, 9/06.
(6) USEPA, AP-42, Section 13.2.3, 2/10.
(7) Estimating PM Emissions from Construction Operations, USEPA, MRI, 9/99.
(8) Wind speed data for Lemoore met station. Annual avg wind speed = 8.03 mph, % calms = 3.44%.
(9) Soil Moisture; 5% assumed avg value
(10) adjusted applicant value based on 7.5% of total acreage disturbed on any given day
(11) SCAQMD CEQA Handbook 1993.
(12) SCAQMD, Sample Construction Scenarios for Projects Less than Five Acres, Fugitive Dust Mitigations, February 2005.

**OFFSITE PAVED ROAD FUGITIVE DUST EMISSIONS**
(associated with delivery truck and worker vehicle traffic on I-5 and plant access road)

| | | | |
|---|---|---|---|
| Average mileage for construction related vehicles: | | NA | miles, roundtrip distance*** |
| Avg weight of vehicular equipment on road: | | 4.1 | tons (range 2 - 42 tons) |
| Road surface silt loading factor: | | 0.015 | g/m2 (range 0.03 - 400 g/m2) |
| | | | Limited Access Freeway >10,000 ADT **(I-5)** |
| Particle size multiplier factors: | PM10 | 0.0022 | lb/VMT |
| | PM2.5 | 0.00054 | lb/VMT |
| C factors (brake and tire wear): | PM10 | 0.00047 | lb/VMT |
| | PM2.5 | 0.00036 | lb/VMT |
| Avg vehicle speed on road: | | 65 | mph |
| Avg. Number of vehicles per day: | | 195 | |
| | | | calculated per Applicant da |
| Avg. Number of work days per month: | | 22 | **VMT/period: 10826972** |
| | Total vehicles per month: | 4290 | |
| Number of work months: | | 15.11 | adjusted for precip events |
| | Total vehicles per const period: | 64821.9 | |

| | PM10 | |
|---|---|---|
| Calc 1 | 0.022 | |
| Calc 2 | 4.217 | |
| Calc 3 | 0.0007 | lb/VMT |

| **Emissions** | **PM10** | **PM2.5** |
|---|---|---|
| **lbs/period** | **7287.61** | **1231.61** |
| **tons/period** | **3.644** | **0.616** |

EPA, AP-42, Section 13.2.1, March 2006, updated 9/2008.
PM2.5 fraction of PM10 per CARB CEIDARs is 0.169
*** Note: avg roundtrip distance traveled by delivery or worker vehicles on freeways (I-5) and other State Routes in the project area.
Vehicles per day: worker + deliveries+staff support vehciles (averages)

**ONSITE UNPAVED ROAD FUGITIVE DUST**

| | | | | | | |
|---|---|---|---|---|---|---|
| Length of Unpaved Roads on Construction site: | | 0.1 | miles* | | | |
| Avg weight of construction vehicular equipment on road: | | 4.1 | tons (range 2 - 42 tons) | | | |
| Road surface silt content: | | 8.5 | % (range 1.8 - 35%) | | | |
| Road surface material moisture content: | | 5 | % (range 0.03 - 13%) | | | |
| | | k | a | b | | |
| Particle size multiplier factors: | PM10 | 1.5 | 0.9 | 0.45 | | |
| | PM2.5 | 0.15 | 0.9 | 0.45 | | |
| C factors (brake and tire wear): | PM10 | 0.00047 | lb/VMT | | | |
| | PM2.5 | 0.00036 | lb/VMT | | | |
| Avg construction vehicle speed on road: | | 5 | mph (range 5-55 mph) | | | |
| Avg number of construction vehicles per day: | | 74 | ** | | | |
| Number of construction work days per month: | | 22 | | | **VMT/period:** | **8045.2** |
| Total vehicles per month: | | 1628 | | | | |
| Number of construction work months: | | 15.11 | adjusted for precipitation events | | | |
| Total vehicles per const period: | | **80452** | | | | |
| Control reduction due to watering, speed control, etc. = | | 80 | | | | |
| | | 0.8 | | | | |
| Release Fraction = | | 0.2 | | | | |

| | PM10 | PM2.5 |
|---|---|---|
| Calc 1 | 0.733 | 0.733 |
| Calc 2 | 1.151 | 1.151 |
| Calc 3 | 1.266 | 0.127 |
| Calc 4 | 1.266 | 0.127 |
| Controlled lb/VMT | 0.253 | 0.025 |

| **Emissions** | **PM10** | **PM2.5** |
|---|---|---|
| **lbs/period** | **2037.42** | **204.25** |
| **tons/period** | **1.019** | **0.102** |

EPA, AP-42, Section 13.2.2, March 2006
Soil Moisture; 5% avg
Soil silt content: 8.5% per AP-42 for construction site scraper routes
** const equipment plus site support pickups plus

**CONSTRUCTION PHASE - Truck Hauling/Delivery and Site Support Vehicle Emissions**

**All Phases**

**Delivery/Hauling Vehicle Use Rates**

| | | |
|---|---|---|
| Delivery Roundtrip Distance: | 0 | miles |
| Const Days per Period: | 0 | |
| Avg Deliveries per Day: | 0 | |
| Fraction of Deliveries-Diesel: | 0.95 | HDDT |
| Fraction of Deliveries-Gas: | 0.05 | MDGT |
| Total Delivery VMT: | **1985372** | **per Applicant** |
| Total Daily VMT-Diesel | 0 | |
| Total Daily VMT-Gasoline | 0 | |
| Total Period VMT-Diesel | 1886103.4 | |
| Total Period VMT-Gasoline | 99268.6 | |

Emissions Factors (lbs/vmt)

| NOx | CO | VOC | SOx | PM10 | CO2 | | PM2.5 | |
|---|---|---|---|---|---|---|---|---|
| 0.00133459 | 0.00037027 | 6.2834E-05 | 0.000025 | 1.0747E-05 | 2.91617689 | HDDT | | |
| 0.00026191 | 0.00201574 | 3.9247E-05 | 0.000011 | 2.7302E-06 | 0.8745735 | MDGT | | |
| **Daily Emissions (lbs)** | | | | | | | | |
| **NOx** | **CO** | **VOC** | **SOx** | **PM10** | **CO2** | | **PM2.5** | |
| 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | | 0.000 | HDDT |
| 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | | 0.000 | MDGT |
| **Tons per Const Period** | | | | | | | | |
| 1.259 | 0.349 | 0.059 | 0.024 | 0.010 | 2750.1 | | 0.008 | HDDT |
| 0.013 | 0.100 | 0.002 | 0.001 | 0.000 | 43.4 | | 0.000 | MDGT |

**Construction Site Support Vehicle Use Rates (LDTs)**

| | |
|---|---|
| Gasoline Vehicle VMT Period: | 75900 |
| Avg Daily Gasoline VMT: | 300 |
| Avg Daily Diesel VMT: | 0 |
| Total Phase Const Days: | 240 |

**Daily Emissions, lbs**

| **NOx** | **CO** | **VOC** | **SOx** | **PM10** | **CO2** | | | **PM2.5** |
|---|---|---|---|---|---|---|---|---|
| 0.0002232 | 0.00204313 | 3.6203E-05 | 0.000007 | 3.782E-06 | 0.55087942 | lbs/vmt* | LDT gasoline | |
| 0.0670 | 0.6129 | 0.0109 | 0.0021 | 0.0011 | 165.2638 | lbs/day | gasoline | 0.0007 |
| **Tons per Const Period** | | | | | | | | |
| 0.0085 | 0.0775 | 0.0014 | 0.0003 | 0.0001 | 20.9 | **tons/period** | **gasoline** | 0.0001 |

Ref: EMFAC 2014, SJVAPCD Year 2023
LDT1-gas, MDV-gas, HDDT-dsl
See EF data in WSP Support Appendix

**Notes *****

VMT for delivery/hauling for all vehicles includes: (1) materials deliveries to site, (2) materials removal from site, other VMT as specified below.
Support Vehicle VMT: best estimate at time of filing, 10 LDT (gasoline) at 30 VMT/day
CARB-CEIDARS, Updated Fractions for PM Profiles: PM2.5 = 0.991 of PM10 for Diesel Exhaust, and 0.998 for Gasoline Vehicles.

**CONSTRUCTION PHASE - Worker Travel - Emissions**

Ref: SJVAPCD EMFAC 2014, Year 2025
LDA-gas
See EF data in WSP Support Appendix

**Worker Travel to Site**

| | |
|---|---|
| Avg Occupancy/Vehicle: | 0 |
| Avg Roundtrip Distance, miles: | 0.0 |
| Avg # of Worker Vehicles, per day: | 0 |
| Avg Daily Worker VMT: | 0 |
| Max # of Worker Vehicles, per day: | 0 |
| Max Daily Worker VMT: | 0 |
| Total Const Days: | 240 |
| **Total Const Period Worker VMT:** | **8841600** |

**VMT data supplied by Applicant.**

Emissions Factors (lbs/VMT)

| NOx | CO | VOC | SOx | PM10 | CO2 |
|---|---|---|---|---|---|
| 8.5075E-05 | 0.000810295 | 1.5737E-05 | 0.000006 | 0.000004 | 0.56063169 |

**Daily Emissions (lbs)**

| | NOx | CO | VOC | SOx | PM10 | CO2 | PM2.5 |
|---|---|---|---|---|---|---|---|
| Avg | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**Tons per Const Period**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Avg | 0.376 | 3.582 | 0.070 | 0.027 | 0.018 | 2478.4 | 0.000 |

**Worker Travel by Busing from Staging Area**

| | |
|---|---|
| Total Bus VMT/Const Period: | 0 |
| Avg Bus VMT/Const Day: | 0 |
| Max Bus VMT/Const Day: | 0 |

| | | |
|---|---|---|
| Bus Round Trips/Day: | 0 | max |
| Bus Occupancy/Trip: | 0 | |

Ref: SJVAPCD EMFAC 2014, Year 2025
All other buses-DSL
See EF data in WSP Support Appendix

# buses supplied by Applicant.

Emissions Factors (lbs/VMT)

| NOx | CO | VOC | SOx | PM10 | CO2 |
|---|---|---|---|---|---|
| 0.002933 | 0.00055 | 0.000105 | 0.000025 | 0.000007 | 2.661084 |

**Daily Emissions (lbs)**

| | **NOx** | **CO** | **VOC** | **SOx** | **PM10** | **CO2** | **PM2.5** |
|---|---|---|---|---|---|---|---|
| Avg | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Max | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**Tons per Const Period**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Avg | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

**CONSTRUCTION PHASE - Trackout Emissions**

| | | | | | |
|---|---|---|---|---|---|
| Paved Road Length (miles): | 0.1 | estimated roundtrip trackout distance | | | |
| Daily # of Vehicles: | 74 | | | | |
| Avg Vehicle Weight (tons): | 6.8 | | **PM10** | **PM2.5*** | |
| Total Unadjusted VMT/day | 7.4 | | 0.361 | | |
| Particle Size Multipliers | PM10 | | 1.924 | | |
| lb/VMT | 0.023 | | 0.002 | 0.0004 | lb/VMT |
| C factor, lb/VMT | 0.00047 | | **0.129** | **0.0217** | **lbs/day** |
| Road Sfc Silt Loading (g/m^2): | 0.56 | local X 2 | **0.001** | **0.0002** | **tons/month** |
| # of Active Trackout Points: | 1 | ** | **0.02** | **0.0036** | **tons/period** |
| Added Trackout Miles: | PM10 | | | | |
| Trackout VMT/day: | 44 | *Default Silt Load Values for Paved Road Types* | | | |
| Final Adjusted VMT/day | 52 | | Freeway | 0.02 g/m2 | |
| Final Adjusted VMT/month | 1140 | | Arterial | 0.036 g/m2 | |
| Final Adjusted VMT/period | 17219 | | Collector | 0.036 g/m2 | |
| Construction days/month: | 22 | | Local | 0.28 g/m2 | |
| Adj. Construction months/period: | 15.11 | | Rural | 1.6 g/m2 | |
| Control Applied to Trackout: | Gravel entrance, metal cleaning grates, water washing, sweeping | | | | |
| Control Efficiency, % | 84 | 0.84 | Release Factor = | 0.16 | |

* PM2.5 fraction of PM10 assumed to be 0.169 (CARB CEIDARS updated fraction values) for paved roads.
** 1 controlled ingress/egress point is planned for site construction
EPA, AP-42, Section 13.2.1, Proposed revisions dated 9/2008.
Use silt loading factor from default values for road type if no site specific data is available.
Trackout effects approximately 0.05 mi. of roadway arriving and departing from the site access point.
Plant access road is already paved. Entrance will be gravelled with metal grates for take out control.
Vehicle count = delivery trucks plus site support trucks (see Unpaved Onsite tab)
Worker vehicles not counted for trackout, they will park on the site perimeter.

SGF 12 2030

## Tons/Period

| | NOx | CO | VOC | SOx | PM10 | CO2 | Fug PM10 | Fug PM2.5 |
|---|---|---|---|---|---|---|---|---|
| on-off site travel | 0.83 | 2.10 | 0.07 | 0.03 | 0.01 | 2408 | 5.19 | 0.90 |
| on-site equipment | 3.13 | 4.01 | 0.69 | 0.01 | 0.11 | 1405 | | |
| Total | 3.96 | 6.11 | 0.75 | 0.04 | 0.13 | 3813 | 5.19 | 0.90 |
| Months: | 13.8 | | | | | | | |
| Max Year Months: | 12 | | | | | | | |
| Total per Year: | 3.44 | 5.31 | 0.65 | 0.04 | 0.11 | 3315.86 | 4.51 | 0.78 |

CONSTRUCTION EQUIPMENT EXHAUST EMISSIONS

Project: WSP **Main Site Construction-SGF 12**

**Assumptions:**

| | | | |
|---|---|---|---|
| 1. The average engines employed in construction equipment use consumes fuel at a rate of: | diesel | 0.06 | gal/hp-hr |
| Ref: EPA, NR-009b Publication, November 2002. | gasoline | 0.11 | gal/hp-hr |

Ref: Sacramento County APCD Const. Program Data, V. 6.0.3, 3/2007.
Ref: EPA, NR-009c Publication, EPA 420-P-04-009, April 2004.
Ref: Niland Energy Project, IID, AFC Vol 2, App A.
Ref: South Coast AQMD PR XXI, Draft Staff Report, 3-15-95, and SCAQMD CEQA Manual, 11/03.
The above noted references present fuel consumption values which range from 0.050 to 0.064 gal/hp-hr for diesel engines used in construction related equipment. The value of 0.060 gal/hp-hr was chosen as a reasonable upper mid-range value for construction diesel emissions calculations.
For gasoline the mid-range value from SCAQMD of 0.11 gal/hp-hr was used.

2. Construction equipment exhaust emissions will be calculated on an annual basis using the site specific equipment list, HP ratings, hours of use, days of use, etc. Annual emissions will be apportioned to daily values based on the estimated construction period time on site.

3. The equipment list derived from the South Coast AQMD Offroad database (2016) will be used to establish the various equipment categories. Avg HP values were derived from SCAQMD and SacMetro AQMD construction resources.

| | | | | | |
|---|---|---|---|---|---|
| 4. Construction Schedule: | 14 | months | Construction Totals: | 180 | hrs/month |
| | 8 | hrs/day | | 2520 | hrs/const period |
| | 1.17 | years | | 315 | days/const period |

5. Anticipated Construction Start Year: 2029

6. Maximum anticipated equipment use month is: n/a

7. N2O EF diesel, lb/gal: 0.000183
N2O EF gasoline, lb/gal: 0.000164
CARB, Mandatory GHG Reporting Regulation
Table 4, Appendix A, 2007.

Equipment types and use rates supplied by the Applicant.

| Equipment Category** | | Weighted Average HP | # of Units Used for Project | Avg Use Rate Hrs/day | # of Days On Site (each) | Total Hrs/Day | Total Hrs per Const Period | Total HP-Hrs Period |
|---|---|---|---|---|---|---|---|---|
| Aerial Lifts | | 63 | 1 | 6 | 38 | 6 | 228 | 14364 |
| Air Compressors | | 78 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bore-Drill Rigs | | 206 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cement Mixers | | 9 | 0 | 0 | 0 | 0 | 0 | 0 |
| Concrete/Industrial Saws | | 81 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cranes | | 226 | 1 | 2 | 38 | 2 | 76 | 17176 |
| Crawler Tractors/Dozers | | 208 | 3 | 7 | 85 | 21 | 1785 | 371280 |
| Crushing/Processing Eq. | | 85 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dumpers/Tenders/Water Trucks | | 16 | 7 | 7 | 78 | 49 | 3822 | 61152 |
| Excavators | | 163 | 0 | 0 | 0 | 0 | 0 | 0 |
| Forklifts | | 89 | 8 | 6 | 80 | 48 | 3840 | 341760 |
| Generator Sets | | 84 | 0 | 0 | 0 | 0 | 0 | 0 |
| Graders | | 175 | 5 | 7 | 43 | 35 | 1505 | 263375 |
| Off-Highway Tractors | | 123 | 0 | 0 | 0 | 0 | 0 | 0 |
| Off-Highway Trucks | | 400 | 12 | 7 | 88 | 84 | 7392 | 2956800 |
| Other Diesel Construction Eq. | | 172 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other General Industrial Eq. | | 88 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Material Handling Eq. | | 167 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pavers | | 126 | 1 | 4 | 11 | 4 | 44 | 5544 |
| Paving Eq. Other | | 131 | 0 | 0 | 0 | 0 | 0 | 0 |
| Plate Compactors | | 8 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pressure Washers | | 13 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pumps | | 84 | 0 | 0 | 0 | 0 | 0 | 0 |
| Roller Compactors | | 81 | 1 | 7 | 17 | 7 | 119 | 9639 |
| Rough Terrain Forklifts | | 100 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber Tired Dozers | | 255 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber Tires Loaders | | 200 | 0 | 0 | 0 | 0 | 0 | 0 |
| Scrapers | | 362 | 0 | 0 | 0 | 0 | 0 | 0 |
| Signal Boards | | 6 | 0 | 0 | 0 | 0 | 0 | 0 |
| Skid Steer Loaders | | 65 | 1 | 7 | 75 | 7 | 525 | 34125 |
| Surfacing Eq. | | 254 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sweepers/Scrubbers | | 64 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tractors | (single category) | 98 | 2 | 7 | 98 | 14 | 1372 | 134456 |
| Front End Loaders | | 98 | 1 | 7 | 33 | 7 | 231 | 22638 |
| Backhoes | | 98 | 1 | 4 | 63 | 4 | 252 | 24696 |
| Trenchers | | 81 | 3 | 4 | 86 | 12 | 1032 | 83592 |
| Welders | | 46 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gasoline Const Eq. | | 175 | 0 | 0 | 0 | 0 | 0 | 0 |

** diesel equipment unless otherwise specified.

| | | |
|---|---|---|
| Const Period Diesel Hp-Hrs = | 4340597 | |
| Const Period Gasoline Hp-Hrs = | 0 | |
| Const Period Diesel Fuel Use = | 260436 | gals |
| Const Period Gasoline Fuel Use = | 0 | gals |

Offroad equipment emissions factors derived SCAQMD Off Road database for 2025.
The SCAQMD EFs as presented incorporate the average equipment load factors.
Emissions factors for each category of equipment represent the composite factors for the stated equipment category as derived from the SCAQMD Offroad database for the construction start year.

**2025 Equipment Emissions Factors**

| Equip. Type | lbs/hr VOC (ROG) | lbs/hr CO | lbs/hr NOx | lbs/hr SOx | lbs/hr PM10 | lbs/hr CO2 | lbs/hr CH4 |
|---|---|---|---|---|---|---|---|
| Aerial Lifts | 0.0184 | 0.1646 | 0.1366 | 0.0004 | 0.0048 | 34.7217 | 0.0017 |
| Air Compressors | 0.0349 | 0.3027 | 0.2104 | 0.0007 | 0.0088 | 63.6073 | 0.0031 |
| Bore-Drill Rigs | 0.0428 | 0.5007 | 0.2864 | 0.0017 | 0.0042 | 164.8678 | 0.0039 |
| Cement Mixers | 0.0085 | 0.0414 | 0.0534 | 0.0001 | 0.0021 | 7.2481 | 0.0008 |
| Concrete/Industrial Saws | 0.0337 | 0.3706 | 0.2471 | 0.0007 | 0.0093 | 58.4637 | 0.0030 |
| Cranes | 0.0681 | 0.3738 | 0.4223 | 0.0014 | 0.0143 | 128.6241 | 0.0061 |
| Crawler Tractors/Dozers | 0.0789 | 0.5065 | 0.4492 | 0.0013 | 0.0227 | 114.0167 | 0.0071 |
| Crushing/Processing Eq. | 0.0693 | 0.6187 | 0.3763 | 0.0015 | 0.0146 | 132.3077 | 0.0062 |
| Dumpers/Tenders | 0.0092 | 0.0314 | 0.0581 | 0.0001 | 0.0022 | 7.6244 | 0.0008 |
| Excavators | 0.0559 | 0.5086 | 0.2269 | 0.0013 | 0.0086 | 119.5792 | 0.0050 |
| Forklifts | 0.0236 | 0.2148 | 0.0860 | 0.0006 | 0.0025 | 54.3958 | 0.0021 |
| Generator Sets | 0.0288 | 0.2667 | 0.2329 | 0.0007 | 0.0081 | 60.9927 | 0.0026 |
| Graders | 0.0676 | 0.5696 | 0.3314 | 0.0015 | 0.0147 | 132.7431 | 0.0061 |
| Off-Highway Tractors | 0.1134 | 0.6101 | 0.7291 | 0.0017 | 0.0331 | 151.3869 | 0.0102 |
| Off-Highway Trucks | 0.1140 | 0.5385 | 0.4769 | 0.0027 | 0.0142 | 260.0652 | 0.0103 |
| Other Diesel Construction Eq. | 0.0442 | 0.3474 | 0.2021 | 0.0013 | 0.0069 | 122.5051 | 0.0040 |
| Other General Industrial Eq. | 0.0747 | 0.4438 | 0.3947 | 0.0016 | 0.0130 | 152.2399 | 0.0067 |
| Other Material Handling Eq. | 0.0696 | 0.4355 | 0.3844 | 0.0015 | 0.0124 | 141.1941 | 0.0063 |
| Pavers | 0.0717 | 0.4745 | 0.3858 | 0.0009 | 0.0220 | 77.9326 | 0.0065 |
| Paving Eq. Other | 0.0548 | 0.3993 | 0.3281 | 0.0008 | 0.0190 | 68.9364 | 0.0049 |
| Plate Compactors | 0.0050 | 0.0263 | 0.0314 | 0.0001 | 0.0012 | 4.3138 | 0.0005 |
| Pressure Washers | 0.0066 | 0.0531 | 0.0561 | 0.0001 | 0.0019 | 9.4135 | 0.0006 |
| Pumps | 0.0270 | 0.2617 | 0.2079 | 0.0006 | 0.0078 | 49.6066 | 0.0024 |
| Roller Compactors | 0.0410 | 0.3763 | 0.2501 | 0.0008 | 0.0122 | 67.0308 | 0.0037 |
| Rough Terrain Forklifts | 0.0396 | 0.4430 | 0.2336 | 0.0008 | 0.0090 | 70.2808 | 0.0036 |
| Rubber Tired Dozers | 0.1672 | 0.6620 | 1.0824 | 0.0025 | 0.0419 | 239.0780 | 0.0151 |
| Rubber Tires Loaders | 0.0559 | 0.4311 | 0.2835 | 0.0012 | 0.0121 | 108.6113 | 0.0050 |
| Scrapers | 0.1495 | 0.7187 | 0.8387 | 0.0027 | 0.0335 | 262.4827 | 0.0135 |
| Signal Boards | 0.0111 | 0.0909 | 0.0718 | 0.0002 | 0.0029 | 16.6983 | 0.0010 |
| Skid Steer Loaders | 0.0186 | 0.2104 | 0.1354 | 0.0004 | 0.0019 | 30.2740 | 0.0017 |
| Surfacing Eq. | 0.0638 | 0.3590 | 0.3924 | 0.0017 | 0.0142 | 165.9715 | 0.0058 |
| Sweepers/Scrubbers | 0.0410 | 0.4840 | 0.2255 | 0.0009 | 0.0061 | 78.5433 | 0.0037 |
| Tractors | 0.0336 | 0.3586 | 0.1857 | 0.0008 | 0.0059 | 66.7965 | 0.0030 |
| Front End Loaders | 0.0336 | 0.3586 | 0.1857 | 0.0008 | 0.0059 | 66.7965 | 0.0030 |
| Backhoes | 0.0336 | 0.3586 | 0.1857 | 0.0008 | 0.0059 | 66.7965 | 0.0030 |
| Trenchers | 0.0674 | 0.4085 | 0.3481 | 0.0007 | 0.0215 | 58.7116 | 0.0061 |
| Welders | 0.0214 | 0.1745 | 0.1373 | 0.0003 | 0.0052 | 25.6027 | 0.0019 |
| Gasoline Const Eq. (assumed 175 hp category) | 0.0771 | 0.3855 | 1.08 | 0.00014 | 0.1542 | 14.1565 | 0.00037 |

(gasoline EFs: EPA OMS-AMD Report NR-009A, 2-13-98, and SCAQMD EMFAC 2007 CEQA Tables, 2016.)

Construction Period Emissions, lbs

| **Equip. Type** | **VOC** | **CO** | **NOx** | **SOx** | **PM10** | **CO2** | **CH4** |
|---|---|---|---|---|---|---|---|
| Aerial Lifts | 4 | 38 | 31 | 0 | 1 | 7917 | 0 |
| Air Compressors | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bore-Drill Rigs | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cement Mixers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Concrete/Industrial Saws | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cranes | 5 | 28 | 32 | 0 | 1 | 9775 | 0 |
| Crawler Tractors/Dozers | 141 | 904 | 802 | 2 | 41 | 203520 | 13 |
| Crushing/Processing Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dumpers/Tenders | 35 | 120 | 222 | 0 | 8 | 29140 | 3 |
| Excavators | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Forklifts | 91 | 825 | 330 | 2 | 10 | 208880 | 8 |
| Generator Sets | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Graders | 102 | 857 | 499 | 2 | 22 | 199778 | 9 |
| Off-Highway Tractors | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Off-Highway Trucks | 843 | 3981 | 3525 | 20 | 105 | 1922402 | 76 |
| Other Diesel Construction Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other General Industrial Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Material Handling Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pavers | 3 | 21 | 17 | 0 | 1 | 3429 | 0 |
| Paving Eq. Other | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Plate Compactors | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pressure Washers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pumps | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Roller Compactors | 5 | 45 | 30 | 0 | 1 | 7977 | 0 |
| Rough Terrain Forklifts | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber Tired Dozers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber Tires Loaders | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Scrapers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Signal Boards | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Skid Steer Loaders | 10 | 110 | 71 | 0 | 1 | 15894 | 1 |
| Surfacing Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sweepers/Scrubbers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tractors | 46 | 492 | 255 | 1 | 8 | 91645 | 4 |
| Front End Loaders | 8 | 83 | 43 | 0 | 1 | 15430 | 1 |
| Backhoes | 8 | 90 | 47 | 0 | 1 | 16833 | 1 |
| Trenchers | 70 | 422 | 359 | 1 | 22 | 60590 | 6 |
| Welders | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gasoline Const Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| **Totals** | **VOC** | **CO** | **NOx** | **SOx** | **PM10** | **PM2.5** | **CO2** | **CH4** | **N2O** |
|---|---|---|---|---|---|---|---|---|---|
| lbs per const. period | 1370 | 8016 | 6263 | 30 | 224 | 222.33 | 2793210 | 123 | 48 |
| tons per const. period | 0.7 | 4.0 | 3.1 | 0.015 | 0.11 | 0.11 | 1396.60 | 0.06 | 0.02 |
| Average lbs/day = | 4.3 | 25.4 | 19.9 | 0.095 | 0.71 | 0.71 | 8867.33 | 0.39 | 0.15 |
| Normalized TPY = | *0.59* | *3.44* | *2.68* | *0.01* | *0.10* | *0.10* | *1197.09* | *0.05* | *0.020* |

| | |
|---|---|
| CO2e, tons/period | 1405.2 |
| CO2e, tons/yr: | 1204.5 |

CARB-CEIDARS, Updated Size Fractions for PM Profiles: PM2.5 = 0.991 of PM10 : Diesel Vehicle Exhaust

Other Assumptions and References:

1. Trench construction times per: Southern Regional Water Pipeline Alliance, 3/08.
   Optimum trench construction progress rate is 80m (260ft) per day.
   Non-optimum trench construction progress rate is 30m (100 ft) per day.
   An average progress of 180 ft/day is used where applicable.
2. Paving speeds can range from 3 to 15 m/min depending on asphalt delivery rates and required compaction thickness.
   A minium paving speed of 3 m/min (10 ft/min or 600 ft/hr) was used where applicable.
   The minimum speed is based upon a 3" compacted layer, 12 ft lane width, with an asphalt delivery rate of ~ 140 tons/hr.
   Ref: Asphalt Paving Speed, Pavement Worktip No. 31, AAPA, 11/2001.
3. Estimation of maximum daily emissions is extremely variable, and these values are not required by SJVAPCD.
4. Construction schedule note: applicant data indicates a construction work day period of 8 hours
   The equipment use rates provided by the applicant are consistent with an 8 hour workday.
5. GWP values: CH4=25, N2O=298, ref: 40 CFR 98 Subpart A, Table A-1.

**CONSTRUCTION PHASE - SGF 12**

| | | | | |
|---|---|---|---|---|
| **MRI Level 2 Analysis (Refs 1, 3-7)** | | Acres | 1151 | |
| Acres Subject to Construction Disturbance Activites: | | | 115.1 | |
| Max Acres Subject to Construction Disturbance Activites on any day of this phase: | | | 8.6 | note (10) |
| Emissions Factor for PM10 Uncontrolled, tons/acre/month: | | | 0.12 | |
| PM2.5 fraction of PM10 (per CARB CEIDARS Profiles): | | | 0.21 | |
| **Activity Levels:** | Hrs/Day: | | 8 | |
| | Days/Wk: | | 5 | |
| | Days/Month: Applicant Data | | 22 | |
| | Phase Const Period, Months: | | 13.8 | 1.15 years |
| | Phase Const Period, Days: | | 303.6 | |

**Wet Season Adjustment:** (Per AP-42, Section 13.2.2, Figure 13.2.2-1, 12/03 or CalEEMod, Appendix D, Table 1.1.)

| | |
|---|---|
| Mean # days/year with rain >= 0.01 inch: | 40 |
| Mean # months/yr with rain >= 0.01 inch: | 1.33 |
| Adjusted Const Period, Months: | 12.27 |
| Adjusted Const Period, Days: | 258 |

**Controls for Fugitive Dust:** Proposed watering cycle: 3 times per day

3 watering cycles/8 hour construction shift yields a 68% reduction, use 68% for non-desert sites. (11)(12)
Speed control of onsite const traffic to <15 mph yields a 40-70% reduction (use 50% control as conservative for site). (11)(12)

| | | |
|---|---|---|
| Calculated % control based on mitigations proposed: | 84 | % control |
| Conservative control % used for emissions estimates: | 84 | % control |
| | 0.16 | release fraction |

| **Emissions: Controlled** | PM10 | PM2.5 |
|---|---|---|
| tons/month | 0.166 | 0.035 |
| tons/period | 2.033 | 0.427 |
| Max lbs/day | 15.068 | 3.164 |

**Soil Handling Emissions (Cut and Fill): (2)**

| | | | | | | |
|---|---|---|---|---|---|---|
| Total cu.yds of soil handled: | | 0 | Mean annual wind speed, mph: (8) | | | 8.03 |
| Total tons of soil handled: | | 0.0 | Avg. Soil moisture, %: (9) | | | 5 |
| Total days soil handled: | | 258 | Avg. Soil density, tons/cu.yd: | | | 1.3 |
| Tons soil/day: | | 0 | k factor for PM10: | | | 0.35 |
| Control Eff, watering, % | | 80 | Number of Drops per ton: | | | 4 |
| | Release Fraction: | 0.2 | Calc 1 | wind | | 1.851 |
| | | | Calc 2 | moisture | | 3.607 |

| Emissions: | PM10 | PM2.5 | | | | |
|---|---|---|---|---|---|---|
| tons/period | 0.000 | 0.000 | Calc 3 | int | | 0.513 |
| tons/month | 0.000 | 0.000 | Calc 4 | PM10 | lb/ton | 0.0006 |
| max lbs/day | 0.000 | 0.000 | PM2.5 fraction of PM10: | | | 0.210 |

| **Emissions Totals:** | **PM10** | **PM2.5** |
|---|---|---|
| **tons/period** | **2.033** | **0.427** |

**Methodology References:**
(1) MRI Report, South Coast AQMD Project No. 95040, March 1996, Level 2 Analysis Procedure.
MRI Report uncontrolled factor of 0.11 tons/acre/month is based on 168 hours per month of const activity.
For an activity rate of ~180 hrs/month, the adjusted EF would be 0.12 tons/acre/month (uncontrolled).
(2) Soil Handling (Cut and Fill), EPA, AP-42, Section 13.2.4., 11/06.
(3) URBEMIS, Version 9.2.4, User's Manual Appendix A, page A-6.
(4) CARB Area Source Methodology, Section 7.7, 9/02.
(5) WRAP Fugitive Dust Handbook, 9/06.
(6) USEPA, AP-42, Section 13.2.3, 2/10.
(7) Estimating PM Emissions from Construction Operations, USEPA, MRI, 9/99.
(8) Wind speed data for Lemoore met station. Annual avg wind speed = 8.03 mph, % calms = 3.44%.
(9) Soil Moisture; 5% assumed avg value
(10) adjusted applicant value based on 7.5% of total acreage disturbed on any given day
(11) SCAQMD CEQA Handbook 1993.
(12) SCAQMD, Sample Construction Scenarios for Projects Less than Five Acres, Fugitive Dust Mitigations, February 2005.

**OFFSITE PAVED ROAD FUGITIVE DUST EMISSIONS**
(associated with delivery truck and worker vehicle traffic on I-5 and plant access road)

| | | | |
|---|---|---|---|
| Average mileage for construction related vehicles: | | NA | miles, roundtrip distance*** |
| Avg weight of vehicular equipment on road: | | 4.1 | tons (range 2 - 42 tons) |
| Road surface silt loading factor: | | 0.015 | g/m2 (range 0.03 - 400 g/m2) |
| | | | Limited Access Freeway >10,000 ADT **(I-5)** |
| Particle size multiplier factors: | PM10 | 0.0022 | lb/VMT |
| | PM2.5 | 0.00054 | lb/VMT |
| C factors (brake and tire wear): | PM10 | 0.00047 | lb/VMT |
| | PM2.5 | 0.00036 | lb/VMT |
| Avg vehicle speed on road: | | 65 | mph |
| Avg. Number of vehicles per day: | | 195 | |
| | | | calculated per Applicant da |
| Avg. Number of work days per month: | | 22 | **VMT/period: 6517302** |
| | Total vehicles per month: | 4290 | |
| Number of work months: | | 12.44 | adjusted for precip events |
| | Total vehicles per const period: | 53367.6 | |

| | PM10 | |
|---|---|---|
| Calc 1 | 0.022 | |
| Calc 2 | 4.217 | |
| Calc 3 | 0.0007 | lb/VMT |

| **Emissions** | **PM10** | **PM2.5** |
|---|---|---|
| **lbs/period** | **4386.78** | **741.37** |
| **tons/period** | **2.193** | **0.371** |

EPA, AP-42, Section 13.2.1, March 2006, updated 9/2008.
PM2.5 fraction of PM10 per CARB CEIDARs is 0.169
*** Note: avg roundtrip distance traveled by delivery or worker vehicles on freeways (I-5) and other State Routes in the project area.
Vehicles per day: worker + deliveries+staff support vehciles (averages)

## ONSITE UNPAVED ROAD FUGITIVE DUST

| | | | | | | |
|---|---|---|---|---|---|---|
| Length of Unpaved Roads on Construction site: | | 0.1 | miles* | | | |
| Avg weight of construction vehicular equipment on road: | | 24 | tons (range 2 - 42 tons) | | | |
| Road surface silt content: | | 4.1 | % (range 1.8 - 35%) | | | |
| Road surface material moisture content: | | 5 | % (range 0.03 - 13%) | | | |
| | | k | a | b | | |
| Particle size multiplier factors: | PM10 | 1.5 | 0.9 | 0.45 | | |
| | PM2.5 | 0.15 | 0.9 | 0.45 | | |
| C factors (brake and tire wear): | PM10 | 0.00047 | lb/VMT | | | |
| | PM2.5 | 0.00036 | lb/VMT | | | |
| Avg construction vehicle speed on road: | | 5 | mph (range 5-55 mph) | | | |
| Avg number of construction vehicles per day: | | 74 | ** | | | |
| Number of construction work days per month: | | 22 | | | **VMT/period:** | **6475.32** |
| Total vehicles per month: | | 1628 | | | | |
| Number of construction work months: | | 12.44 | adjusted for precipitation events | | | |
| Total vehicles per const period: | | **64753.2** | | | | |
| Control reduction due to watering, speed control, etc. = | | 80 | | | | |
| | | 0.8 | | | | |
| Release Fraction = | | 0.2 | | | | |

| | PM10 | PM2.5 |
|---|---|---|
| Calc 1 | 0.380 | 0.380 |
| Calc 2 | 2.549 | 2.549 |
| Calc 3 | 1.455 | 0.145 |
| Calc 4 | 1.455 | 0.146 |
| Controlled lb/VMT | 0.291 | 0.029 |

| **Emissions** | **PM10** | **PM2.5** |
|---|---|---|
| **lbs/period** | **1884.32** | **188.84** |
| **tons/period** | **0.942** | **0.094** |

EPA, AP-42, Section 13.2.2, March 2006
Soil Moisture; 5% avg
Soil silt content: 8.5% per AP-42 for construction site scraper routes
** const equipment plus site support pickups plus

**CONSTRUCTION PHASE - Truck Hauling/Delivery and Site Support Vehicle Emissions**

**All Phases**

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Delivery/Hauling Vehicle Use Rates** | | | | | Emissions Factors (lbs/vmt) | | | | | | |
| Delivery Roundtrip Distance: | 0 | miles | NOx | CO | VOC | SOx | PM10 | CO2 | | | |
| Const Days per Period: | 0 | | 0.00133459 | 0.00037027 | 6.2834E-05 | 0.000025 | 1.0747E-05 | 2.91617689 | HDDT | | |
| Avg Deliveries per Day: | 0 | | 0.00026191 | 0.00201574 | 3.9247E-05 | 0.000011 | 2.7302E-06 | 0.8745735 | MDGT | | |
| Fraction of Deliveries-Diesel: | 0.95 | HDDT | | | **Daily Emissions (lbs)** | | | | | | |
| Fraction of Deliveries-Gas: | 0.05 | MDGT | **NOx** | **CO** | **VOC** | **SOx** | **PM10** | **CO2** | **PM2.5** | | |
| Total Delivery VMT: | **987625** | **per Applicant** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | HDDT | |
| Total Daily VMT-Diesel | 0 | | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | MDGT | |
| Total Daily VMT-Gasoline | 0 | | | | **Tons per Const Period** | | | | | | |
| Total Period VMT-Diesel | 938243.75 | | 0.626 | 0.174 | 0.029 | 0.012 | 0.005 | 1368.0 | 0.004 | HDDT | |
| Total Period VMT-Gasoline | 49381.25 | | 0.006 | 0.050 | 0.001 | 0.000 | 0.000 | 21.6 | 0.000 | MDGT | |
| | | | | | | | | | | | |
| **Construction Site Support Vehicle Use Rates (LDTs)** | | | | | **Daily Emissions, lbs** | | | | | | |
| Gasoline Vehicle VMT Period: | 75900 | | **NOx** | **CO** | **VOC** | **SOx** | **PM10** | **CO2** | | | **PM2.5** |
| Avg Daily Gasoline VMT: | 300 | | 0.0002232 | 0.00204313 | 3.6203E-05 | 0.000007 | 3.782E-06 | 0.55087942 | lbs/vmt* | LDT gasoline | |
| Avg Daily Diesel VMT: | 0 | | 0.0670 | 0.6129 | 0.0109 | 0.0021 | 0.0011 | 165.2638 | lbs/day | gasoline | 0.0007 |
| Total Phase Const Days: | 240 | | | | | | | | | | |
| | | | | | **Tons per Const Period** | | | | | | |
| Ref: EMFAC 2014, SJVAPCD Year 2023 | | | 0.0085 | 0.0775 | 0.0014 | 0.0003 | 0.0001 | 20.9 | **tons/period** | **gasoline** | 0.0001 |
| LDT1-gas, MDV-gas, HDDT-dsl | | | | | | | | | | | |
| See EF data in WSP Support Appendix | | | | | | | | | | | |

**Notes*****

VMT for delivery/hauling for all vehicles includes: (1) materials deliveries to site, (2) materials removal from site, other VMT as specified below.

Support Vehicle VMT: best estimate at time of filing, 10 LDT (gasoline) at 30 VMT/day

CARB-CEIDARS, Updated Fractions for PM Profiles: PM2.5 = 0.991 of PM10 for Diesel Exhaust, and 0.998 for Gasoline Vehicles.

**CONSTRUCTION PHASE - Worker Travel - Emissions**

Ref: SJVAPCD EMFAC 2014, Year 2025
LDA-gas
See EF data in WSP Support Appendix

**Worker Travel to Site**

| | |
|---|---|
| Avg Occupancy/Vehicle: | 0 |
| Avg Roundtrip Distance, miles: | 0.0 |
| Avg # of Worker Vehicles, per day: | 0 |
| Avg Daily Worker VMT: | 0 |
| Max # of Worker Vehicles, per day: | 0 |
| Max Daily Worker VMT: | 0 |
| Total Const Days: | 240 |
| **Total Const Period Worker VMT:** | **4437000** |

**VMT data supplied by Applicant.**

Emissions Factors (lbs/VMT)

| NOx | CO | VOC | SOx | PM10 | CO2 |
|---|---|---|---|---|---|
| 8.5075E-05 | 0.000810295 | 1.5737E-05 | 0.000006 | 0.000004 | 0.56063169 |

**Daily Emissions (lbs)**

| | NOx | CO | VOC | SOx | PM10 | CO2 | PM2.5 |
|---|---|---|---|---|---|---|---|
| Avg | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**Tons per Const Period**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Avg | 0.189 | 1.798 | 0.035 | 0.013 | 0.009 | 1243.8 | 0.000 |

**Worker Travel by Busing from Staging Area**

| | |
|---|---|
| Total Bus VMT/Const Period: | 0 |
| Avg Bus VMT/Const Day: | 0 |
| Max Bus VMT/Const Day: | 0 |

| | | |
|---|---|---|
| Bus Round Trips/Day: | 0 | max |
| Bus Occupancy/Trip: | 0 | |

Ref: SJVAPCD EMFAC 2014, Year 2025
All other buses-DSL
See EF data in WSP Support Appendix

# buses supplied by Applicant.

Emissions Factors (lbs/VMT)

| NOx | CO | VOC | SOx | PM10 | CO2 |
|---|---|---|---|---|---|
| 0.002933 | 0.00055 | 0.000105 | 0.000025 | 0.000007 | 2.661084 |

**Daily Emissions (lbs)**

| | **NOx** | **CO** | **VOC** | **SOx** | **PM10** | **CO2** | **PM2.5** |
|---|---|---|---|---|---|---|---|
| Avg | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Max | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**Tons per Const Period**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Avg | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

**CONSTRUCTION PHASE - Trackout Emissions**

| | | | | | | |
|---|---|---|---|---|---|---|
| Paved Road Length (miles): | 0.1 | estimated roundtrip trackout distance | | | | |
| Daily # of Vehicles: | 74 | | | | | |
| Avg Vehicle Weight (tons): | 6.8 | | | **PM10** | **PM2.5*** | |
| Total Unadjusted VMT/day | 7.4 | | | 0.361 | | |
| Particle Size Multipliers | PM10 | | | 1.924 | | |
| lb/VMT | 0.023 | | | 0.002 | 0.0004 | lb/VMT |
| C factor, lb/VMT | 0.00047 | | | **0.129** | **0.0217** | **lbs/day** |
| Road Sfc Silt Loading (g/m^2): | 0.56 | local X 2 | | **0.001** | **0.0002** | **tons/month** |
| # of Active Trackout Points: | 1 | ** | | **0.02** | **0.0030** | **tons/period** |
| Added Trackout Miles: | PM10 | | | | | |
| Trackout VMT/day: | 44 | | *Default Silt Load Values for Paved Road Types* | | | |
| Final Adjusted VMT/day | 52 | | | Freeway | 0.02 g/m2 | |
| Final Adjusted VMT/month | 1140 | | | Arterial | 0.036 g/m2 | |
| Final Adjusted VMT/period | 14177 | | | Collector | 0.036 g/m2 | |
| Construction days/month: | 22 | | | Local | 0.28 g/m2 | |
| Adj. Construction months/period: | 12.44 | | | Rural | 1.6 g/m2 | |
| Control Applied to Trackout: | Gravel entrance, metal cleaning grates, water washing, sweeping | | | | | |
| Control Efficiency, % | 84 | 0.84 | Release Factor = | | 0.16 | |

* PM2.5 fraction of PM10 assumed to be 0.169 (CARB CEIDARS updated fraction values) for paved roads.
** 1 controlled ingress/egress point is planned for site construction
EPA, AP-42, Section 13.2.1, Proposed revisions dated 9/2008.
Use silt loading factor from default values for road type if no site specific data is available.
Trackout effects approximately 0.05 mi. of roadway arriving and departing from the site access point.
Plant access road is already paved. Entrance will be gravelled with metal grates for take out control.
Vehicle count = delivery trucks plus site support trucks (see Unpaved Onsite tab)
Worker vehicles not counted for trackout, they will park on the site perimeter.

CONSTRUCTION EQUIPMENT EXHAUST EMISSIONS

Project: WSP **Main Site Construction-230 kV Switchyard (2 identical switchyards, emissions are the same for each)**

**Assumptions:** **North Site**

1. The average engines employed in construction equipment use consumes fuel at a rate of: diesel 0.06 gal/hp-hr
Ref: EPA, NR-009b Publication, November 2002. gasoline 0.11 gal/hp-hr
Ref: Sacramento County APCD Const. Program Data, V. 6.0.3, 3/2007.
Ref: EPA, NR-009c Publication, EPA 420-P-04-009, April 2004.
Ref: Niland Energy Project, IID, AFC Vol 2, App A.
Ref: South Coast AQMD PR XXI, Draft Staff Report, 3-15-95, and SCAQMD CEQA Manual, 11/03.
The above noted references present fuel consumption values which range from 0.050 to 0.064 gal/hp-hr for diesel engines used in construction related equipment. The value of 0.060 gal/hp-hr was chosen as a reasonable upper mid-range value for construction diesel emissions calculations.
For gasoline the mid-range value from SCAQMD of 0.11 gal/hp-hr was used.

2. Construction equipment exhaust emissions will be calculated on an annual basis using the site specific equipment list, HP ratings, hours of use, days of use, etc. Annual emissions will be apportioned to daily values based on the estimated construction period time on site.

3. The equipment list derived from the South Coast AQMD Offroad database (2016) will be used to establish the various equipment categories. Avg HP values were derived from SCAQMD and SacMetro AQMD construction resources.

4. Construction Schedule: 8 months; 8 hrs/day; 0.67 years

Construction Totals: 170 hrs/month; 1360 hrs/const period; 170 days/const period

5. Anticipated Construction Start Year: 2017/2021

6. Maximum anticipated equipment use month is: n/a

7. N2O EF diesel, lb/gal: 0.000183
N2O EF gasoline, lb/gal: 0.000164
CARB, Mandatory GHG Reporting Regulation Table 4, Appendix A, 2007.

Equipment types and use rates supplied by the Applicant.

| Equipment Category** | Weighted Average HP | # of Units Used for Project | Avg Use Rate Hrs/day | # of Days On Site (each) | Total Hrs/Day | Total Hrs per Const Period | Total HP-Hrs Period |
|---|---|---|---|---|---|---|---|
| Aerial Lifts | 63 | 0 | 0 | 0 | 0 | 0 | 0 |
| Air Compressors | 78 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bore-Drill Rigs | 206 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cement Mixers | 9 | 0 | 0 | 0 | 0 | 0 | 0 |
| Concrete/Industrial Saws | 81 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cranes | 226 | 1 | 8 | 4 | 8 | 32 | 7232 |
| Crawler Tractors/Dozers | 208 | 0 | 0 | 0 | 0 | 0 | 0 |
| Crushing/Processing Eq. | 85 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dumpers/Tenders/Water Trucks | 16 | 1 | 6 | 170 | 6 | 1020 | 16320 |
| Excavators | 163 | 1 | 8 | 25 | 8 | 200 | 32600 |
| Forklifts | 89 | 1 | 8 | 60 | 8 | 480 | 42720 |
| Generator Sets | 84 | 1 | 8 | 40 | 8 | 320 | 26880 |
| Graders | 175 | 1 | 8 | 40 | 8 | 320 | 56000 |
| Off-Highway Tractors | 123 | 0 | 0 | 0 | 0 | 0 | 0 |
| Off-Highway Trucks | 400 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Diesel Construction Eq. | 172 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other General Industrial Eq. | 88 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Material Handling Eq. | 167 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pavers | 126 | 1 | 8 | 25 | 8 | 200 | 25200 |
| Paving Eq. Other | 131 | 0 | 0 | 0 | 0 | 0 | 0 |
| Plate Compactors | 8 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pressure Washers | 13 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pumps | 84 | 0 | 0 | 0 | 0 | 0 | 0 |
| Roller Compactors | 81 | 1 | 8 | 2 | 8 | 16 | 1296 |
| Rough Terrain Forklifts | 100 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber Tired Dozers | 255 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber Tires Loaders | 200 | 0 | 0 | 0 | 0 | 0 | 0 |
| Scrapers | 362 | 1 | 8 | 14 | 8 | 112 | 40544 |
| Signal Boards | 6 | 0 | 0 | 0 | 0 | 0 | 0 |
| Skid Steer Loaders | 65 | 0 | 0 | 0 | 0 | 0 | 0 |
| Surfacing Eq. | 254 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sweepers/Scrubbers | 64 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tractors (single category) | 98 | 0 | 0 | 0 | 0 | 0 | 0 |
| Front End Loaders (single category) | 98 | 0 | 0 | 0 | 0 | 0 | 0 |
| Backhoes (single category) | 98 | 0 | 0 | 0 | 0 | 0 | 0 |
| Trenchers | 81 | 0 | 0 | 0 | 0 | 0 | 0 |
| Welders | 46 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gasoline Const Eq. | 175 | 0 | 0 | 0 | 0 | 0 | 0 |

** diesel equipment unless otherwise specified.

Const Period Diesel Hp-Hrs = 248792
Const Period Gasoline Hp-Hrs = 0
Const Period Diesel Fuel Use = 14928 gals
Const Period Gasoline Fuel Use = 0 gals

Offroad equipment emissions factors derived SCAQMD Off Road database for 2016.
The SCAQMD EFs as presented incorporate the average equipment load factors.
Emissions factors for each category of equipment represent the composite factors for the stated equipment category as derived from the SCAQMD Offroad database for the construction start year.

**2016 Equipment Emissions Factors**

| Equip. Type | lbs/hr VOC (ROG) | lbs/hr CO | lbs/hr NOx | lbs/hr SOx | lbs/hr PM10 | lbs/hr CO2 | lbs/hr CH4 |
|---|---|---|---|---|---|---|---|
| Aerial Lifts | 0.0397 | 0.1800 | 0.2482 | 0.0004 | 0.0150 | 34.7217 | 0.0036 |
| Air Compressors | 0.0704 | 0.3207 | 0.4729 | 0.0007 | 0.0318 | 63.6073 | 0.0064 |
| Bore-Drill Rigs | 0.0623 | 0.5016 | 0.5340 | 0.0017 | 0.0160 | 164.9093 | 0.0056 |
| Cement Mixers | 0.0088 | 0.0418 | 0.0542 | 0.0001 | 0.0023 | 7.2481 | 0.0008 |
| Concrete/Industrial Saws | 0.0756 | 0.3936 | 0.4589 | 0.0007 | 0.0336 | 58.4637 | 0.0068 |
| Cranes | 0.1137 | 0.4263 | 0.9387 | 0.0014 | 0.0388 | 128.6292 | 0.0103 |
| Crawler Tractors/Dozers | 0.1335 | 0.5549 | 0.9315 | 0.0013 | 0.0546 | 114.0188 | 0.0120 |
| Crushing/Processing Eq. | 0.1337 | 0.6461 | 0.8965 | 0.0015 | 0.0538 | 132.3090 | 0.0121 |
| Dumpers/Tenders | 0.0093 | 0.0314 | 0.0587 | 0.0001 | 0.0024 | 7.6244 | 0.0008 |
| Excavators | 0.0988 | 0.5213 | 0.6603 | 0.0013 | 0.0332 | 119.5800 | 0.0089 |
| Forklifts | 0.0427 | 0.2190 | 0.2816 | 0.0006 | 0.0137 | 54.3958 | 0.0039 |
| Generator Sets | 0.0581 | 0.2862 | 0.4370 | 0.0007 | 0.0241 | 60.9927 | 0.0052 |
| Graders | 0.1197 | 0.5883 | 0.8866 | 0.0015 | 0.0441 | 132.7430 | 0.0108 |
| Off-Highway Tractors | 0.1803 | 0.7067 | 1.4108 | 0.0017 | 0.0670 | 151.4197 | 0.0163 |
| Off-Highway Trucks | 0.1816 | 0.5831 | 1.3322 | 0.0027 | 0.0459 | 260.0516 | 0.0164 |
| Other Diesel Construction Eq. | 0.0720 | 0.3602 | 0.5680 | 0.0013 | 0.0234 | 122.5629 | 0.0065 |
| Other General Industrial Eq. | 0.1267 | 0.4731 | 1.0122 | 0.0016 | 0.0425 | 152.2399 | 0.0114 |
| Other Material Handling Eq. | 0.1202 | 0.4608 | 0.9913 | 0.0015 | 0.0411 | 141.1941 | 0.0108 |
| Pavers | 0.1269 | 0.5135 | 0.7128 | 0.0009 | 0.0489 | 77.9335 | 0.0114 |
| Paving Eq. Other | 0.0965 | 0.4198 | 0.6393 | 0.0008 | 0.0436 | 68.9412 | 0.0087 |
| Plate Compactors | 0.0050 | 0.0263 | 0.0314 | 0.0001 | 0.0012 | 4.3138 | 0.0005 |
| Pressure Washers | 0.0121 | 0.0579 | 0.0764 | 0.0001 | 0.0044 | 9.4135 | 0.0011 |
| Pumps | 0.0562 | 0.2785 | 0.3830 | 0.0006 | 0.0239 | 49.6067 | 0.0051 |
| Roller Compactors | 0.0792 | 0.3944 | 0.5273 | 0.0008 | 0.0353 | 67.0483 | 0.0071 |
| Rough Terrain Forklifts | 0.0775 | 0.4549 | 0.5104 | 0.0008 | 0.0372 | 70.2808 | 0.0070 |
| Rubber Tired Dozers | 0.2591 | 0.9834 | 2.0891 | 0.0025 | 0.0858 | 239.0905 | 0.0234 |
| Rubber Tires Loaders | 0.0983 | 0.4557 | 0.7114 | 0.0012 | 0.0375 | 108.6114 | 0.0089 |
| Scrapers | 0.2383 | 0.9053 | 1.9017 | 0.0027 | 0.0783 | 262.4900 | 0.0215 |
| Signal Boards | 0.0161 | 0.0921 | 0.1172 | 0.0002 | 0.0060 | 16.6983 | 0.0014 |
| Skid Steer Loaders | 0.0305 | 0.2184 | 0.2044 | 0.0004 | 0.0106 | 30.2770 | 0.0028 |
| Surfacing Eq. | 0.1045 | 0.4506 | 0.9731 | 0.0017 | 0.0353 | 165.9721 | 0.0094 |
| Sweepers/Scrubbers | 0.0810 | 0.4988 | 0.5192 | 0.0009 | 0.0332 | 78.5433 | 0.0073 |
| Tractors | 0.0610 | 0.3689 | 0.4070 | 0.0008 | 0.0258 | 66.7979 | 0.0055 |
| Front End Loaders | 0.0610 | 0.3689 | 0.4070 | 0.0008 | 0.0258 | 66.7979 | 0.0055 |
| Backhoes | 0.0610 | 0.3689 | 0.4070 | 0.0008 | 0.0258 | 66.7979 | 0.0055 |
| Trenchers | 0.1200 | 0.4479 | 0.5719 | 0.0007 | 0.0453 | 58.7146 | 0.0108 |
| Welders | 0.0482 | 0.1951 | 0.2173 | 0.0003 | 0.0168 | 25.6027 | 0.0044 |
| Gasoline Const Eq. (assumed 175 hp category) | 0.0771 | 0.3855 | 1.08 | 0.00014 | 0.1542 | 14.1565 | 0.00037 |

(gasoline EFs: EPA OMS-AMD Report NR-009A, 2-13-98, and SCAQMD EMFAC 2007 CEQA Tables, 2016.)

Construction Period Emissions, lbs

| **Equip. Type** | **VOC** | **CO** | **NOx** | **SOx** | **PM10** | **CO2** | **CH4** |
|---|---|---|---|---|---|---|---|
| Aerial Lifts | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Air Compressors | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bore-Drill Rigs | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cement Mixers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Concrete/Industrial Saws | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cranes | 4 | 14 | 30 | 0 | 1 | 4116 | 0 |
| Crawler Tractors/Dozers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Crushing/Processing Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dumpers/Tenders | 9 | 32 | 60 | 0 | 2 | 7777 | 1 |
| Excavators | 20 | 104 | 132 | 0 | 7 | 23916 | 2 |
| Forklifts | 21 | 105 | 135 | 0 | 7 | 26110 | 2 |
| Generator Sets | 19 | 92 | 140 | 0 | 8 | 19518 | 2 |
| Graders | 38 | 188 | 284 | 0 | 14 | 42478 | 3 |
| Off-Highway Tractors | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Off-Highway Trucks | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Diesel Construction Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other General Industrial Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Material Handling Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pavers | 25 | 103 | 143 | 0 | 10 | 15587 | 2 |
| Paving Eq. Other | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Plate Compactors | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pressure Washers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pumps | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Roller Compactors | 1 | 6 | 8 | 0 | 1 | 1073 | 0 |
| Rough Terrain Forklifts | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber Tired Dozers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber Tires Loaders | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Scrapers | 27 | 101 | 213 | 0 | 9 | 29399 | 2 |
| Signal Boards | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Skid Steer Loaders | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Surfacing Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sweepers/Scrubbers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tractors | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Front End Loaders | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Backhoes | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Trenchers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Welders | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gasoline Const Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| **Totals** | **VOC** | **CO** | **NOx** | **SOx** | **PM10** | **PM2.5** | **CO2** | **CH4** | **N2O** |
|---|---|---|---|---|---|---|---|---|---|
| lbs per const. period | 164 | 745 | 1145 | 2 | 58 | 57.26 | 169973 | 15 | 3 |
| tons per const. period | 0.1 | 0.4 | 0.6 | 0.001 | 0.03 | 0.03 | 84.99 | 0.01 | 0.00 |
| Average lbs/day = | 1.0 | 4.4 | 6.7 | 0.011 | 0.34 | 0.34 | 999.84 | 0.09 | 0.02 |
| Normalized TPY = | *0.12* | *0.56* | *0.86* | *0.00* | *0.04* | *0.04* | *127.48* | *0.01* | *0.002* |

| | |
|---|---|
| CO2e, tons/period | 85.6 |
| CO2e, tons/yr: | 128.4 |

CARB-CEIDARS, Updated Size Fractions for PM Profiles: PM2.5 = 0.991 of PM10 : Diesel Vehicle Exhaust

Other Assumptions and References:

1. Trench construction times per: Southern Regional Water Pipeline Alliance, 3/08.
   Optimum trench construction progress rate is 80m (260ft) per day.
   Non-optimum trench construction progress rate is 30m (100 ft) per day.
   An average progress of 180 ft/day is used where applicable.
2. Paving speeds can range from 3 to 15 m/min depending on asphalt delivery rates and required compaction thickness.
   A minium paving speed of 3 m/min (10 ft/min or 600 ft/hr) was used where applicable.
   The minimum speed is based upon a 3" compacted layer, 12 ft lane width, with an asphalt delivery rate of ~ 140 tons/hr.
   Ref: Asphalt Paving Speed, Pavement Worktip No. 31, AAPA, 11/2001.
3. Estimation of maximum daily emissions is extremely variable, and these values are not required by SJVAPCD.
4. Construction schedule note: applicant data indicates a construction work day period of 8 hours
   The equipment use rates provided by the applicant are consistent with an 8 hour workday.
5. GWP values: CH4=25, N2O=298, ref: 40 CFR 98 Subpart A, Table A-1.

CONSTRUCTION EQUIPMENT EXHAUST EMISSIONS

Project: WSP — **Main Site Construction-230 kV Switchyard (2 identical switchyards, emissions are the same for each)**

**Assumptions:** — **South Site**

1. The average engines employed in construction equipment use consumes fuel at a rate of: diesel 0.06 gal/hp-hr; gasoline 0.11 gal/hp-hr

Ref: EPA, NR-009b Publication, November 2002.
Ref: Sacramento County APCD Const. Program Data, V. 6.0.3, 3/2007.
Ref: EPA, NR-009c Publication, EPA 420-P-04-009, April 2004.
Ref: Niland Energy Project, IID, AFC Vol 2, App A.
Ref: South Coast AQMD PR XXI, Draft Staff Report, 3-15-95, and SCAQMD CEQA Manual, 11/03.
The above noted references present fuel consumption values which range from 0.050 to 0.064 gal/hp-hr for diesel engines used in construction related equipment. The value of 0.060 gal/hp-hr was chosen as a reasonable upper mid-range value for construction diesel emissions calculations.
For gasoline the mid-range value from SCAQMD of 0.11 gal/hp-hr was used.

2. Construction equipment exhaust emissions will be calculated on an annual basis using the site specific equipment list, HP ratings, hours of use, days of use, etc. Annual emissions will be apportioned to daily values based on the estimated construction period time on site.

3. The equipment list derived from the South Coast AQMD Offroad database (2016) will be used to establish the various equipment categories. Avg HP values were derived from SCAQMD and SacMetro AQMD construction resources.

| 4. Construction Schedule: | | | Construction Totals: | | |
|---|---|---|---|---|---|
| | 8 | months | | 170 | hrs/month |
| | 8 | hrs/day | | 1360 | hrs/const period |
| | 0.67 | years | | 170 | days/const period |

5. Anticipated Construction Start Year: 2017/2021

6. Maximum anticipated equipment use month is: n/a

7. N2O EF diesel, lb/gal: 0.000183
N2O EF gasoline, lb/gal: 0.000164
CARB, Mandatory GHG Reporting Regulation Table 4, Appendix A, 2007.

Equipment types and use rates supplied by the Applicant.

| Equipment Category** | Weighted Average HP | # of Units Used for Project | Avg Use Rate Hrs/day | # of Days On Site (each) | Total Hrs/Day | Total Hrs per Const Period | Total HP-Hrs Period |
|---|---|---|---|---|---|---|---|
| Aerial Lifts | 63 | 0 | 0 | 0 | 0 | 0 | 0 |
| Air Compressors | 78 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bore-Drill Rigs | 206 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cement Mixers | 9 | 0 | 0 | 0 | 0 | 0 | 0 |
| Concrete/Industrial Saws | 81 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cranes | 226 | 1 | 8 | 4 | 8 | 32 | 7232 |
| Crawler Tractors/Dozers | 208 | 0 | 0 | 0 | 0 | 0 | 0 |
| Crushing/Processing Eq. | 85 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dumpers/Tenders/Water Trucks | 16 | 1 | 6 | 170 | 6 | 1020 | 16320 |
| Excavators | 163 | 1 | 8 | 25 | 8 | 200 | 32600 |
| Forklifts | 89 | 1 | 8 | 60 | 8 | 480 | 42720 |
| Generator Sets | 84 | 1 | 8 | 40 | 8 | 320 | 26880 |
| Graders | 175 | 1 | 8 | 40 | 8 | 320 | 56000 |
| Off-Highway Tractors | 123 | 0 | 0 | 0 | 0 | 0 | 0 |
| Off-Highway Trucks | 400 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Diesel Construction Eq. | 172 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other General Industrial Eq. | 88 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Material Handling Eq. | 167 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pavers | 126 | 1 | 8 | 25 | 8 | 200 | 25200 |
| Paving Eq. Other | 131 | 0 | 0 | 0 | 0 | 0 | 0 |
| Plate Compactors | 8 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pressure Washers | 13 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pumps | 84 | 0 | 0 | 0 | 0 | 0 | 0 |
| Roller Compactors | 81 | 1 | 8 | 2 | 8 | 16 | 1296 |
| Rough Terrain Forklifts | 100 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber Tired Dozers | 255 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber Tires Loaders | 200 | 0 | 0 | 0 | 0 | 0 | 0 |
| Scrapers | 362 | 1 | 8 | 14 | 8 | 112 | 40544 |
| Signal Boards | 6 | 0 | 0 | 0 | 0 | 0 | 0 |
| Skid Steer Loaders | 65 | 0 | 0 | 0 | 0 | 0 | 0 |
| Surfacing Eq. | 254 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sweepers/Scrubbers | 64 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tractors (single category) | 98 | 0 | 0 | 0 | 0 | 0 | 0 |
| Front End Loaders (single category) | 98 | 0 | 0 | 0 | 0 | 0 | 0 |
| Backhoes (single category) | 98 | 0 | 0 | 0 | 0 | 0 | 0 |
| Trenchers | 81 | 0 | 0 | 0 | 0 | 0 | 0 |
| Welders | 46 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gasoline Const Eq. | 175 | 0 | 0 | 0 | 0 | 0 | 0 |

** diesel equipment unless otherwise specified.

| | | |
|---|---|---|
| Const Period Diesel Hp-Hrs = | 248792 | |
| Const Period Gasoline Hp-Hrs = | 0 | |
| Const Period Diesel Fuel Use = | 14928 | gals |
| Const Period Gasoline Fuel Use = | 0 | gals |

Offroad equipment emissions factors derived SCAQMD Off Road database for 2020.
The SCAQMD EFs as presented incorporate the average equipment load factors.
Emissions factors for each category of equipment represent the composite factors for the stated equipment category as derived from the SCAQMD Offroad database for the construction start year.

**2020 Equipment Emissions Factors**

| Equip. Type | lbs/hr VOC (ROG) | lbs/hr CO | lbs/hr NOx | lbs/hr SOx | lbs/hr PM10 | lbs/hr CO2 | lbs/hr CH4 |
|---|---|---|---|---|---|---|---|
| Aerial Lifts | 0.0261 | 0.1696 | 0.1866 | 0.0004 | 0.0092 | 34.7217 | 0.0024 |
| Air Compressors | 0.0483 | 0.3077 | 0.3255 | 0.0007 | 0.0185 | 63.6073 | 0.0044 |
| Bore-Drill Rigs | 0.0480 | 0.5008 | 0.3439 | 0.0017 | 0.0062 | 164.8622 | 0.0043 |
| Cement Mixers | 0.0086 | 0.0415 | 0.0536 | 0.0001 | 0.0021 | 7.2481 | 0.0008 |
| Concrete/Industrial Saws | 0.0484 | 0.3783 | 0.3410 | 0.0007 | 0.0196 | 58.4636 | 0.0044 |
| Cranes | 0.0898 | 0.3917 | 0.6610 | 0.0014 | 0.0256 | 128.6305 | 0.0081 |
| Crawler Tractors/Dozers | 0.1049 | 0.5260 | 0.6772 | 0.0013 | 0.0378 | 114.0177 | 0.0095 |
| Crushing/Processing Eq. | 0.0934 | 0.6247 | 0.5983 | 0.0015 | 0.0310 | 132.3083 | 0.0084 |
| Dumpers/Tenders | 0.0092 | 0.0314 | 0.0582 | 0.0001 | 0.0022 | 7.6244 | 0.0008 |
| Excavators | 0.0733 | 0.5124 | 0.4042 | 0.0013 | 0.0184 | 119.5795 | 0.0066 |
| Forklifts | 0.0320 | 0.2160 | 0.1691 | 0.0006 | 0.0070 | 54.3958 | 0.0029 |
| Generator Sets | 0.0395 | 0.2732 | 0.3232 | 0.0007 | 0.0150 | 60.9927 | 0.0036 |
| Graders | 0.0919 | 0.5765 | 0.5823 | 0.0015 | 0.0280 | 132.7430 | 0.0083 |
| Off-Highway Tractors | 0.1470 | 0.6517 | 1.0657 | 0.0017 | 0.0497 | 151.4031 | 0.0133 |
| Off-Highway Trucks | 0.1443 | 0.5514 | 0.8306 | 0.0027 | 0.0280 | 260.0871 | 0.0130 |
| Other Diesel Construction Eq. | 0.0563 | 0.3508 | 0.3519 | 0.0013 | 0.0139 | 122.4967 | 0.0051 |
| Other General Industrial Eq. | 0.0983 | 0.4517 | 0.6661 | 0.0016 | 0.0262 | 152.2399 | 0.0089 |
| Other Material Handling Eq. | 0.0924 | 0.4429 | 0.6500 | 0.0015 | 0.0252 | 141.1941 | 0.0083 |
| Pavers | 0.0989 | 0.4920 | 0.5450 | 0.0009 | 0.0355 | 77.9332 | 0.0089 |
| Paving Eq. Other | 0.0757 | 0.4084 | 0.4807 | 0.0008 | 0.0315 | 68.9391 | 0.0068 |
| Plate Compactors | 0.0050 | 0.0263 | 0.0314 | 0.0001 | 0.0012 | 4.3138 | 0.0005 |
| Pressure Washers | 0.0085 | 0.0549 | 0.0650 | 0.0001 | 0.0030 | 9.4135 | 0.0008 |
| Pumps | 0.0376 | 0.2674 | 0.2854 | 0.0006 | 0.0147 | 49.6067 | 0.0034 |
| Roller Compactors | 0.0584 | 0.3837 | 0.3793 | 0.0008 | 0.0232 | 67.0402 | 0.0053 |
| Rough Terrain Forklifts | 0.0533 | 0.4464 | 0.3494 | 0.0008 | 0.0201 | 70.2808 | 0.0048 |
| Rubber Tired Dozers | 0.2118 | 0.8006 | 1.5773 | 0.0025 | 0.0630 | 239.0842 | 0.0191 |
| Rubber Tires Loaders | 0.0753 | 0.4406 | 0.4747 | 0.0012 | 0.0235 | 108.6109 | 0.0068 |
| Scrapers | 0.1914 | 0.7938 | 1.3434 | 0.0027 | 0.0541 | 262.4852 | 0.0173 |
| Signal Boards | 0.0129 | 0.0912 | 0.0912 | 0.0002 | 0.0042 | 16.6983 | 0.0012 |
| Skid Steer Loaders | 0.0222 | 0.2125 | 0.1614 | 0.0004 | 0.0050 | 30.2770 | 0.0020 |
| Surfacing Eq. | 0.0823 | 0.3953 | 0.6593 | 0.0017 | 0.0239 | 165.9635 | 0.0074 |
| Sweepers/Scrubbers | 0.0584 | 0.4916 | 0.3563 | 0.0009 | 0.0183 | 78.5433 | 0.0053 |
| Tractors | 0.0436 | 0.3616 | 0.2744 | 0.0008 | 0.0134 | 66.7988 | 0.0039 |
| Front End Loaders | 0.0436 | 0.3616 | 0.2744 | 0.0008 | 0.0134 | 66.7988 | 0.0039 |
| Backhoes | 0.0436 | 0.3616 | 0.2744 | 0.0008 | 0.0134 | 66.7988 | 0.0039 |
| Trenchers | 0.0933 | 0.4270 | 0.4575 | 0.0007 | 0.0336 | 58.7130 | 0.0084 |
| Welders | 0.0310 | 0.1816 | 0.1735 | 0.0003 | 0.0102 | 25.6027 | 0.0028 |
| Gasoline Const Eq. (assumed 175 hp category) | 0.0771 | 0.3855 | 1.08 | 0.00014 | 0.1542 | 14.1565 | 0.00037 |

(gasoline EFs: EPA OMS-AMD Report NR-009A, 2-13-98, and SCAQMD EMFAC 2007 CEQA Tables, 2016.)

Construction Period Emissions, lbs

| **Equip. Type** | **VOC** | **CO** | **NOx** | **SOx** | **PM10** | **CO2** | **CH4** |
|---|---|---|---|---|---|---|---|
| Aerial Lifts | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Air Compressors | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bore-Drill Rigs | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cement Mixers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Concrete/Industrial Saws | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cranes | 3 | 13 | 21 | 0 | 1 | 4116 | 0 |
| Crawler Tractors/Dozers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Crushing/Processing Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dumpers/Tenders | 9 | 32 | 59 | 0 | 2 | 7777 | 1 |
| Excavators | 15 | 102 | 81 | 0 | 4 | 23916 | 1 |
| Forklifts | 15 | 104 | 81 | 0 | 3 | 26110 | 1 |
| Generator Sets | 13 | 87 | 103 | 0 | 5 | 19518 | 1 |
| Graders | 29 | 184 | 186 | 0 | 9 | 42478 | 3 |
| Off-Highway Tractors | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Off-Highway Trucks | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Diesel Construction Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other General Industrial Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Material Handling Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pavers | 20 | 98 | 109 | 0 | 7 | 15587 | 2 |
| Paving Eq. Other | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Plate Compactors | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pressure Washers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pumps | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Roller Compactors | 1 | 6 | 6 | 0 | 0 | 1073 | 0 |
| Rough Terrain Forklifts | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber Tired Dozers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber Tires Loaders | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Scrapers | 21 | 89 | 150 | 0 | 6 | 29398 | 2 |
| Signal Boards | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Skid Steer Loaders | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Surfacing Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sweepers/Scrubbers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tractors | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Front End Loaders | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Backhoes | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Trenchers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Welders | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gasoline Const Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| **Totals** | **VOC** | **CO** | **NOx** | **SOx** | **PM10** | **PM2.5** | **CO2** | **CH4** | **N2O** |
|---|---|---|---|---|---|---|---|---|---|
| lbs per const. period | 126 | 716 | 798 | 2 | 37 | 37.06 | 169972 | 11 | 3 |
| tons per const. period | 0.1 | 0.4 | 0.4 | 0.001 | 0.02 | 0.02 | 84.99 | 0.01 | 0.00 |
| Average lbs/day = | 0.7 | 4.2 | 4.7 | 0.011 | 0.22 | 0.22 | 999.84 | 0.07 | 0.02 |
| Normalized TPY = | *0.09* | *0.54* | *0.60* | *0.00* | *0.03* | *0.03* | *127.48* | *0.01* | *0.002* |

| | |
|---|---|
| CO2e, tons/period | 85.5 |
| CO2e, tons/yr: | 128.3 |

CARB-CEIDARS, Updated Size Fractions for PM Profiles: PM2.5 = 0.991 of PM10 : Diesel Vehicle Exhaust

Other Assumptions and References:

1. Trench construction times per: Southern Regional Water Pipeline Alliance, 3/08.
   Optimum trench construction progress rate is 80m (260ft) per day.
   Non-optimum trench construction progress rate is 30m (100 ft) per day.
   An average progress of 180 ft/day is used where applicable.
2. Paving speeds can range from 3 to 15 m/min depending on asphalt delivery rates and required compaction thickness.
   A minium paving speed of 3 m/min (10 ft/min or 600 ft/hr) was used where applicable.
   The minimum speed is based upon a 3" compacted layer, 12 ft lane width, with an asphalt delivery rate of ~ 140 tons/hr.
   Ref: Asphalt Paving Speed, Pavement Worktip No. 31, AAPA, 11/2001.
3. Estimation of maximum daily emissions is extremely variable, and these values are not required by SJVAPCD.
4. Construction schedule note: applicant data indicates a construction work day period of 8 hours
   The equipment use rates provided by the applicant are consistent with an 8 hour workday.
5. GWP values: CH4=25, N2O=298, ref: 40 CFR 98 Subpart A, Table A-1.

CONSTRUCTION EQUIPMENT EXHAUST EMISSIONS

Project: WSP — **Off Site Construction-Substation Upgrades (2 identical substation upgrades, emissions are the same for each)**

**Assumptions:** **Gates Site**

1. The average engines employed in construction equipment use consumes fuel at a rate of: diesel 0.06 gal/hp-hr; gasoline 0.11 gal/hp-hr

Ref: EPA, NR-009b Publication, November 2002.
Ref: Sacramento County APCD Const. Program Data, V. 6.0.3, 3/2007.
Ref: EPA, NR-009c Publication, EPA 420-P-04-009, April 2004.
Ref: Niland Energy Project, IID, AFC Vol 2, App A.
Ref: South Coast AQMD PR XXI, Draft Staff Report, 3-15-95, and SCAQMD CEQA Manual, 11/03.
The above noted references present fuel consumption values which range from 0.050 to 0.064 gal/hp-hr for diesel engines used in construction related equipment. The value of 0.060 gal/hp-hr was chosen as a reasonable upper mid-range value for construction diesel emissions calculations.
For gasoline the mid-range value from SCAQMD of 0.11 gal/hp-hr was used.

2. Construction equipment exhaust emissions will be calculated on an annual basis using the site specific equipment list, HP ratings, hours of use, days of use, etc. Annual emissions will be apportioned to daily values based on the estimated construction period time on site.

3. The equipment list derived from the South Coast AQMD Offroad database (2016) will be used to establish the various equipment categories. Avg HP values were derived from SCAQMD and SacMetro AQMD construction resources.

| 4. Construction Schedule: | | | Construction Totals: | | |
|---|---|---|---|---|---|
| | 3 | months | | 240 | hrs/month |
| | 8 | hrs/day | | 720 | hrs/const period |
| | 0.25 | years | | 90 | days/const period |

5. Anticipated Construction Start Year: 2018

6. Maximum anticipated equipment use month is: n/a

7. N2O EF diesel, lb/gal: 0.000183
N2O EF gasoline, lb/gal: 0.000164
CARB, Mandatory GHG Reporting Regulation
Table 4, Appendix A, 2007.

Equipment types and use rates supplied by the Applicant.

| **Equipment Category**** | | **Weighted Average HP** | **# of Units Used for Project** | **Avg Use Rate Hrs/day** | **# of Days On Site (each)** | **Total Hrs/Day** | **Total Hrs per Const Period** | **Total HP-Hrs Period** |
|---|---|---|---|---|---|---|---|---|
| Aerial Lifts | | 63 | 0 | 0 | 0 | 0 | 0 | 0 |
| Air Compressors | | 78 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bore-Drill Rigs | | 206 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cement Mixers | | 9 | 0 | 0 | 0 | 0 | 0 | 0 |
| Concrete/Industrial Saws | | 81 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cranes | | 226 | 2 | 2 | 4 | 4 | 16 | 3616 |
| Crawler Tractors/Dozers | | 208 | 2 | 7 | 20 | 14 | 280 | 58240 |
| Crushing/Processing Eq. | | 85 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dumpers/Tenders/Water Trucks | | 16 | 1 | 7 | 90 | 7 | 630 | 10080 |
| Excavators | | 163 | 2 | 7 | 20 | 14 | 280 | 45640 |
| Forklifts | | 89 | 0 | 0 | 0 | 0 | 0 | 0 |
| Generator Sets | | 84 | 0 | 0 | 0 | 0 | 0 | 0 |
| Graders | | 175 | 1 | 7 | 15 | 7 | 105 | 18375 |
| Off-Highway Tractors | | 123 | 0 | 0 | 0 | 0 | 0 | 0 |
| Off-Highway Trucks | | 400 | 4 | 6 | 50 | 24 | 1200 | 480000 |
| Other Diesel Construction Eq. | | 172 | 4 | 6 | 50 | 24 | 1200 | 206400 |
| Other General Industrial Eq. | | 88 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Material Handling Eq. | | 167 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pavers | | 126 | 0 | 0 | 0 | 0 | 0 | 0 |
| Paving Eq. Other | | 131 | 0 | 0 | 0 | 0 | 0 | 0 |
| Plate Compactors | | 8 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pressure Washers | | 13 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pumps | | 84 | 0 | 0 | 0 | 0 | 0 | 0 |
| Roller Compactors | | 81 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rough Terrain Forklifts | | 100 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber Tired Dozers | | 255 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber Tires Loaders | | 200 | 0 | 0 | 0 | 0 | 0 | 0 |
| Scrapers | | 362 | 0 | 0 | 0 | 0 | 0 | 0 |
| Signal Boards | | 6 | 0 | 0 | 0 | 0 | 0 | 0 |
| Skid Steer Loaders | | 65 | 0 | 0 | 0 | 0 | 0 | 0 |
| Surfacing Eq. | | 254 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sweepers/Scrubbers | | 64 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tractors | (single category) | 98 | 1 | 7 | 30 | 7 | 210 | 20580 |
| Front End Loaders | | 98 | 1 | 7 | 30 | 7 | 210 | 20580 |
| Backhoes | | 98 | 0 | 0 | 0 | 0 | 0 | 0 |
| Trenchers | | 81 | 0 | 0 | 0 | 0 | 0 | 0 |
| Welders | | 46 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gasoline Const Eq. | | 175 | 0 | 0 | 0 | 0 | 0 | 0 |

| | | |
|---|---|---|
| Const Period Diesel Hp-Hrs = | 863511 | |
| Const Period Gasoline Hp-Hrs = | 0 | |
| Const Period Diesel Fuel Use = | 51811 | gals |
| Const Period Gasoline Fuel Use = | 0 | gals |

** diesel equipment unless otherwise specified.

Offroad equipment emissions factors derived SCAQMD Off Road database for 2016.
The SCAQMD EFs as presented incorporate the average equipment load factors.
Emissions factors for each category of equipment represent the composite factors for the stated equipment category as derived from the SCAQMD Offroad database for the construction start year.

**2016 Equipment Emissions Factors**

| Equip. Type | lbs/hr VOC (ROG) | lbs/hr CO | lbs/hr NOx | lbs/hr SOx | lbs/hr PM10 | lbs/hr CO2 | lbs/hr CH4 |
|---|---|---|---|---|---|---|---|
| Aerial Lifts | 0.0397 | 0.1800 | 0.2482 | 0.0004 | 0.0150 | 34.7217 | 0.0036 |
| Air Compressors | 0.0704 | 0.3207 | 0.4729 | 0.0007 | 0.0318 | 63.6073 | 0.0064 |
| Bore-Drill Rigs | 0.0623 | 0.5016 | 0.5340 | 0.0017 | 0.0160 | 164.9093 | 0.0056 |
| Cement Mixers | 0.0088 | 0.0418 | 0.0542 | 0.0001 | 0.0023 | 7.2481 | 0.0008 |
| Concrete/Industrial Saws | 0.0756 | 0.3936 | 0.4589 | 0.0007 | 0.0336 | 58.4637 | 0.0068 |
| Cranes | 0.1137 | 0.4263 | 0.9387 | 0.0014 | 0.0388 | 128.6292 | 0.0103 |
| Crawler Tractors/Dozers | 0.1335 | 0.5549 | 0.9315 | 0.0013 | 0.0546 | 114.0188 | 0.0120 |
| Crushing/Processing Eq. | 0.1337 | 0.6461 | 0.8965 | 0.0015 | 0.0538 | 132.3090 | 0.0121 |
| Dumpers/Tenders | 0.0093 | 0.0314 | 0.0587 | 0.0001 | 0.0024 | 7.6244 | 0.0008 |
| Excavators | 0.0988 | 0.5213 | 0.6603 | 0.0013 | 0.0332 | 119.5800 | 0.0089 |
| Forklifts | 0.0427 | 0.2190 | 0.2816 | 0.0006 | 0.0137 | 54.3958 | 0.0039 |
| Generator Sets | 0.0581 | 0.2862 | 0.4370 | 0.0007 | 0.0241 | 60.9927 | 0.0052 |
| Graders | 0.1197 | 0.5883 | 0.8866 | 0.0015 | 0.0441 | 132.7430 | 0.0108 |
| Off-Highway Tractors | 0.1803 | 0.7067 | 1.4108 | 0.0017 | 0.0670 | 151.4197 | 0.0163 |
| Off-Highway Trucks | 0.1816 | 0.5831 | 1.3322 | 0.0027 | 0.0459 | 260.0516 | 0.0164 |
| Other Diesel Construction Eq. | 0.0720 | 0.3602 | 0.5680 | 0.0013 | 0.0234 | 122.5629 | 0.0065 |
| Other General Industrial Eq. | 0.1267 | 0.4731 | 1.0122 | 0.0016 | 0.0425 | 152.2399 | 0.0114 |
| Other Material Handling Eq. | 0.1202 | 0.4608 | 0.9913 | 0.0015 | 0.0411 | 141.1941 | 0.0108 |
| Pavers | 0.1269 | 0.5135 | 0.7128 | 0.0009 | 0.0489 | 77.9335 | 0.0114 |
| Paving Eq. Other | 0.0965 | 0.4198 | 0.6393 | 0.0008 | 0.0436 | 68.9412 | 0.0087 |
| Plate Compactors | 0.0050 | 0.0263 | 0.0314 | 0.0001 | 0.0012 | 4.3138 | 0.0005 |
| Pressure Washers | 0.0121 | 0.0579 | 0.0764 | 0.0001 | 0.0044 | 9.4135 | 0.0011 |
| Pumps | 0.0562 | 0.2785 | 0.3830 | 0.0006 | 0.0239 | 49.6067 | 0.0051 |
| Roller Compactors | 0.0792 | 0.3944 | 0.5273 | 0.0008 | 0.0353 | 67.0483 | 0.0071 |
| Rough Terrain Forklifts | 0.0775 | 0.4549 | 0.5104 | 0.0008 | 0.0372 | 70.2808 | 0.0070 |
| Rubber Tired Dozers | 0.2591 | 0.9834 | 2.0891 | 0.0025 | 0.0858 | 239.0905 | 0.0234 |
| Rubber Tires Loaders | 0.0983 | 0.4557 | 0.7114 | 0.0012 | 0.0375 | 108.6114 | 0.0089 |
| Scrapers | 0.2383 | 0.9053 | 1.9017 | 0.0027 | 0.0783 | 262.4900 | 0.0215 |
| Signal Boards | 0.0161 | 0.0921 | 0.1172 | 0.0002 | 0.0060 | 16.6983 | 0.0014 |
| Skid Steer Loaders | 0.0305 | 0.2184 | 0.2044 | 0.0004 | 0.0106 | 30.2770 | 0.0028 |
| Surfacing Eq. | 0.1045 | 0.4506 | 0.9731 | 0.0017 | 0.0353 | 165.9721 | 0.0094 |
| Sweepers/Scrubbers | 0.0810 | 0.4988 | 0.5192 | 0.0009 | 0.0332 | 78.5433 | 0.0073 |
| Tractors | 0.0610 | 0.3689 | 0.4070 | 0.0008 | 0.0258 | 66.7979 | 0.0055 |
| Front End Loaders | 0.0610 | 0.3689 | 0.4070 | 0.0008 | 0.0258 | 66.7979 | 0.0055 |
| Backhoes | 0.0610 | 0.3689 | 0.4070 | 0.0008 | 0.0258 | 66.7979 | 0.0055 |
| Trenchers | 0.1200 | 0.4479 | 0.5719 | 0.0007 | 0.0453 | 58.7146 | 0.0108 |
| Welders | 0.0482 | 0.1951 | 0.2173 | 0.0003 | 0.0168 | 25.6027 | 0.0044 |
| Gasoline Const Eq. (assumed 175 hp category) | 0.0771 | 0.3855 | 1.08 | 0.00014 | 0.1542 | 14.1565 | 0.00037 |

(gasoline EFs: EPA OMS-AMD Report NR-009A, 2-13-98, and SCAQMD EMFAC 2007 CEQA Tables, 2016.)

Construction Period Emissions, lbs

| **Equip. Type** | **VOC** | **CO** | **NOx** | **SOx** | **PM10** | **CO2** | **CH4** |
|---|---|---|---|---|---|---|---|
| Aerial Lifts | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Air Compressors | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bore-Drill Rigs | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cement Mixers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Concrete/Industrial Saws | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cranes | 2 | 7 | 15 | 0 | 1 | 2058 | 0 |
| Crawler Tractors/Dozers | 37 | 155 | 261 | 0 | 15 | 31925 | 3 |
| Crushing/Processing Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dumpers/Tenders | 6 | 20 | 37 | 0 | 1 | 4803 | 1 |
| Excavators | 28 | 146 | 185 | 0 | 9 | 33482 | 2 |
| Forklifts | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Generator Sets | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Graders | 13 | 62 | 93 | 0 | 5 | 13938 | 1 |
| Off-Highway Tractors | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Off-Highway Trucks | 218 | 700 | 1599 | 3 | 55 | 312062 | 20 |
| Other Diesel Construction Eq. | 86 | 432 | 682 | 2 | 28 | 147075 | 8 |
| Other General Industrial Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Material Handling Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pavers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Paving Eq. Other | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Plate Compactors | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pressure Washers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pumps | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Roller Compactors | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rough Terrain Forklifts | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber Tired Dozers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber Tires Loaders | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Scrapers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Signal Boards | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Skid Steer Loaders | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Surfacing Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sweepers/Scrubbers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tractors | 13 | 77 | 85 | 0 | 5 | 14028 | 1 |
| Front End Loaders | 13 | 77 | 85 | 0 | 5 | 14028 | 1 |
| Backhoes | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Trenchers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Welders | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gasoline Const Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| **Totals** | **VOC** | **CO** | **NOx** | **SOx** | **PM10** | **PM2.5** | **CO2** | **CH4** | **N2O** |
|---|---|---|---|---|---|---|---|---|---|
| lbs per const. period | 415 | 1677 | 3042 | 6 | 125 | 124.14 | 573400 | 37 | 9 |
| tons per const. period | 0.2 | 0.8 | 1.5 | 0.003 | 0.06 | 0.06 | 286.70 | 0.02 | 0.00 |
| Average lbs/day = | 4.6 | 18.6 | 33.8 | 0.067 | 1.39 | 1.38 | 6371.11 | 0.42 | 0.11 |
| Normalized TPY = | *0.21* | *0.84* | *1.52* | *0.00* | *0.06* | *0.06* | *286.70* | *0.02* | *0.004* |

| | |
|---|---|
| CO2e, tons/period | 288.6 |
| CO2e, tons/yr: | 288.6 |

CARB-CEIDARS, Updated Size Fractions for PM Profiles: PM2.5 = 0.991 of PM10 : Diesel Vehicle Exhaust

Other Assumptions and References:

1. Trench construction times per: Southern Regional Water Pipeline Alliance, 3/08.
   Optimum trench construction progress rate is 80m (260ft) per day.
   Non-optimum trench construction progress rate is 30m (100 ft) per day.
   An average progress of 180 ft/day is used where applicable.
2. Paving speeds can range from 3 to 15 m/min depending on asphalt delivery rates and required compaction thickness.
   A minium paving speed of 3 m/min (10 ft/min or 600 ft/hr) was used where applicable.
   The minimum speed is based upon a 3" compacted layer, 12 ft lane width, with an asphalt delivery rate of ~ 140 tons/hr.
   Ref: Asphalt Paving Speed, Pavement Worktip No. 31, AAPA, 11/2001.
3. Estimation of maximum daily emissions is extremely variable, and these values are not required by SJVAPCD.
4. Construction schedule note: applicant data indicates a construction work day period of 8 hours
   The equipment use rates provided by the applicant are consistent with an 8 hour workday.
5. GWP values: CH4=25, N2O=298, ref: 40 CFR 98 Subpart A, Table A-1.

**GHG Emissions Associated with Water Pumping/Use**

Project: Westlands Solar Facility

| Phase: | Construction | Operation | |
|---|---|---|---|
| Acre-feet:* | 4187.6 | 282.7 | pumped and consumed during each phase |

Assumptions:

1. electric power required to pump 1 acre-foot of water with minimal treatment is 400 kilowatt-hours, or 0.4 MW-hours (footnote 1)
2. electric power is assumed to be generated via combustion of natural gas by the utility servicing the area.
3. generation technology is assumed to be a mix of combined-cycle turbines and steam boilers, with avg efficiency of 45%

| | | |
|---|---|---|
| mmbtu/Mw-hr: | 3.41 | std conversion value (footnote 2) |
| Efficiency multiplier: | 1.55 | |
| mmbtu/MW-hr: | 5.29 | revised for Eff multiplier |

| | Construction | Operation |
|---|---|---|
| Total KW-Hrs: | 1675040 | 113080 |
| Total MW-Hrs: | 1675.04 | 113.08 |
| Total mmbtu: | 8853.4 | 597.7 |

| | CO2 | CH4 | N2O | |
|---|---|---|---|---|
| Default EPA NG EF's | 116.89 | 0.0022046 | 0.00022046 | lb/mmbtu |
| GWP: | 1 | 25 | 298 | |
| Composite CO2e EF: (footnote 3) | | 117.0108 | lb/mmbtu | |

| | Construction | Operation | |
|---|---|---|---|
| Total CO2e: | 518.0 | 35.0 | tons |
| | 470.9 | 31.8 | metric tons |
| | per period | per year | |

Footnotes:

1. Tranquility SGF, AQ/GHG Technical Report, Feb 2014, Rincon. GEI Consultants/Navigant Consulting Inc., 2010,
2. CRC Handbook of Chemistry and Physics, 72nd Ed., 1992.
3. 40 CFR 98, subpart C, Tables C-1 and C-2, FR 74, No. 209, 10/30/09. 40 CFR 98, Subpart A, Table A-1

* data supplied by Applicant.

**Helicopter Emissions Estimates for Transmission Line Projects**

Ref: Gateway West Transmission Line DEIS, Tetra Tech EC, Inc., AQ Technical Report, 01/12.
Conklin and deDecker Associates, Helicopter CO2 Emissions, Orleans, MA. 02653

Reference helicopters used on T-Line projects:

| ID/Name | Lift Rating | Work days | Hrs/day | Total Hrs | LTO/hr | Fuel type | Engine Type | # of Engines | Engine/HP |
|---|---|---|---|---|---|---|---|---|---|
| Hughes 500 | Light | 85.8 | 8 | 686.4 | 1.5 | AV kerosene | Turbine | 1 | 420 |
| Sikorsky Skycrane | Heavy | 0 | 0 | 0 | 0.5 | AV kerosene | Turbine | 2 | 4500 (each) |

| Emissions Factors | Light Lift | Heavy Lift | | Emissions | Light Lift | Heavy Lift | |
|---|---|---|---|---|---|---|---|
| CO | 2.07 | 2.98 | lbs/hr | CO | 0.71 | 0.00 | tons/period |
| NOx | 1.75 | 15.5 | lbs/hr | NOx | 0.60 | 0.00 | tons/period |
| PM10 | 0.096 | 2.09 | lbs/hr | PM10 | 0.03 | 0.00 | tons/period |
| SOx | 0.14 | 0.96 | lbs/hr | SOx | 0.05 | 0.00 | tons/period |
| VOC | 0.08 | 0.2 | lbs/hr | VOC | 0.03 | 0.00 | tons/period |
| CO2 | 590 | 3600 | lbs/hr | CO2 | 202.49 | 0.00 | tons/period |
| | | | | CO2e | 203.20 | 0.00 | tons/period |

**Fugitive Dust Emissions from LTO Cycles**

Ref: Huey TPG UH-IH Medium Lift Unit, blade diameter 48 ft., PM fugitive rate at 2 kg/LTO (4.4092 lbs/LTO)

| | | | | | | | Period Emissions | |
|---|---|---|---|---|---|---|---|---|
| ID/Name | Lift Rating | LTO/Hr | Blade Diam, ft | lbs PM/LTO | # LTOs | PM, tons | PM10, tons | PM2.5, tons |
| Hughes 500 | Light | 1.5 | 26.3 | 2.41 | 1030 | 1.24 | 0.74 | 0.12 |
| Sikorsky Skycrane | Heavy | 0.5 | 72 | 6.61 | 0 | 0.00 | 0.00 | 0.00 |

* based on the WSP project data it was assumed the helicopter type would be a heavy lift unit.

North Gen 2025

## Tons/Period

| | NOx | CO | VOC | SOx | PM10 | CO2 | Fug PM10 | Fug PM2.5 |
|---|---|---|---|---|---|---|---|---|
| on-off site travel | 0.23 | 0.14 | 0.01 | 0.00 | 0.00 | 530.56 | 2.32 | 0.31 |
| Helicopter | 0.03 | 0.03 | 0.00 | 0.00 | 0.00 | 9.47 | 0.03 | 0.01 |
| on-site equipment | 4.16 | 4.35 | 0.69 | 0.01 | 0.15 | 1245 | | |
| Total | 4.42 | 4.52 | 0.70 | 0.02 | 0.15 | 1786 | 2.36 | 0.32 |

**Helicopter Emissions Estimates for Transmission Line Projects**

Ref: Gateway West Transmission Line DEIS, Tetra Tech EC, Inc., AQ Technical Report, 01/12.
Conklin and deDecker Associates, Helicopter CO2 Emissions, Orleans, MA. 02653

Reference helicopters used on T-Line projects:

| ID/Name | Lift Rating | Work days | Hrs/day | Total Hrs | LTO/hr |
|---|---|---|---|---|---|
| Hughes 500 | Light | 4 | 8 | 32 | 1.5 |
| Sikorsky Skycrane | Heavy | 0 | 0 | 0 | 0.5 |

| Emissions Factors | Light Lift | Heavy Lift | | Emissions | Light Lift |
|---|---|---|---|---|---|
| CO | 2.07 | 2.98 | lbs/hr | CO | 0.03 |
| NOx | 1.75 | 15.5 | lbs/hr | NOx | 0.03 |
| PM10 | 0.096 | 2.09 | lbs/hr | PM10 | 0.00 |
| SOx | 0.14 | 0.96 | lbs/hr | SOx | 0.00 |
| VOC | 0.08 | 0.2 | lbs/hr | VOC | 0.00 |
| CO2 | 590 | 3600 | lbs/hr | CO2 | 9.44 |
| | | | | CO2e | 9.47 |

**Fugitive Dust Emissions from LTO Cycles**

Ref: Huey TPG UH-IH Medium Lift Unit, blade diameter 48 ft., PM fugitive rate at 2 kg/LTO (4.4092 lbs/LTO)

| ID/Name | Lift Rating | LTO/Hr | Blade Diam, ft | lbs PM/LTO | # LTOs |
|---|---|---|---|---|---|
| Hughes 500 | Light | 1.5 | 26.3 | 2.41 | 48 |
| Sikorsky Skycrane | Heavy | 0.5 | 72 | 6.61 | 0 |

* based on the WSP project data it was assumed the helicopter type would be a heavy lift unit.

| Fuel type | Engine Type | # of Engines | Engine/HP |
|---|---|---|---|
| AV kerosene | Turbine | 1 | 420 |
| AV kerosene | Turbine | 2 | 4500 (each) |

**Heavy Lift**

| | |
|---|---|
| 0.00 | tons/period |
| 0.00 | tons/period |
| 0.00 | tons/period |
| 0.00 | tons/period |
| 0.00 | tons/period |
| 0.00 | tons/period |
| 0.00 | tons/period |

| | Period Emissions | |
|---|---|---|
| **PM, tons** | **PM10, tons** | **PM2.5, tons** |
| 0.06 | 0.03 | 0.01 |
| 0.00 | 0.00 | 0.00 |

CONSTRUCTION EQUIPMENT EXHAUST EMISSIONS

Project: WSP — **Off Site Construction-Transmission Line Pads and Structures**

**Assumptions:** South Gen Tie

1. The average engines employed in construction equipment use consumes fuel at a rate of: diesel 0.06 gal/hp-hr; gasoline 0.11 gal/hp-hr

Ref: EPA, NR-009b Publication, November 2002.
Ref: Sacramento County APCD Const. Program Data, V. 6.0.3, 3/2007.
Ref: EPA, NR-009c Publication, EPA 420-P-04-009, April 2004.
Ref: Niland Energy Project, IID, AFC Vol 2, App A.
Ref: South Coast AQMD PR XXI, Draft Staff Report, 3-15-95, and SCAQMD CEQA Manual, 11/03.
The above noted references present fuel consumption values which range from 0.050 to 0.064 gal/hp-hr for diesel engines used in construction related equipment. The value of 0.060 gal/hp-hr was chosen as a reasonable upper mid-range value for construction diesel emissions calculations.
For gasoline the mid-range value from SCAQMD of 0.11 gal/hp-hr was used.

2. Construction equipment exhaust emissions will be calculated on an annual basis using the site specific equipment list, HP ratings, hours of use, days of use, etc. Annual emissions will be apportioned to daily values based on the estimated construction period time on site.

3. The equipment list derived from the South Coast AQMD Offroad database (2016) will be used to establish the various equipment categories. Avg HP values were derived from SCAQMD and SacMetro AQMD construction resources.

4. Construction Schedule: 12 months; 8 hrs/day; 1.00 years

Construction Totals: 173.33333 hrs/month; 2080 hrs/const period; 260 days/const period

5. Anticipated Construction Start Year: 2019

6. Maximum anticipated equipment use month is: n/a

7. N2O EF diesel, lb/gal: 0.000183
N2O EF gasoline, lb/gal: 0.000164
CARB, Mandatory GHG Reporting Regulation Table 4, Appendix A, 2007.

Equipment types and use rates supplied by the Applicant.

| Equipment Category** | Weighted Average HP | # of Units Used for Project | Avg Use Rate Hrs/day | # of Days On Site (each) | Total Hrs/Day | Total Hrs per Const Period | Total HP-Hrs Period | |
|---|---|---|---|---|---|---|---|---|
| Aerial Lifts | 63 | 1 | 8 | 320 | 8 | 2560 | 161280 | |
| Air Compressors | 78 | 1 | 8 | 360 | 8 | 2880 | 224640 | |
| Bore-Drill Rigs | 206 | 1 | 8 | 180 | 8 | 1440 | 296640 | |
| Cement Mixers | 9 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Concrete/Industrial Saws | 81 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Cranes | 226 | 1 | 8 | 230 | 8 | 1840 | 415840 | |
| Crawler Tractors/Dozers | 208 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Crushing/Processing Eq. | 85 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Dumpers/Tenders/Water Trucks | 16 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Excavators | 163 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Forklifts | 89 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Generator Sets | 84 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Graders | 175 | 1 | 8 | 90 | 8 | 720 | 126000 | |
| Off-Highway Tractors | 123 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Off-Highway Trucks | 400 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Other Diesel Construction Eq. | 172 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Other General Industrial Eq. | 88 | 1 | 8 | 280 | 8 | 2240 | 197120 | Pullers, tensioners |
| Other Material Handling Eq. | 167 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Pavers | 126 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Paving Eq. Other | 131 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Plate Compactors | 8 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Pressure Washers | 13 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Pumps | 84 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Roller Compactors | 81 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Rough Terrain Forklifts | 100 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Rubber Tired Dozers | 255 | 1 | 8 | 390 | 8 | 3120 | 795600 | |
| Rubber Tires Loaders | 200 | 1 | 8 | 70 | 8 | 560 | 112000 | |
| Scrapers | 362 | 1 | 8 | 70 | 8 | 560 | 202720 | |
| Signal Boards | 6 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Skid Steer Loaders | 65 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Surfacing Eq. | 254 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Sweepers/Scrubbers | 64 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Tractors (augers) (single category) | 98 | 1 | 8 | 300 | 8 | 2400 | 235200 | |
| Front End Loaders (single category) | 98 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Backhoes (single category) | 98 | 1 | 8 | 270 | 8 | 2160 | 211680 | |
| Trenchers | 81 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Welders | 46 | 1 | 8 | 180 | 8 | 1440 | 66240 | |
| Gasoline Const Eq. | 175 | 0 | 0 | 0 | 0 | 0 | 0 | |

** diesel equipment unless otherwise specified.

Const Period Diesel Hp-Hrs = 3044960
Const Period Gasoline Hp-Hrs = 0
Const Period Diesel Fuel Use = 182698 gals
Const Period Gasoline Fuel Use = 0 gals

Offroad equipment emissions factors derived SCAQMD Off Road database for 2016.
The SCAQMD EFs as presented incorporate the average equipment load factors.
Emissions factors for each category of equipment represent the composite factors for the stated equipment category as derived from the SCAQMD Offroad database for the construction start year.

**2025 Equipment Emissions Factors**

| Equip. Type | lbs/hr VOC (ROG) | lbs/hr CO | lbs/hr NOx | lbs/hr SOx | lbs/hr PM10 | lbs/hr CO2 | lbs/hr CH4 |
|---|---|---|---|---|---|---|---|
| Aerial Lifts | 0.0184 | 0.1646 | 0.1366 | 0.0004 | 0.0048 | 34.7217 | 0.0017 |
| Air Compressors | 0.0349 | 0.3027 | 0.2104 | 0.0007 | 0.0088 | 63.6073 | 0.0031 |
| Bore-Drill Rigs | 0.0428 | 0.5007 | 0.2864 | 0.0017 | 0.0042 | 164.8678 | 0.0039 |
| Cement Mixers | 0.0085 | 0.0414 | 0.0534 | 0.0001 | 0.0021 | 7.2481 | 0.0008 |
| Concrete/Industrial Saws | 0.0337 | 0.3706 | 0.2471 | 0.0007 | 0.0093 | 58.4637 | 0.0030 |
| Cranes | 0.0681 | 0.3738 | 0.4223 | 0.0014 | 0.0143 | 128.6241 | 0.0061 |
| Crawler Tractors/Dozers | 0.0789 | 0.5065 | 0.4492 | 0.0013 | 0.0227 | 114.0167 | 0.0071 |
| Crushing/Processing Eq. | 0.0693 | 0.6187 | 0.3763 | 0.0015 | 0.0146 | 132.3077 | 0.0062 |
| Dumpers/Tenders | 0.0092 | 0.0314 | 0.0581 | 0.0001 | 0.0022 | 7.6244 | 0.0008 |
| Excavators | 0.0559 | 0.5086 | 0.2269 | 0.0013 | 0.0086 | 119.5792 | 0.0050 |
| Forklifts | 0.0236 | 0.2148 | 0.0860 | 0.0006 | 0.0025 | 54.3958 | 0.0021 |
| Generator Sets | 0.0288 | 0.2667 | 0.2329 | 0.0007 | 0.0081 | 60.9927 | 0.0026 |
| Graders | 0.0676 | 0.5696 | 0.3314 | 0.0015 | 0.0147 | 132.7431 | 0.0061 |
| Off-Highway Tractors | 0.1134 | 0.6101 | 0.7291 | 0.0017 | 0.0331 | 151.3869 | 0.0102 |
| Off-Highway Trucks | 0.1140 | 0.5385 | 0.4769 | 0.0027 | 0.0142 | 260.0652 | 0.0103 |
| Other Diesel Construction Eq. | 0.0442 | 0.3474 | 0.2021 | 0.0013 | 0.0069 | 122.5051 | 0.0040 |
| Other General Industrial Eq. | 0.0747 | 0.4438 | 0.3947 | 0.0016 | 0.0130 | 152.2399 | 0.0067 |
| Other Material Handling Eq. | 0.0696 | 0.4355 | 0.3844 | 0.0015 | 0.0124 | 141.1941 | 0.0063 |
| Pavers | 0.0717 | 0.4745 | 0.3858 | 0.0009 | 0.0220 | 77.9326 | 0.0065 |
| Paving Eq. Other | 0.0548 | 0.3993 | 0.3281 | 0.0008 | 0.0190 | 68.9364 | 0.0049 |
| Plate Compactors | 0.0050 | 0.0263 | 0.0314 | 0.0001 | 0.0012 | 4.3138 | 0.0005 |
| Pressure Washers | 0.0066 | 0.0531 | 0.0561 | 0.0001 | 0.0019 | 9.4135 | 0.0006 |
| Pumps | 0.0270 | 0.2617 | 0.2079 | 0.0006 | 0.0078 | 49.6066 | 0.0024 |
| Roller Compactors | 0.0410 | 0.3763 | 0.2501 | 0.0008 | 0.0122 | 67.0308 | 0.0037 |
| Rough Terrain Forklifts | 0.0396 | 0.4430 | 0.2336 | 0.0008 | 0.0090 | 70.2808 | 0.0036 |
| Rubber Tired Dozers | 0.1672 | 0.6620 | 1.0824 | 0.0025 | 0.0419 | 239.0780 | 0.0151 |
| Rubber Tires Loaders | 0.0559 | 0.4311 | 0.2835 | 0.0012 | 0.0121 | 108.6113 | 0.0050 |
| Scrapers | 0.1495 | 0.7187 | 0.8387 | 0.0027 | 0.0335 | 262.4827 | 0.0135 |
| Signal Boards | 0.0111 | 0.0909 | 0.0718 | 0.0002 | 0.0029 | 16.6983 | 0.0010 |
| Skid Steer Loaders | 0.0186 | 0.2104 | 0.1354 | 0.0004 | 0.0019 | 30.2740 | 0.0017 |
| Surfacing Eq. | 0.0638 | 0.3590 | 0.3924 | 0.0017 | 0.0142 | 165.9715 | 0.0058 |
| Sweepers/Scrubbers | 0.0410 | 0.4840 | 0.2255 | 0.0009 | 0.0061 | 78.5433 | 0.0037 |
| Tractors | 0.0336 | 0.3586 | 0.1857 | 0.0008 | 0.0059 | 66.7965 | 0.0030 |
| Front End Loaders | 0.0336 | 0.3586 | 0.1857 | 0.0008 | 0.0059 | 66.7965 | 0.0030 |
| Backhoes | 0.0336 | 0.3586 | 0.1857 | 0.0008 | 0.0059 | 66.7965 | 0.0030 |
| Trenchers | 0.0674 | 0.4085 | 0.3481 | 0.0007 | 0.0215 | 58.7116 | 0.0061 |
| Welders | 0.0214 | 0.1745 | 0.1373 | 0.0003 | 0.0052 | 25.6027 | 0.0019 |
| Gasoline Const Eq. (assumed 175 hp category) | 0.0771 | 0.3855 | 1.08 | 0.00014 | 0.1542 | 14.1565 | 0.00037 |

(gasoline EFs: EPA OMS-AMD Report NR-009A, 2-13-98, and SCAQMD EMFAC 2007 CEQA Tables, 2016.)

Construction Period Emissions, lbs

| Equip. Type | VOC | CO | NOx | SOx | PM10 | CO2 | CH4 |
|---|---|---|---|---|---|---|---|
| Aerial Lifts | 47 | 421 | 350 | 1 | 12 | 88888 | 4 |
| Air Compressors | 101 | 872 | 606 | 2 | 25 | 183189 | 9 |
| Bore-Drill Rigs | 62 | 721 | 412 | 2 | 6 | 237410 | 6 |
| Cement Mixers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Concrete/Industrial Saws | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cranes | 125 | 688 | 777 | 3 | 26 | 236668 | 11 |
| Crawler Tractors/Dozers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Crushing/Processing Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dumpers/Tenders | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Excavators | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Forklifts | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Generator Sets | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Graders | 49 | 410 | 239 | 1 | 11 | 95575 | 4 |
| Off-Highway Tractors | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Off-Highway Trucks | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Diesel Construction Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other General Industrial Eq. | 167 | 994 | 884 | 4 | 29 | 341017 | 15 |
| Other Material Handling Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pavers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Paving Eq. Other | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Plate Compactors | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pressure Washers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pumps | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Roller Compactors | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rough Terrain Forklifts | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber Tired Dozers | 522 | 2065 | 3377 | 8 | 131 | 745923 | 47 |
| Rubber Tires Loaders | 31 | 241 | 159 | 1 | 7 | 60822 | 3 |
| Scrapers | 84 | 402 | 470 | 2 | 19 | 146990 | 8 |
| Signal Boards | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Skid Steer Loaders | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Surfacing Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sweepers/Scrubbers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tractors | 81 | 861 | 446 | 2 | 14 | 160312 | 7 |
| Front End Loaders | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Backhoes | 73 | 775 | 401 | 2 | 13 | 144280 | 6 |
| Trenchers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Welders | 31 | 251 | 198 | 0 | 7 | 36868 | 3 |
| Gasoline Const Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| **Totals** | **VOC** | **CO** | **NOx** | **SOx** | **PM10** | **PM2.5** | **CO2** | **CH4** | **N2O** |
|---|---|---|---|---|---|---|---|---|---|
| lbs per const. period | 1371 | 8702 | 8318 | 27 | 300 | 297.65 | 2477943 | 123 | 33 |
| tons per const. period | 0.7 | 4.4 | 4.2 | 0.013 | 0.15 | 0.15 | 1238.97 | 0.06 | 0.02 |
| Average lbs/day = | 5.3 | 33.5 | 32.0 | 0.103 | 1.16 | 1.14 | 9530.55 | 0.47 | 0.13 |
| Normalized TPY = | *0.7* | *4.4* | *4.2* | *0.0* | *0.2* | *0.1* | *1239.0* | *0.1* | *0.017* |

| | |
|---|---|
| CO2e, tons/period | 1245.5 |
| CO2e, tons/yr: | 1245.5 |

CARB-CEIDARS, Updated Size Fractions for PM Profiles: PM2.5 = 0.991 of PM10 : Diesel Vehicle Exhaust

Other Assumptions and References:

1. Trench construction times per: Southern Regional Water Pipeline Alliance, 3/08.
   Optimum trench construction progress rate is 80m (260ft) per day.
   Non-optimum trench construction progress rate is 30m (100 ft) per day.
   An average progress of 180 ft/day is used where applicable.
2. Paving speeds can range from 3 to 15 m/min depending on asphalt delivery rates and required compaction thickness.
   A minium paving speed of 3 m/min (10 ft/min or 600 ft/hr) was used where applicable.
   The minimum speed is based upon a 3" compacted layer, 12 ft lane width, with an asphalt delivery rate of ~ 140 tons/hr.
   Ref: Asphalt Paving Speed, Pavement Worktip No. 31, AAPA, 11/2001.
3. Estimation of maximum daily emissions is extremely variable, and these values are not required by SJVAPCD.
4. Construction schedule note: applicant data indicates a construction work day period of 8 hours
   The equipment use rates provided by the applicant are consistent with an 8 hour workday.
5. GWP values: CH4=25, N2O=298, ref: 40 CFR 98 Subpart A, Table A-1.

**CONSTRUCTION PHASE - T-Line Phases 1 and 2**

**MRI Level 2 Analysis (Refs 1, 3-7)**

| | | | | |
|---|---|---|---|---|
| Acres Subject to Construction Disturbance Activites: | | | 26.4 | Using North Tie |
| Max Acres Subject to Construction Disturbance Activites on any day of this phase: | | | 2.6 | note (10) |
| Emissions Factor for PM10 Uncontrolled, tons/acre/month: | | | 0.12 | |
| PM2.5 fraction of PM10 (per CARB CEIDARS Profiles): | | | 0.21 | |
| **Activity Levels:** | Hrs/Day: | | 8 | |
| | Days/Wk: | | 5 | |
| | Days/Month: | Applicant Data | 22 | |
| | Phase Const Period, Months: | | 12 | 1.00 years |
| | Phase Const Period, Days: | | 260 | |

**Wet Season Adjustment:** (Per AP-42, Section 13.2.2, Figure 13.2.2-1, 12/03 or CalEEMod, Appendix D, Table 1.1.)

| | | |
|---|---|---|
| Mean # days/year with rain >= 0.01 inch: | 40 | |
| Mean # months/yr with rain >= 0.01 inch: | 1.33 | |
| Adjusted Const Period, Months: | 10.67 | |
| Adjusted Const Period, Days: | 220 | |

**Controls for Fugitive Dust:** Proposed watering cycle: 3 times per day

3 watering cycles/8 hour construction shift yields a 68% reduction, use 68% for non-desert sites. (11)(12)

Speed control of onsite const traffic to <15 mph yields a 40-70% reduction (use 50% control as conservative for site). (11)(12)

| | | |
|---|---|---|
| Calculated % control based on mitigations proposed: | 84 | % control |
| Conservative control % used for emissions estimates: | 84 | % control |
| | 0.16 | release fraction |

| **Emissions: Controlled** | PM10 | PM2.5 |
|---|---|---|
| tons/month | 0.051 | 0.011 |
| tons/period | 0.541 | 0.114 |
| Max lbs/day | 4.608 | 0.968 |

**Soil Handling Emissions (Cut and Fill): (2)**

| | | | | | |
|---|---|---|---|---|---|
| Total cu.yds of soil handled: | 0 | Mean annual wind speed, mph: (8) | | | 8.03 |
| Total tons of soil handled: | 0.0 | Avg. Soil moisture, %: (9) | | | 5 |
| Total days soil handled: | 220 | Avg. Soil density, tons/cu.yd: | | | 1.3 |
| Tons soil/day: | 0 | k factor for PM10: | | | 0.35 |
| Control Eff, watering, % | 80 | Number of Drops per ton: | | | 4 |
| Release Fraction: | 0.2 | Calc 1 | wind | | 1.851 |
| | | Calc 2 | moisture | | 3.607 |
| | | Calc 3 | int | | 0.513 |
| | | Calc 4 | PM10 | lb/ton | 0.0006 |
| | | PM2.5 fraction of PM10: | | | 0.210 |

| Emissions: | PM10 | PM2.5 |
|---|---|---|
| tons/period | 0.000 | 0.000 |
| tons/month | 0.000 | 0.000 |
| max lbs/day | 0.000 | 0.000 |

| **Emissions Totals:** | **PM10** | **PM2.5** |
|---|---|---|
| **tons/period** | **0.541** | **0.114** |

**Methodology References:**

(1) MRI Report, South Coast AQMD Project No. 95040, March 1996, Level 2 Analysis Procedure.
MRI Report uncontrolled factor of 0.11 tons/acre/month is based on 168 hours per month of const activity.
For an activity rate of ~180 hrs/month, the adjusted EF would be 0.12 tons/acre/month (uncontrolled).
(2) Soil Handling (Cut and Fill), EPA, AP-42, Section 13.2.4., 11/06.
(3) URBEMIS, Version 9.2.4, User's Manual Appendix A, page A-6.
(4) CARB Area Source Methodology, Section 7.7, 9/02.
(5) WRAP Fugitive Dust Handbook, 9/06.
(6) USEPA, AP-42, Section 13.2.3, 2/10.
(7) Estimating PM Emissions from Construction Operations, USEPA, MRI, 9/99.
(8) Wind speed data for Lemoore met station. Annual avg wind speed = 8.03 mph, % calms = 3.44%.
(9) Soil Moisture; 5% assumed avg value
(10) adjusted applicant value based on 10% of total acreage disturbed on any given day
(11) SCAQMD CEQA Handbook 1993.
(12) SCAQMD, Sample Construction Scenarios for Projects Less than Five Acres, Fugitive Dust Mitigations, February 2005.

**OFFSITE PAVED ROAD FUGITIVE DUST EMISSIONS**
(associated with delivery truck and worker vehicle traffic on I-5 and plant access road)

| | | | |
|---|---|---|---|
| Average mileage for construction related vehicles: | | 50 | miles, trip distance*** |
| Avg weight of vehicular equipment on road: | | 4.1 | tons (range 2 - 42 tons) |
| Road surface silt loading factor: | | 0.015 | g/m2 (range 0.03 - 400 g/m2)<br>Limited Access Freeway >10,000 ADT **(I-5)** |
| Particle size multiplier factors: | PM10 | 0.0022 | lb/VMT |
| | PM2.5 | 0.00054 | lb/VMT |
| C factors (brake and tire wear): | PM10 | 0.00047 | lb/VMT |
| | PM2.5 | 0.00036 | lb/VMT |
| Avg vehicle speed on road: | | 65 | mph |
| Total Trips | | 17843 | |
| | | | **VMT/period: 892150** |
| Total vehicles per const period: | | 0 | |

| | PM10 | |
|---|---|---|
| Calc 1 | 0.022 | |
| Calc 2 | 4.217 | |
| Calc 3 | 0.0007 | lb/VMT |

| **Emissions** | **PM10** | **PM2.5** |
|---|---|---|
| **lbs/period** | **600.50** | **101.49** |
| **tons/period** | **0.300** | **0.051** |

EPA, AP-42, Section 13.2.1, March 2006, updated 9/2008.
PM2.5 fraction of PM10 per CARB CEIDARs is 0.169
*** Note: avg trip distance traveled by delivery or worker vehicles on freeways (I-5) and other State Routes in the project area.
Vehicles per day: worker + deliveries+staff support vehciles (averages)

**ONSITE UNPAVED ROAD FUGITIVE DUST**

| | | | | | | |
|---|---|---|---|---|---|---|
| Length of Unpaved Roads on Construction site: | | 1 | miles* | assume 1 mile travel from roads | | |
| Avg weight of construction vehicular equipment on road: | | 4.1 | tons (range 2 - 42 tons) | | | |
| Road surface silt content: | | 8.5 | % (range 1.8 - 35%) | | | |
| Road surface material moisture content: | | 5 | % (range 0.03 - 13%) | | | |
| | | k | a | b | | |
| Particle size multiplier factors: | PM10 | 1.5 | 0.9 | 0.45 | | |
| | PM2.5 | 0.15 | 0.9 | 0.45 | | |
| C factors (brake and tire wear): | PM10 | 0.00047 | lb/VMT | | | |
| | PM2.5 | 0.00036 | lb/VMT | | | |
| Avg construction vehicle speed on road: | | 5 | mph (range 5-55 mph) | | | |
| Total Construciton Vehicles | | 11680 | ** | | | |
| | | | | **calculated per Applicant data** | | |
| | | | | **VMT/period:** | **11680** | |
| Control reduction due to watering, speed control, etc. = | | 80 | | | | |
| | | 0.8 | | | | |
| | Release Fraction = | 0.2 | | | | |

| | PM10 | PM2.5 | | **Emissions** | **PM10** | **PM2.5** |
|---|---|---|---|---|---|---|
| Calc 1 | 0.733 | 0.733 | | **lbs/period** | **2957.93** | **296.52** |
| Calc 2 | 1.151 | 1.151 | | **tons/period** | **1.479** | **0.148** |
| Calc 3 | 1.266 | 0.127 | | | | |
| Calc 4 | 1.266 | 0.127 | | | | |
| Controlled lb/VMT | 0.253 | 0.025 | | | | |

EPA, AP-42, Section 13.2.2, March 2006
Soil Moisture; 5% avg
Soil silt content: 8.5% per AP-42 for construction site scraper routes
** const equipment plus site support pickups plus

**CONSTRUCTION PHASE - Truck Hauling/Delivery and Site Support Vehicle Emissions**
**All Phases**

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Delivery/Hauling Vehicle Use Rates** | | | | | Emissions Factors (lbs/vmt) | | | | | | |
| Delivery Roundtrip Distance: | 30 | miles | NOx | CO | VOC | SOx | PM10 | CO2 | | | |
| Total Trips | 11680 | | 0.00133459 | 0.00037027 | 6.2834E-05 | 0.000025 | 1.0747E-05 | 2.91617689 | HDDT | | |
| Avg Deliveries per Day: | | | 0.00026191 | 0.00201574 | 3.9247E-05 | 0.000011 | 2.7302E-06 | 0.8745735 | MDGT | | |
| Fraction of Deliveries-Diesel: | 0.95 | HDDT | | | **Daily Emissions (lbs)** | | | | | | |
| Fraction of Deliveries-Gas: | 0.05 | MDGT | **NOx** | **CO** | **VOC** | **SOx** | **PM10** | **CO2** | **PM2.5** | | |
| Total Delivery VMT: | **350400** | | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | HDDT | |
| Total Daily VMT-Diesel | 0 | | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | MDGT | |
| Total Daily VMT-Gasoline | 0 | | | | **Tons per Const Period** | | | | | | |
| Total Period VMT-Diesel | 332880 | | 0.222 | 0.062 | 0.010 | 0.004 | 0.002 | 485.4 | 0.001 | HDDT | |
| Total Period VMT-Gasoline | 17520 | | 0.002 | 0.018 | 0.000 | 0.000 | 0.000 | 7.7 | 0.000 | MDGT | |
| | | | | | | | | | | | |
| **Construction Site Support Vehicle Use Rates (LDTs)** | | | | | **Daily Emissions, lbs** | | | | | | |
| Gasoline Vehicle VMT Period: | 10800 | | **NOx** | **CO** | **VOC** | **SOx** | **PM10** | **CO2** | | | **PM2.5** |
| Avg Daily Gasoline VMT: | 42 | | 0.0002232 | 0.00204313 | 3.6203E-05 | 0.000007 | 3.782E-06 | 0.55087942 | lbs/vmt* | LDT gasoline | |
| Avg Daily Diesel VMT: | 0 | | 0.0093 | 0.0849 | 0.0015 | 0.0003 | 0.0002 | 22.8827 | lbs/day | gasoline | 0.0001 |
| Total Phase Const Days: | 260 | | | | | | | | | | |
| | | | | | **Tons per Const Period** | | | | | | |
| Ref: EMFAC 2014, SJVAPCD Year 2019 | | | 0.0012 | 0.0110 | 0.0002 | 0.0000 | 0.0000 | 3.0 | **tons/period** | **gasoline** | 0.0000 |
| LDT1-gas, MDV-gas, HDDT-dsl | | | | | | | | | | | |
| See EF data in WSP Support Appendix | | | | | | | | | | | |

**Notes *****
VMT for delivery/hauling for all vehicles includes: (1) materials deliveries to site, (2) materials removal from site, other VMT as specified below.
Support Vehicle VMT: best estimate at time of filing, 2 LDT (gasoline) at 30 VMT/day for260 days
CARB-CEIDARS, Updated Fractions for PM Profiles: PM2.5 = 0.991 of PM10 for Diesel Exhaust, and 0.998 for Gasoline Vehicles.

**CONSTRUCTION PHASE - Worker Travel - Emissions**

Ref: SJVAPCD EMFAC 2014, Year 2023
LDA-gas
See EF data in WSP Support Appendix

**Worker Travel to Site**

| | |
|---|---|
| Total Trips | 6163 |
| Average distance | 20.0 |
| **Total Const Period Worker VMT:** | **123260** |

Emissions Factors (lbs/VMT)

| NOx | CO | VOC | SOx | PM10 | CO2 |
|---|---|---|---|---|---|
| 8.5075E-05 | 0.000810295 | 1.5737E-05 | 0.000006 | 0.000004 | 0.56063169 |

**Daily Emissions (lbs)**

| | NOx | CO | VOC | SOx | PM10 | CO2 | PM2.5 |
|---|---|---|---|---|---|---|---|
| Avg | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**Tons per Const Period**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Avg | 0.005 | 0.050 | 0.001 | 0.000 | 0.000 | 34.6 | 0.000 |

**CONSTRUCTION PHASE - Trackout Emissions**

| | | | | | |
|---|---|---|---|---|---|
| Paved Road Length (miles): | 0.1 | estimated roundtrip trackout distance | | | |
| Daily # of Vehicles: | 21 | | | | |
| Avg Vehicle Weight (tons): | 6.8 | | **PM10** | **PM2.5*** | |
| Total Unadjusted VMT/day | 2.1 | | 0.361 | | |
| Particle Size Multipliers | PM10 | | 1.924 | | |
| lb/VMT | 0.023 | | 0.002 | 0.0004 | lb/VMT |
| C factor, lb/VMT | 0.00047 | | **0.036** | **0.0062** | **lbs/day** |
| Road Sfc Silt Loading (g/m^2): | 0.56 | local X 2 | **0.000** | **0.0001** | **tons/month** |
| # of Active Trackout Points: | 1 | ** | **0.00** | **0.0008** | **tons/period** |
| Added Trackout Miles: | PM10 | | | | |
| Trackout VMT/day: | 13 | *Default Silt Load Values for Paved Road Types* | | | |
| Final Adjusted VMT/day | 15 | | Freeway | 0.02 g/m2 | |
| Final Adjusted VMT/month | 323 | | Arterial | 0.036 g/m2 | |
| Final Adjusted VMT/period | 3881 | | Collector | 0.036 g/m2 | |
| Construction days/month: | 22 | | Local | 0.28 g/m2 | |
| Adj. Construction months/period: | 12.00 | | Rural | 1.6 g/m2 | |
| Control Applied to Trackout: | Gravel entrance, metal cleaning grates, water washing, sweeping | | | | |
| Control Efficiency, % | 84 | 0.84 | Release Factor = | 0.16 | |

* PM2.5 fraction of PM10 assumed to be 0.169 (CARB CEIDARS updated fraction values) for paved roads.
** 1 controlled ingress/egress point is planned for site construction
EPA, AP-42, Section 13.2.1, Proposed revisions dated 9/2008.
Use silt loading factor from default values for road type if no site specific data is available.
Trackout effects approximately 0.05 mi. of roadway arriving and departing from the site access point.
Plant access road is already paved. Entrance will be gravelled with metal grates for take out control.
Vehicle count = delivery trucks plus site support trucks (see Unpaved Onsite tab)
Worker vehicles not counted for trackout, they will park on the site perimeter.

South Gen 2019

## Tons/Period

| | NOx | CO | VOC | SOx | PM10 | CO2 | Fug PM10 | Fug PM2.5 |
|---|---|---|---|---|---|---|---|---|
| on-off site travel | 1.06 | 0.20 | 0.02 | 0.00 | 0.01 | 569.88 | 2.32 | 0.31 |
| Helicopter | 0.03 | 0.03 | 0.00 | 0.00 | 0.00 | 9.47 | 0.03 | 0.01 |
| on-site equipment | 8.77 | 5.08 | 1.16 | 0.01 | 0.41 | 1247 | | |
| Total | 9.86 | 5.32 | 1.18 | 0.02 | 0.42 | 1826 | 2.36 | 0.32 |

**Helicopter Emissions Estimates for Transmission Line Projects**

Ref: Gateway West Transmission Line DEIS, Tetra Tech EC, Inc., AQ Technical Report, 01/12.
Conklin and deDecker Associates, Helicopter CO2 Emissions, Orleans, MA. 02653

Reference helicopters used on T-Line projects:

| ID/Name | Lift Rating | Work days | Hrs/day | Total Hrs | LTO/hr |
|---|---|---|---|---|---|
| Hughes 500 | Light | 4 | 8 | 32 | 1.5 |
| Sikorsky Skycrane | Heavy | 0 | 0 | 0 | 0.5 |

| Emissions Factors | Light Lift | Heavy Lift | | Emissions | Light Lift |
|---|---|---|---|---|---|
| CO | 2.07 | 2.98 | lbs/hr | CO | 0.03 |
| NOx | 1.75 | 15.5 | lbs/hr | NOx | 0.03 |
| PM10 | 0.096 | 2.09 | lbs/hr | PM10 | 0.00 |
| SOx | 0.14 | 0.96 | lbs/hr | SOx | 0.00 |
| VOC | 0.08 | 0.2 | lbs/hr | VOC | 0.00 |
| CO2 | 590 | 3600 | lbs/hr | CO2 | 9.44 |
| | | | | CO2e | 9.47 |

**Fugitive Dust Emissions from LTO Cycles**

Ref: Huey TPG UH-IH Medium Lift Unit, blade diameter 48 ft., PM fugitive rate at 2 kg/LTO (4.4092 lbs/LTO)

| ID/Name | Lift Rating | LTO/Hr | Blade Diam, ft | lbs PM/LTO | # LTOs |
|---|---|---|---|---|---|
| Hughes 500 | Light | 1.5 | 26.3 | 2.41 | 48 |
| Sikorsky Skycrane | Heavy | 0.5 | 72 | 6.61 | 0 |

* based on the WSP project data it was assumed the helicopter type would be a heavy lift unit.

| Fuel type | Engine Type | # of Engines | Engine/HP |
|---|---|---|---|
| AV kerosene | Turbine | 1 | 420 |
| AV kerosene | Turbine | 2 | 4500 (each) |

| Heavy Lift | |
|---|---|
| 0.00 | tons/period |
| 0.00 | tons/period |
| 0.00 | tons/period |
| 0.00 | tons/period |
| 0.00 | tons/period |
| 0.00 | tons/period |
| 0.00 | tons/period |

| | Period Emissions | |
|---|---|---|
| **PM, tons** | **PM10, tons** | **PM2.5, tons** |
| 0.06 | 0.03 | 0.01 |
| 0.00 | 0.00 | 0.00 |

CONSTRUCTION EQUIPMENT EXHAUST EMISSIONS

Project: WSP — **Off Site Construction-Transmission Line Pads and Structures**

**Assumptions:** South Gen Tie

1. The average engines employed in construction equipment use consumes fuel at a rate of: diesel 0.06 gal/hp-hr; gasoline 0.11 gal/hp-hr

Ref: EPA, NR-009b Publication, November 2002.
Ref: Sacramento County APCD Const. Program Data, V. 6.0.3, 3/2007.
Ref: EPA, NR-009c Publication, EPA 420-P-04-009, April 2004.
Ref: Niland Energy Project, IID, AFC Vol 2, App A.
Ref: South Coast AQMD PR XXI, Draft Staff Report, 3-15-95, and SCAQMD CEQA Manual, 11/03.
The above noted references present fuel consumption values which range from 0.050 to 0.064 gal/hp-hr for diesel engines used in construction related equipment. The value of 0.060 gal/hp-hr was chosen as a reasonable upper mid-range value for construction diesel emissions calculations.
For gasoline the mid-range value from SCAQMD of 0.11 gal/hp-hr was used.

2. Construction equipment exhaust emissions will be calculated on an annual basis using the site specific equipment list, HP ratings, hours of use, days of use, etc. Annual emissions will be apportioned to daily values based on the estimated construction period time on site.

3. The equipment list derived from the South Coast AQMD Offroad database (2016) will be used to establish the various equipment categories. Avg HP values were derived from SCAQMD and SacMetro AQMD construction resources.

4. Construction Schedule: 12 months; 8 hrs/day; 1.00 years

Construction Totals: 173.33333 hrs/month; 2080 hrs/const period; 260 days/const period

5. Anticipated Construction Start Year: 2019

6. Maximum anticipated equipment use month is: n/a

7. N2O EF diesel, lb/gal: 0.000183
N2O EF gasoline, lb/gal: 0.000164
CARB, Mandatory GHG Reporting Regulation
Table 4, Appendix A, 2007.

Equipment types and use rates supplied by the Applicant.

| Equipment Category** | | Weighted Average HP | # of Units Used for Project | Avg Use Rate Hrs/day | # of Days On Site (each) | Total Hrs/Day | Total Hrs per Const Period | Total HP-Hrs Period | |
|---|---|---|---|---|---|---|---|---|---|
| Aerial Lifts | | 63 | 1 | 8 | 320 | 8 | 2560 | 161280 | |
| Air Compressors | | 78 | 1 | 8 | 360 | 8 | 2880 | 224640 | |
| Bore-Drill Rigs | | 206 | 1 | 8 | 180 | 8 | 1440 | 296640 | |
| Cement Mixers | | 9 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Concrete/Industrial Saws | | 81 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Cranes | | 226 | 1 | 8 | 230 | 8 | 1840 | 415840 | |
| Crawler Tractors/Dozers | | 208 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Crushing/Processing Eq. | | 85 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Dumpers/Tenders/Water Trucks | | 16 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Excavators | | 163 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Forklifts | | 89 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Generator Sets | | 84 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Graders | | 175 | 1 | 8 | 90 | 8 | 720 | 126000 | |
| Off-Highway Tractors | | 123 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Off-Highway Trucks | | 400 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Other Diesel Construction Eq. | | 172 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Other General Industrial Eq. | | 88 | 1 | 8 | 280 | 8 | 2240 | 197120 | Pullers, tensioners |
| Other Material Handling Eq. | | 167 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Pavers | | 126 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Paving Eq. Other | | 131 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Plate Compactors | | 8 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Pressure Washers | | 13 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Pumps | | 84 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Roller Compactors | | 81 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Rough Terrain Forklifts | | 100 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Rubber Tired Dozers | | 255 | 1 | 8 | 390 | 8 | 3120 | 795600 | |
| Rubber Tires Loaders | | 200 | 1 | 8 | 70 | 8 | 560 | 112000 | |
| Scrapers | | 362 | 1 | 8 | 70 | 8 | 560 | 202720 | |
| Signal Boards | | 6 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Skid Steer Loaders | | 65 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Surfacing Eq. | | 254 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Sweepers/Scrubbers | | 64 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Tractors (augers) | (single category) | 98 | 1 | 8 | 300 | 8 | 2400 | 235200 | |
| Front End Loaders | | 98 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Backhoes | | 98 | 1 | 8 | 270 | 8 | 2160 | 211680 | |
| Trenchers | | 81 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Welders | | 46 | 1 | 8 | 180 | 8 | 1440 | 66240 | |
| Gasoline Const Eq. | | 175 | 0 | 0 | 0 | 0 | 0 | 0 | |

** diesel equipment unless otherwise specified.

| | | |
|---|---|---|
| Const Period Diesel Hp-Hrs = | 3044960 | |
| Const Period Gasoline Hp-Hrs = | 0 | |
| Const Period Diesel Fuel Use = | 182698 | gals |
| Const Period Gasoline Fuel Use = | 0 | gals |

Offroad equipment emissions factors derived SCAQMD Off Road database for 2016.
The SCAQMD EFs as presented incorporate the average equipment load factors.
Emissions factors for each category of equipment represent the composite factors for the stated equipment category as derived from the SCAQMD Offroad database for the construction start year.

**2016 Equipment Emissions Factors**

| Equip. Type | lbs/hr VOC (ROG) | lbs/hr CO | lbs/hr NOx | lbs/hr SOx | lbs/hr PM10 | lbs/hr CO2 | lbs/hr CH4 |
|---|---|---|---|---|---|---|---|
| Aerial Lifts | 0.0397 | 0.1800 | 0.2482 | 0.0004 | 0.0150 | 34.7217 | 0.0036 |
| Air Compressors | 0.0704 | 0.3207 | 0.4729 | 0.0007 | 0.0318 | 63.6073 | 0.0064 |
| Bore-Drill Rigs | 0.0623 | 0.5016 | 0.5340 | 0.0017 | 0.0160 | 164.9093 | 0.0056 |
| Cement Mixers | 0.0088 | 0.0418 | 0.0542 | 0.0001 | 0.0023 | 7.2481 | 0.0008 |
| Concrete/Industrial Saws | 0.0756 | 0.3936 | 0.4589 | 0.0007 | 0.0336 | 58.4637 | 0.0068 |
| Cranes | 0.1137 | 0.4263 | 0.9387 | 0.0014 | 0.0388 | 128.6292 | 0.0103 |
| Crawler Tractors/Dozers | 0.1335 | 0.5549 | 0.9315 | 0.0013 | 0.0546 | 114.0188 | 0.0120 |
| Crushing/Processing Eq. | 0.1337 | 0.6461 | 0.8965 | 0.0015 | 0.0538 | 132.3090 | 0.0121 |
| Dumpers/Tenders | 0.0093 | 0.0314 | 0.0587 | 0.0001 | 0.0024 | 7.6244 | 0.0008 |
| Excavators | 0.0988 | 0.5213 | 0.6603 | 0.0013 | 0.0332 | 119.5800 | 0.0089 |
| Forklifts | 0.0427 | 0.2190 | 0.2816 | 0.0006 | 0.0137 | 54.3958 | 0.0039 |
| Generator Sets | 0.0581 | 0.2862 | 0.4370 | 0.0007 | 0.0241 | 60.9927 | 0.0052 |
| Graders | 0.1197 | 0.5883 | 0.8866 | 0.0015 | 0.0441 | 132.7430 | 0.0108 |
| Off-Highway Tractors | 0.1803 | 0.7067 | 1.4108 | 0.0017 | 0.0670 | 151.4197 | 0.0163 |
| Off-Highway Trucks | 0.1816 | 0.5831 | 1.3322 | 0.0027 | 0.0459 | 260.0516 | 0.0164 |
| Other Diesel Construction Eq. | 0.0720 | 0.3602 | 0.5680 | 0.0013 | 0.0234 | 122.5629 | 0.0065 |
| Other General Industrial Eq. | 0.1267 | 0.4731 | 1.0122 | 0.0016 | 0.0425 | 152.2399 | 0.0114 |
| Other Material Handling Eq. | 0.1202 | 0.4608 | 0.9913 | 0.0015 | 0.0411 | 141.1941 | 0.0108 |
| Pavers | 0.1269 | 0.5135 | 0.7128 | 0.0009 | 0.0489 | 77.9335 | 0.0114 |
| Paving Eq. Other | 0.0965 | 0.4198 | 0.6393 | 0.0008 | 0.0436 | 68.9412 | 0.0087 |
| Plate Compactors | 0.0050 | 0.0263 | 0.0314 | 0.0001 | 0.0012 | 4.3138 | 0.0005 |
| Pressure Washers | 0.0121 | 0.0579 | 0.0764 | 0.0001 | 0.0044 | 9.4135 | 0.0011 |
| Pumps | 0.0562 | 0.2785 | 0.3830 | 0.0006 | 0.0239 | 49.6067 | 0.0051 |
| Roller Compactors | 0.0792 | 0.3944 | 0.5273 | 0.0008 | 0.0353 | 67.0483 | 0.0071 |
| Rough Terrain Forklifts | 0.0775 | 0.4549 | 0.5104 | 0.0008 | 0.0372 | 70.2808 | 0.0070 |
| Rubber Tired Dozers | 0.2591 | 0.9834 | 2.0891 | 0.0025 | 0.0858 | 239.0905 | 0.0234 |
| Rubber Tires Loaders | 0.0983 | 0.4557 | 0.7114 | 0.0012 | 0.0375 | 108.6114 | 0.0089 |
| Scrapers | 0.2383 | 0.9053 | 1.9017 | 0.0027 | 0.0783 | 262.4900 | 0.0215 |
| Signal Boards | 0.0161 | 0.0921 | 0.1172 | 0.0002 | 0.0060 | 16.6983 | 0.0014 |
| Skid Steer Loaders | 0.0305 | 0.2184 | 0.2044 | 0.0004 | 0.0106 | 30.2770 | 0.0028 |
| Surfacing Eq. | 0.1045 | 0.4506 | 0.9731 | 0.0017 | 0.0353 | 165.9721 | 0.0094 |
| Sweepers/Scrubbers | 0.0810 | 0.4988 | 0.5192 | 0.0009 | 0.0332 | 78.5433 | 0.0073 |
| Tractors | 0.0610 | 0.3689 | 0.4070 | 0.0008 | 0.0258 | 66.7979 | 0.0055 |
| Front End Loaders | 0.0610 | 0.3689 | 0.4070 | 0.0008 | 0.0258 | 66.7979 | 0.0055 |
| Backhoes | 0.0610 | 0.3689 | 0.4070 | 0.0008 | 0.0258 | 66.7979 | 0.0055 |
| Trenchers | 0.1200 | 0.4479 | 0.5719 | 0.0007 | 0.0453 | 58.7146 | 0.0108 |
| Welders | 0.0482 | 0.1951 | 0.2173 | 0.0003 | 0.0168 | 25.6027 | 0.0044 |
| Gasoline Const Eq. (assumed 175 hp category) | 0.0771 | 0.3855 | 1.08 | 0.00014 | 0.1542 | 14.1565 | 0.00037 |

(gasoline EFs: EPA OMS-AMD Report NR-009A, 2-13-98, and SCAQMD EMFAC 2007 CEQA Tables, 2016.)

Construction Period Emissions, lbs

| **Equip. Type** | **VOC** | **CO** | **NOx** | **SOx** | **PM10** | **CO2** | **CH4** |
|---|---|---|---|---|---|---|---|
| Aerial Lifts | 102 | 461 | 635 | 1 | 38 | 88888 | 9 |
| Air Compressors | 203 | 924 | 1362 | 2 | 92 | 183189 | 18 |
| Bore-Drill Rigs | 90 | 722 | 769 | 3 | 23 | 237469 | 8 |
| Cement Mixers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Concrete/Industrial Saws | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cranes | 209 | 784 | 1727 | 3 | 71 | 236678 | 19 |
| Crawler Tractors/Dozers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Crushing/Processing Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dumpers/Tenders | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Excavators | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Forklifts | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Generator Sets | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Graders | 86 | 424 | 638 | 1 | 32 | 95575 | 8 |
| Off-Highway Tractors | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Off-Highway Trucks | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Diesel Construction Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other General Industrial Eq. | 284 | 1060 | 2267 | 4 | 95 | 341017 | 26 |
| Other Material Handling Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pavers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Paving Eq. Other | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Plate Compactors | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pressure Washers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pumps | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Roller Compactors | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rough Terrain Forklifts | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber Tired Dozers | 808 | 3068 | 6518 | 8 | 268 | 745962 | 73 |
| Rubber Tires Loaders | 55 | 255 | 398 | 1 | 21 | 60822 | 5 |
| Scrapers | 133 | 507 | 1065 | 2 | 44 | 146994 | 12 |
| Signal Boards | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Skid Steer Loaders | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Surfacing Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sweepers/Scrubbers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tractors | 146 | 885 | 977 | 2 | 62 | 160315 | 13 |
| Front End Loaders | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Backhoes | 132 | 797 | 879 | 2 | 56 | 144283 | 12 |
| Trenchers | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Welders | 69 | 281 | 313 | 0 | 24 | 36868 | 6 |
| Gasoline Const Eq. | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| **Totals** | **VOC** | **CO** | **NOx** | **SOx** | **PM10** | **PM2.5** | **CO2** | **CH4** | **N2O** |
|---|---|---|---|---|---|---|---|---|---|
| lbs per const. period | 2318 | 10168 | 17549 | 27 | 826 | 818.55 | 2478062 | 209 | 33 |
| tons per const. period | 1.2 | 5.1 | 8.8 | 0.013 | 0.41 | 0.41 | 1239.03 | 0.10 | 0.02 |
| Average lbs/day = | 8.9 | 39.1 | 67.5 | 0.102 | 3.18 | 3.15 | 9531.01 | 0.80 | 0.13 |
| Normalized TPY = | *1.2* | *5.1* | *8.8* | *0.0* | *0.4* | *0.4* | *1239.0* | *0.1* | *0.017* |

| | |
|---|---|
| CO2e, tons/period | 1246.6 |
| CO2e, tons/yr: | 1246.6 |

CARB-CEIDARS, Updated Size Fractions for PM Profiles: PM2.5 = 0.991 of PM10 : Diesel Vehicle Exhaust

Other Assumptions and References:

1. Trench construction times per: Southern Regional Water Pipeline Alliance, 3/08.
   Optimum trench construction progress rate is 80m (260ft) per day.
   Non-optimum trench construction progress rate is 30m (100 ft) per day.
   An average progress of 180 ft/day is used where applicable.
2. Paving speeds can range from 3 to 15 m/min depending on asphalt delivery rates and required compaction thickness.
   A minium paving speed of 3 m/min (10 ft/min or 600 ft/hr) was used where applicable.
   The minimum speed is based upon a 3" compacted layer, 12 ft lane width, with an asphalt delivery rate of ~ 140 tons/hr.
   Ref: Asphalt Paving Speed, Pavement Worktip No. 31, AAPA, 11/2001.
3. Estimation of maximum daily emissions is extremely variable, and these values are not required by SJVAPCD.
4. Construction schedule note: applicant data indicates a construction work day period of 8 hours
   The equipment use rates provided by the applicant are consistent with an 8 hour workday.
5. GWP values: CH4=25, N2O=298, ref: 40 CFR 98 Subpart A, Table A-1.

**CONSTRUCTION PHASE - T-Line Phases 1 and 2**

**MRI Level 2 Analysis (Refs 1, 3-7)**

| | | | | |
|---|---|---|---|---|
| Acres Subject to Construction Disturbance Activites: | | | 26.4 | 1 acre per tower |
| Max Acres Subject to Construction Disturbance Activites on any day of this phase: | | | 2.6 | note (10) |
| Emissions Factor for PM10 Uncontrolled, tons/acre/month: | | | 0.12 | |
| PM2.5 fraction of PM10 (per CARB CEIDARS Profiles): | | | 0.21 | |
| **Activity Levels:** | Hrs/Day: | | 8 | |
| | Days/Wk: | | 5 | |
| | Days/Month: | Applicant Data | 22 | |
| Phase Const Period, Months: | | | 12 | 1.00 years |
| Phase Const Period, Days: | | | 260 | |

**Wet Season Adjustment:** (Per AP-42, Section 13.2.2, Figure 13.2.2-1, 12/03 or CalEEMod, Appendix D, Table 1.1.)

| | |
|---|---|
| Mean # days/year with rain >= 0.01 inch: | 40 |
| Mean # months/yr with rain >= 0.01 inch: | 1.33 |
| Adjusted Const Period, Months: | 10.67 |
| Adjusted Const Period, Days: | 220 |

**Controls for Fugitive Dust:** Proposed watering cycle: 3 times per day

3 watering cycles/8 hour construction shift yields a 68% reduction, use 68% for non-desert sites. (11)(12)

Speed control of onsite const traffic to <15 mph yields a 40-70% reduction (use 50% control as conservative for site). (11)(12)

| | | |
|---|---|---|
| Calculated % control based on mitigations proposed: | 84 | % control |
| Conservative control % used for emissions estimates: | 84 | % control |
| | 0.16 | release fraction |

| **Emissions: Controlled** | PM10 | PM2.5 |
|---|---|---|
| tons/month | 0.051 | 0.011 |
| tons/period | 0.541 | 0.114 |
| Max lbs/day | 4.608 | 0.968 |

**Soil Handling Emissions (Cut and Fill): (2)**

| | |
|---|---|
| Total cu.yds of soil handled: | 0 |
| Total tons of soil handled: | 0.0 |
| Total days soil handled: | 220 |
| Tons soil/day: | 0 |
| Control Eff, watering, % | 80 |
| Release Fraction: | 0.2 |

| Emissions: | PM10 | PM2.5 |
|---|---|---|
| tons/period | 0.000 | 0.000 |
| tons/month | 0.000 | 0.000 |
| max lbs/day | 0.000 | 0.000 |

| | | | |
|---|---|---|---|
| Mean annual wind speed, mph: (8) | | | 8.03 |
| Avg. Soil moisture, %: (9) | | | 5 |
| Avg. Soil density, tons/cu.yd: | | | 1.3 |
| k factor for PM10: | | | 0.35 |
| Number of Drops per ton: | | | 4 |
| Calc 1 | wind | | 1.851 |
| Calc 2 | moisture | | 3.607 |
| Calc 3 | int | | 0.513 |
| Calc 4 | PM10 | lb/ton | 0.0006 |
| PM2.5 fraction of PM10: | | | 0.210 |

| **Emissions Totals:** | **PM10** | **PM2.5** |
|---|---|---|
| **tons/period** | **0.541** | **0.114** |

**Methodology References:**

(1) MRI Report, South Coast AQMD Project No. 95040, March 1996, Level 2 Analysis Procedure.
MRI Report uncontrolled factor of 0.11 tons/acre/month is based on 168 hours per month of const activity.
For an activity rate of ~180 hrs/month, the adjusted EF would be 0.12 tons/acre/month (uncontrolled).
(2) Soil Handling (Cut and Fill), EPA, AP-42, Section 13.2.4., 11/06.
(3) URBEMIS, Version 9.2.4, User's Manual Appendix A, page A-6.
(4) CARB Area Source Methodology, Section 7.7, 9/02.
(5) WRAP Fugitive Dust Handbook, 9/06.
(6) USEPA, AP-42, Section 13.2.3, 2/10.
(7) Estimating PM Emissions from Construction Operations, USEPA, MRI, 9/99.
(8) Wind speed data for Lemoore met station. Annual avg wind speed = 8.03 mph, % calms = 3.44%.
(9) Soil Moisture; 5% assumed avg value
(10) adjusted applicant value based on 10% of total acreage disturbed on any given day
(11) SCAQMD CEQA Handbook 1993.
(12) SCAQMD, Sample Construction Scenarios for Projects Less than Five Acres, Fugitive Dust Mitigations, February 2005.

**OFFSITE PAVED ROAD FUGITIVE DUST EMISSIONS**
(associated with delivery truck and worker vehicle traffic on I-5 and plant access road)

| | | | |
|---|---|---|---|
| Average mileage for construction related vehicles: | | 50 | miles, roundtrip distance*** |
| Avg weight of vehicular equipment on road: | | 4.1 | tons (range 2 - 42 tons) |
| Road surface silt loading factor: | | 0.015 | g/m2 (range 0.03 - 400 g/m2)<br>Limited Access Freeway >10,000 ADT **(I-5)** |
| Particle size multiplier factors: | PM10 | 0.0022 | lb/VMT |
| | PM2.5 | 0.00054 | lb/VMT |
| C factors (brake and tire wear): | PM10 | 0.00047 | lb/VMT |
| | PM2.5 | 0.00036 | lb/VMT |
| Avg vehicle speed on road: | | 65 | mph |
| Total Trips | | 17843 | |
| | | | **VMT/period: 892150** |
| | | | adjusted for precip events |
| | Total vehicles per const period: | 0 | |

| | PM10 | |
|---|---|---|
| Calc 1 | 0.022 | |
| Calc 2 | 4.217 | |
| Calc 3 | 0.0007 | lb/VMT |

| **Emissions** | **PM10** | **PM2.5** |
|---|---|---|
| **lbs/period** | **600.50** | **101.49** |
| **tons/period** | **0.300** | **0.051** |

EPA, AP-42, Section 13.2.1, March 2006, updated 9/2008.
PM2.5 fraction of PM10 per CARB CEIDARs is 0.169
*** Note: avg roundtrip distance traveled by delivery or worker vehicles on freeways (I-5) and other State Routes in the project area.
Vehicles per day: worker + deliveries+staff support vehciles (averages)

**ONSITE UNPAVED ROAD FUGITIVE DUST**

| | | | | | |
|---|---|---|---|---|---|
| Length of Unpaved Roads on Construction site: | | 1 | miles* | assume 1 mile travel from roads | |
| Avg weight of construction vehicular equipment on road: | | 4.1 | tons (range 2 - 42 tons) | | |
| Road surface silt content: | | 8.5 | % (range 1.8 - 35%) | | |
| Road surface material moisture content: | | 5 | % (range 0.03 - 13%) | | |
| | | k | a | b | |
| Particle size multiplier factors: | PM10 | 1.5 | 0.9 | 0.45 | |
| | PM2.5 | 0.15 | 0.9 | 0.45 | |
| C factors (brake and tire wear): | PM10 | 0.00047 | lb/VMT | | |
| | PM2.5 | 0.00036 | lb/VMT | | |
| Avg construction vehicle speed on road: | | 5 | mph (range 5-55 mph) | | |
| Total Construciton Vehicles | | 11680 | ** | | |
| | | | | **calculated per Applicant data** | |
| | | | | **VMT/period:** | **11680** |
| Control reduction due to watering, speed control, etc. = | | 80 | | | |
| | | 0.8 | | | |
| | Release Fraction = | 0.2 | | | |

| | PM10 | PM2.5 |
|---|---|---|
| Calc 1 | 0.733 | 0.733 |
| Calc 2 | 1.151 | 1.151 |
| Calc 3 | 1.266 | 0.127 |
| Calc 4 | 1.266 | 0.127 |
| Controlled lb/VMT | 0.253 | 0.025 |

| **Emissions** | **PM10** | **PM2.5** |
|---|---|---|
| **lbs/period** | **2957.93** | **296.52** |
| **tons/period** | **1.479** | **0.148** |

EPA, AP-42, Section 13.2.2, March 2006
Soil Moisture; 5% avg
Soil silt content: 8.5% per AP-42 for construction site scraper routes
** const equipment plus site support pickups plus

**CONSTRUCTION PHASE - Truck Hauling/Delivery and Site Support Vehicle Emissions**

**All Phases**

| **Delivery/Hauling Vehicle Use Rates** | | | | | Emissions Factors (lbs/vmt) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Delivery Roundtrip Distance: | 30 | miles | NOx | CO | VOC | SOx | PM10 | CO2 | | | |
| Total Trips | 11680 | | 0.0062534 | 0.0005153 | 0.0001138 | 0.000026 | 3.984E-05 | 3.1064617 | HDDT | | |
| Avg Deliveries per Day: | | | 0.0004698 | 0.0034003 | 7.817E-05 | 0.000013 | 2.92E-06 | 1.0236164 | MDGT | | |
| Fraction of Deliveries-Diesel: | 0.95 | HDDT | | | **Daily Emissions (lbs)** | | | | | | |
| Fraction of Deliveries-Gas: | 0.05 | MDGT | **NOx** | **CO** | **VOC** | **SOx** | **PM10** | **CO2** | **PM2.5** | | |
| Total Delivery VMT: | **350400** | | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | HDDT | |
| Total Daily VMT-Diesel | 0 | | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | MDGT | |
| Total Daily VMT-Gasoline | 0 | | | | **Tons per Const Period** | | | | | | |
| Total Period VMT-Diesel | 332880 | | 1.041 | 0.086 | 0.019 | 0.004 | 0.007 | 517.0 | 0.006 | HDDT | |
| Total Period VMT-Gasoline | 17520 | | 0.004 | 0.030 | 0.001 | 0.000 | 0.000 | 9.0 | 0.000 | MDGT | |
| | | | | | | | | | | | |
| **Construction Site Support Vehicle Use Rates (LDTs)** | | | | | **Daily Emissions, lbs** | | | | | | |
| Gasoline Vehicle VMT Period: | 10800 | | **NOx** | **CO** | **VOC** | **SOx** | **PM10** | **CO2** | | | **PM2.5** |
| Avg Daily Gasoline VMT: | 42 | | 0.0004076 | 0.0035926 | 6.999E-05 | 0.000008 | 5.072E-06 | 0.6541839 | lbs/vmt* | LDT gasoline | |
| Avg Daily Diesel VMT: | 0 | | 0.0169 | 0.1492 | 0.0029 | 0.0003 | 0.0002 | 27.1738 | lbs/day | gasoline | 0.0001 |
| Total Phase Const Days: | 260 | | | | | | | | | | |
| | | | | | **Tons per Const Period** | | | | | | |
| Ref: EMFAC 2014, SJVAPCD Year 2019 | | | 0.0022 | 0.0194 | 0.0004 | 0.0000 | 0.0000 | 3.5 | **tons/period** | **gasoline** | 0.0000 |
| LDT1-gas, MDV-gas, HDDT-dsl | | | | | | | | | | | |
| See EF data in WSP Support Appendix | | | | | | | | | | | |

**Notes** ***

VMT for delivery/hauling for all vehicles includes: (1) materials deliveries to site, (2) materials removal from site, other VMT as specified below.

Support Vehicle VMT: best estimate at time of filing, 2 LDT (gasoline) at 30 VMT/day for260 days

CARB-CEIDARS, Updated Fractions for PM Profiles: PM2.5 = 0.991 of PM10 for Diesel Exhaust, and 0.998 for Gasoline Vehicles.

**CONSTRUCTION PHASE - Worker Travel - Emissions**

Ref: SJVAPCD EMFAC 2014, Year 2020
LDA-gas
See EF data in WSP Support Appendix

**Worker Travel to Site**

| | |
|---|---|
| Total Trips | 6163 |
| Average distance | 20.0 |
| **Total Const Period Worker VMT:** | **123260** |

Emissions Factors (lbs/VMT)

| NOx | CO | VOC | SOx | PM10 | CO2 |
|---|---|---|---|---|---|
| 0.00013058 | 0.001103197 | 2.504E-05 | 0.000007 | 0.000004 | 0.65463696 |

**Daily Emissions (lbs)**

| | NOx | CO | VOC | SOx | PM10 | CO2 | PM2.5 |
|---|---|---|---|---|---|---|---|
| Avg | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**Tons per Const Period**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Avg | 0.008 | 0.068 | 0.002 | 0.000 | 0.000 | 40.3 | 0.000 |

**CONSTRUCTION PHASE - Trackout Emissions**

| | | | | | |
|---|---|---|---|---|---|
| Paved Road Length (miles): | 0.1 | estimated roundtrip trackout distance | | | |
| Daily # of Vehicles: | 21 | | | | |
| Avg Vehicle Weight (tons): | 6.8 | | **PM10** | **PM2.5*** | |
| Total Unadjusted VMT/day | 2.1 | | 0.361 | | |
| Particle Size Multipliers | PM10 | | 1.924 | | |
| lb/VMT | 0.023 | | 0.002 | 0.0004 | lb/VMT |
| C factor, lb/VMT | 0.00047 | | **0.036** | **0.0062** | **lbs/day** |
| Road Sfc Silt Loading (g/m^2): | 0.56 | local X 2 | **0.000** | **0.0001** | **tons/month** |
| # of Active Trackout Points: | 1 | ** | **0.00** | **0.0008** | **tons/period** |
| Added Trackout Miles: | PM10 | | | | |
| Trackout VMT/day: | 13 | *Default Silt Load Values for Paved Road Types* | | | |
| Final Adjusted VMT/day | 15 | | Freeway | 0.02 g/m2 | |
| Final Adjusted VMT/month | 323 | | Arterial | 0.036 g/m2 | |
| Final Adjusted VMT/period | 3881 | | Collector | 0.036 g/m2 | |
| Construction days/month: | 22 | | Local | 0.28 g/m2 | |
| Adj. Construction months/period: | 12.00 | | Rural | 1.6 g/m2 | |
| Control Applied to Trackout: | Gravel entrance, metal cleaning grates, water washing, sweeping | | | | |
| Control Efficiency, % | 84 | 0.84 | Release Factor = | 0.16 | |

* PM2.5 fraction of PM10 assumed to be 0.169 (CARB CEIDARS updated fraction values) for paved roads.

** 1 controlled ingress/egress point is planned for site construction

EPA, AP-42, Section 13.2.1, Proposed revisions dated 9/2008.

Use silt loading factor from default values for road type if no site specific data is available.

Trackout effects approximately 0.05 mi. of roadway arriving and departing from the site access point.

Plant access road is already paved. Entrance will be gravelled with metal grates for take out control.

Vehicle count = delivery trucks plus site support trucks (see Unpaved Onsite tab)

Worker vehicles not counted for trackout, they will park on the site perimeter.

## SGF 2,3 and South Gen Tie Overlap

| | | | | | | | | % Overlap 2019 | 2020 |
|---|---|---|---|---|---|---|---|---|---|
| **SGF 2** | **250** | 1 | 210 | 43 | 1-Nov-18 | 31-Aug-19 | | | |
| | | 2 | 300 | 61 | 1-Jun-19 | 31-Jul-20 | | 0.52 | 0.42 |
| | | 3 | 150 | 30 | 1-Apr-20 | **31-Oct-20** | | | |
| | | | | | | 23 | | | |
| **SGF 3** | **250** | 1 | 210 | 43 | 1-Jan-20 | 31-Oct-20 | | | |
| | | 2 | 300 | 61 | 1-Aug-20 | 30-Sep-21 | | | 0.50 |
| | | 3 | 150 | 30 | 1-Jun-21 | **31-Dec-21** | | | |
| | | | | | | 24 | | | |
| **South Gen** | | | | | 1-Jan-19 | 31-Dec-19 | | 1.00 | |

Overlap
SGF2 /South Gen

| **Total Emissions** | **NOx** | **CO** | **VOC** | **SOx** | **PM 10** | **CO2** | Fug **PM 10** | Fug **PM 2.5** |
|---|---|---|---|---|---|---|---|---|
| SGF 2 | 26.92259 | 16.75746 | 3.393851 | 0.084367 | 1.044509412 | 7995.93 | 9.139774 | 1.679576 |
| South Gen Tie In | 9.857817 | 5.320083 | 1.18171 | 0.020455 | 0.421460873 | 1825.984 | 2.359079 | 0.319184 |
| SGF3 | 24.45172 | 13.13011 | 3.277872 | 0.05401 | 1.019007753 | 5221.69 | 5.797572 | 1.081314 |
| Gates | 1.567632 | 0.96093 | 0.210929 | 0.003823 | 0.063087216 | 362.7886 | 0.074837 | 0.012328 |
| | | | | | | | | |
| 2019 | 25.43 | 14.99 | 3.16 | 0.07 | 1.03 | 6347 | 7.19 | 1.20 |
| 2020 | 23.53 | 13.60 | 3.06 | 0.06 | 0.95 | 5969 | 6.74 | 1.25 |

## Westlands Solar Park - Construction - Off-Site Vehicle Usage

### Solar Generating Facilities

| Vehicles | Estimated Usage | | | | | Truck Trip Estimates | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Units | Miles/Round Trip | Round Trips per Unit | | | | | | |
| | | | 100 MW SGF | 150 MW SGF | 250 MW SGF | | 100 MW SGF | 150 MW SGF | 250 MW SGF |
| **Phase 1 – Site Preparation** | | | | | | | | | |
| Water Trucks | 5 | 85 | 1 | 1 | 1 | | 5 | 5 | 5 |
| Flat Bed Trucks | 12 | 85 | 2 | 3 | 4 | | 24 | 36 | 48 |
| Gravel Trucks (End Dump)(Delivery) | 18 | 56 | 85 | 125 | 210 | | 1530 | 2250 | 3780 |
| Equipment Transport Trucks (Delivery) | 24 | 85 | 12 | 18 | 30 | | 288 | 432 | 720 |
| Worker Vehicles | 140 | 90 | 85 | 125 | 210 | | | | |
| **Phase 2 – Installation of Solar Arrays** | | | | | | | | | |
| Water Trucks | 4 | 85 | 1 | 1 | 1 | | 4 | 4 | 4 |
| Freight Trucks (Delivery) | 19 | 400 | 110 | 165 | 275 | | 2090 | 3135 | 5225 |
| Equipment Transport Trucks (Delivery) | 7 | 85 | 3 | 6 | 10 | | 21 | 42 | 70 |
| Service Trucks | 3 | 85 | 110 | 165 | 275 | | 330 | 495 | 825 |
| Worker Vehicles | 290 | 90 | 120 | 180 | 300 | | | | |
| **Phase 3 – Installation of Inverters, Transformers, Substation, Interconnection** | | | | | | | | | |
| Water Trucks | 1 | 85 | 1 | 1 | 1 | | 1 | 1 | 1 |
| Ready Mix (Delivery) | 3 | 50 | 100 | 150 | 250 | | 300 | 450 | 750 |
| Freight (Delivery) | 1 | 400 | 60 | 90 | 150 | | 60 | 90 | 150 |
| Equipment Transport Trucks (Delivery) | 1 | 85 | 8 | 12 | 18 | | 8 | 12 | 18 |
| Worker Vehicles | 40 | 90 | 65 | 95 | 160 | | | | |
| Source: Tranquillity | Total worker: | | 49300 | 73500 | 122800 | Total Truck: | 4661 | 6952 | 11596 |
| | per day | | 224 | 334 | 558 | | | | |

| Total VMT | 100 MW SGF | 150 MW SGF | 250 MW SGF |
|---|---|---|---|
| Trucks - roundtrips | | | |
| vmt | 994,085 | 1,489,075 | 2,481,715 |
| Workers - roundtrips | | | |
| vmt | 4,437,000 | 6,615,000 | 11,052,000 |
| Total VMT | 5,431,085 | 8,104,075 | 13,533,715 |

**Totals Scaled to Project Size**

| Subarea | MW | Worker trips | Truck Trips | Total Trips | Worker VMT | Truck VMT | Total VMT | Truck percentage |
|---|---|---|---|---|---|---|---|---|
| 1 | 100 | 49300 | 4661 | 53961 | 4,437,000 | 994,085 | 5,431,085 | 9% |
| 2 | 160 | 78400 | 7415 | 85815 | 7056000 | 1,588,347 | 8,644,347 | 9% |
| 3 | 90 | 44370 | 4195 | 48565 | 3993300 | 894,677 | 4,887,977 | 9% |
| 4 | 220 | 108064 | 10204 | 118268 | 9725760 | 2,183,909 | 11,909,669 | 9% |
| 5 | 180 | 88200 | 8342 | 96542 | 7938000 | 1,786,890 | 9,724,890 | 9% |
| 6 | 170 | 83300 | 7879 | 91179 | 7497000 | 1,687,618 | 9,184,618 | 9% |
| 7 | 110 | 54230 | 5127 | 59357 | 4880700 | 1,093,494 | 5,974,194 | 9% |
| 8 | 250 | 122800 | 11596 | 134396 | 11,052,000 | 2,481,715 | 13,533,715 | 9% |
| 9 | 250 | 122800 | 11596 | 134396 | 11,052,000 | 2,481,715 | 13,533,715 | 9% |
| 10 | 150 | 73500 | 6952 | 80452 | 6,615,000 | 1,489,075 | 8,104,075 | 9% |
| 11 | 200 | 98240 | 9277 | 107517 | 8841600 | 1,985,372 | 10,826,972 | 9% |
| 12 | 120 | 59160 | 5593 | 64753 | 5324400 | 1,192,902 | 6,517,302 | 9% |

## Westlands Solar Park - Construction - Off-Site Vehicle Usage

### Solar Generating Facilities

| Vehicles | Estimated Usage | | | | |
|---|---|---|---|---|---|
| | Units | Miles/Round Trip | Round Trips per Unit | | |
| | | | 100 MW SGF | 150 MW SGF | 250 MW SGF |
| **Phase 1 – Site Preparation** | | | | | |
| Water Trucks | 5 | 85 | 1 | 1 | 1 |
| Flat Bed Trucks | 12 | 85 | 2 | 3 | 4 |
| Gravel Trucks (End Dump)(Delivery) | 18 | 56 | 85 | 125 | 210 |
| Equipment Transport Trucks (Delivery) | 24 | 85 | 12 | 18 | 30 |
| Worker Vehicles | 140 | 90 | 85 | 125 | 210 |
| **Phase 2 – Installation of Solar Arrays** | | | | | |
| Water Trucks | 4 | 85 | 1 | 1 | 1 |
| Freight Trucks (Delivery) | 19 | 400 | 110 | 165 | 275 |
| Equipment Transport Trucks (Delivery) | 7 | 85 | 3 | 6 | 10 |
| Service Trucks | 3 | 85 | 110 | 165 | 275 |
| Worker Vehicles | 290 | 90 | 120 | 180 | 300 |
| **Phase 3 – Installation of Inverters, Transformers, Substation, Interconnection** | | | | | |
| Water Trucks | 1 | 85 | 1 | 1 | 1 |
| Ready Mix (Delivery) | 3 | 50 | 100 | 150 | 250 |
| Freight (Delivery) | 1 | 400 | 60 | 90 | 150 |
| Equipment Transport Trucks (Delivery) | 1 | 85 | 8 | 12 | 18 |
| Worker Vehicles | 40 | 90 | 65 | 95 | 160 |
| Source: Tranquillity | Total worker: | | 49300 | 73500 | 122800 |
| | | per day | 224 | 334 | 558 |

### 230 kV Switching Stations

| Vehicles | Estimated Usage | | |
|---|---|---|---|
| Construction Duration – 170 work days | Units | Miles/Round Trip | Round Trips/Unit |
| Water Trucks | 1 | 85 | 1 |
| Concrete and Gravel Delivery | 9 | 56 | 18 |
| Equipment Transport Trucks (Delivery) | 4 | 85 | 6 |
| Freight Trucks (Delivery) | 4 | 400 | 85 |
| Worker Vehicles | 6 | 90 | 170 |

Source: Tranquillity

| Total VMT | | 100 MW SGF | 150 MW SGF | 250 MW SGF |
|---|---|---|---|---|
| Trucks - roundtrips | | | | |
| | vmt | 994,085 | 1,489,075 | 2,481,715 |
| Workers - roundtrips | | | | |
| | vmt | 4,437,000 | 6,615,000 | 11,052,000 |
| Total VMT | | 5,431,085 | 8,104,075 | 13,533,715 |

## Westlands Solar Park - Construction - On-Site Equipment Usage

### Solar Generating Facilities

| Equipment | Estimated Usage | | | | |
|---|---|---|---|---|---|
| | Units | Hours/Day | Days per Unit | | |
| **Phase 1 – Site Preparation** | | (5 days/week) | 100 MW SGF | 150 MW SGF | 250 MW SGF |
| Water Trucks | 5 | 7 | 85 | 125 | 210 |
| Bulldozers | 3 | 7 | 85 | 125 | 210 |
| Graders | 5 | 7 | 43 | 65 | 108 |
| Compactors | 1 | 7 | 17 | 25 | 42 |
| Skid Loaders | 1 | 7 | 75 | 113 | 188 |
| Asphalt Pavers | 1 | 4 | 11 | 17 | 28 |
| Front-End Loaders | 1 | 7 | 33 | 50 | 83 |
| **Phase 2 – Installation of Solar Arrays** | | | | | |
| Water Trucks | 1 | 7 | 62 | 93 | 154 |
| Tractors – post drivers | 2 | 7 | 98 | 147 | 245 |
| Forklifts | 6 | 7 | 88 | 132 | 220 |
| Trenchers | 9 | 4 | 98 | 147 | 245 |
| Flat Bed Trucks | 12 | 7 | 88 | 132 | 220 |
| **Phase 3 – Installation of Inverters, Transformers, Substation, Interconnection** | | | | | |
| Water Trucks | 1 | 7 | 56 | 84 | 140 |
| Forklifts | 2 | 4 | 56 | 84 | 140 |
| Trenchers | 1 | 4 | 58 | 86 | 144 |
| Backhoes | 1 | 4 | 63 | 95 | 158 |
| Cranes | 1 | 2 | 38 | 56 | 94 |
| Aerial Lifts | 1 | 6 | 38 | 56 | 94 |

Source: Tranquillity

### 230 kV Switching Stations

| Equipment | Estimated Usage | | |
|---|---|---|---|
| Construction Duration – 170 days | Units | Hours/Day (5 days/wk) | Days/Unit |
| Water Truck | 1 | 6 | 170 |
| Grader | 1 | 8 | 40 |
| Scraper | 1 | 8 | 14 |
| Excavator | 1 | 8 | 25 |
| Roller | 1 | 8 | 2 |
| Asphalt Paver | 1 | 8 | 25 |
| Forklift | 1 | 8 | 60 |
| Generator Set | 1 | 8 | 40 |
| Crane | 1 | 8 | 4 |

Source: Tranquillity

**Operational Exhaust Emissions Estimates**

*The WSP project does not become fully operationl until 2030, while most of the emissionsfactor databases end at 2025-2026.*
*The emissions presented herein are for the first operational year after the completion of construction, i.e., 2030.*

Project: **WSP**

*Off-Site Worker Commute and Delivery Emissions Estimates*

| Personnel | # Workers | Work Days/Yr | RT Dist, miles | Total Trips | VMT/Yr |
|---|---|---|---|---|---|
| Permanent | 2 | 252 | 50 | 504 | 25200 |
| Repair Crews | 20 | 25 | 50 | 500 | 25000 |
| Shepherds | 3 | 110 | 50 | 330 | 16500 |
| Panel Crews | 25 | 40 | 50 | 1000 | 50000 |
| | | | | Total VMT/Yr | 116700 |
| | | | | | |
| Deliveries | (1 deliveries/weekday) HDDT | | 150 | 260 | 39000 |

*On-site Pickup Trucks and ATVs*

| Category | # Units | VMT/day | Days/Yr | | VMT/Yr |
|---|---|---|---|---|---|
| O&M | 8 | 30 | 130 | | 31200 |
| Panel Washing | 15 | 40 | 80 | | 48000 |
| ATV | 2 | 40 | 5 | | 400 |
| | | | | Total VMT/Yr | 79600 |

*On-Site Tractor Use*

| Category | # Units | Hours/day | Days/yr | Avtg HP | Total Hrs/Yr |
|---|---|---|---|---|---|
| Diesel Tractor | 2 | 8 | 100 | 98 | 1600 |

Composite LDA Emissions Factors, SJVAPCD Scenario Year 2030, EMFAC2014 (lbs/VMT)

| NOx | CO | VOC | SOx | PM10 | PM2.5 | CO2 |
|---|---|---|---|---|---|---|
| 0.000066 | 0.000872 | 0.000013 | 0.000005 | 0.000003 | 0.000003 | 0.481456 |

Composite HD-DSL Emissions Factors, SJVAPCD Scenario Year 2030, EMFAC2014 (lbs/VMT)

| NOx | CO | VOC | SOx | PM10 | PM2.5 | CO2 |
|---|---|---|---|---|---|---|
| 0.003142 | 0.00058 | 0.00011 | 0.000024 | 0.000008 | 0.000008 | 2.545193 |

**Worker Commute Emissions Estimates (tons/yr)**

| NOx | CO | VOC | SOx | PM10 | PM2.5 | CO2 | CO2e |
|---|---|---|---|---|---|---|---|
| 0.004 | 0.051 | 0.001 | 0.000 | 0.000 | 0.000 | 28.093 | 28.194 |

**On-Site Pickup Trucks (O&M and Panel Washing) Emissions Estimates (tons/yr)**

| NOx | CO | VOC | SOx | PM10 | PM2.5 | CO2 | CO2e |
|---|---|---|---|---|---|---|---|
| 0.003 | 0.035 | 0.001 | 0.000 | 0.000 | 0.000 | 19.162 | 19.231 |

Tractor EF (lbs/hr), 98 HP, CalEEMod, Appendix D, Table 3.5 (51-120 HP category for Year 2030)

| NOx | CO | VOC | SOx | PM10 | PM2.5 | CO2 |
|---|---|---|---|---|---|---|
| 0.3509 | 0.8005 | 0.0588 | 0.0013 | 0.00648 | 0.00648 | 122.78 |

**On-Site Tractor Use Emissions Estimates (tons/yr)**

| NOx | CO | VOC | SOx | PM10 | PM2.5 | CO2 | CO2e |
|---|---|---|---|---|---|---|---|
| 0.281 | 0.640 | 0.047 | 0.001 | 0.005 | 0.005 | 98.224 | 98.565 |

**Annual Emissions Estimates for Portable Gen Sets (see separate calculation sheet attached)**

| NOx | CO | VOC | SOx | PM10 | PM2.5 | CO2 | CO2e |
|---|---|---|---|---|---|---|---|
| 0.385 | 3.256 | 0.089 | 0.00762 | 0.012 | 0.01092 | 840.98 | 764.5 |

**Annual Emissions Estimates for Site Deliveries (HDDT)**

| NOx | CO | VOC | SOx | PM10 | PM2.5 | CO2 | CO2e |
|---|---|---|---|---|---|---|---|
| 0.061269 | 0.01131 | 0.002145 | 0.000468 | 0.000156 | 0.000156 | 49.6312635 | 49.802 |

***********

**Cumulative Total-Annual Exhaust Emissions Estimates for Operations as WSP (tons/yr)**

| NOx | CO | VOC | SOx | PM10 | PM2.5 | CO2 | CO2e |
|---|---|---|---|---|---|---|---|
| 0.733 | 3.993 | 0.139 | 0.010 | 0.018 | 0.017 | 1036.090 | 960.292 |

**OFFSITE PAVED ROAD FUGITIVE DUST EMISSIONS-OPERATIONS**
(associated with delivery truck and worker vehicle traffic on I-5 and plant access road)

| | | | |
|---|---|---|---|
| Average mileage for Operations related vehicles: | | NA | miles, roundtrip distance*** |
| Avg weight of vehicular equipment on road: | | 2.4 | tons (range 2 - 42 tons) |
| Road surface silt loading factor: | | 0.03 | g/m2 (range 0.03 - 400 g/m2)<br>Limited Access Freeway >10,000 ADT **(I-5)** |
| Particle size multiplier factors: | PM10 | 0.0022 | lb/VMT |
| C factors (brake and tire wear): | PM10 | 0.00047 | lb/VMT |
| Avg vehicle speed on road: | | 65 | mph |
| Number of vehicles per day: | | 51 | * |
| Number of work days per month: | | 30 | |
| | Total vehicles per month: | 1530 | |
| Number of work months per year: | | 10.67 | adjusted for precip events |
| | Total vehicles per OPs period: | 16325.1 | |

Inputs from Exhaust Calcs

**VMT/period:** **171740**

| | PM10 | |
|---|---|---|
| Calc 1 | 0.041 | |
| Calc 2 | 2.442 | |
| Calc 3 | 0.0007 | lb/VMT |

| **Emissions** | **PM10** | **PM2.5** |
|---|---|---|
| **lbs/period** | **118.67** | **20.06** |
| **tons/period** | **0.059** | **0.010** |

EPA, AP-42, Section 13.2.1, Jan 2011
PM2.5 fraction of PM10 per CARB CEIDARs is 0.169
*** Note: avg roundtrip distance traveled by delivery or worker vehicles on freeways (I-5) and other State Routes in the project area.
Vehicles per day: worker + deliveries+staff support vehciles (averages)

**ONSITE UNPAVED ROAD FUGITIVE DUST-OPERATIONS**

| | | | | | |
|---|---|---|---|---|---|
| Length of Unpaved Road used for Operations, etc.: | | 12 | miles* | | |
| Avg weight of operations vehicular equipment on road: | | 1.4 | tons (range 2 - 42 tons) | | |
| Road surface silt content: (gravel roads) | | 6 | % (range 1.8 - 35%) | | |
| Road surface material moisture content: | | 5 | % (range 0.03 - 13%) | | |
| | | k | a | c | |
| Particle size multiplier factors: | PM10 | 1.5 | 0.9 | 0.45 | |
| | PM2.5 | 0.15 | 0.9 | 0.45 | |
| C factors (brake and tire wear): | PM10 | 0.00047 | lb/VMT | | |
| | PM2.5 | 0.00036 | lb/VMT | | |
| Avg operations vehicle speed on road: | | 10 | mph (range 5-55 mph) | | |
| Avg number of operations vehicles per day: | | 32 | ** | | |
| | | | | calculated from Applicant data | |
| Number of operations work days per month: | | 30 | | VMT/period: | **103600** |
| Total vehicles per month: | | 960 | | | |
| Number of operations work months: | | 10.67 | adjusted for precipitation events | | |
| Total vehicles per const period: | | 10243.2 | | | |
| Control efficiency (gravel roads, dust palliatives, wetting): | | 80 | | | |
| | | 0.8 | | | |
| Release Fraction = | | 0.2 | | | |

| | PM10 | PM2.5 |
|---|---|---|
| Calc 1 | 0.536 | 0.536 |
| Calc 2 | 0.710 | 0.710 |
| Calc 3 | 0.570 | 0.057 |
| Calc 4 | 0.571 | 0.057 |
| Controlled lb/VMT | 0.114 | 0.011 |

| **Emissions** | **PM10** | **PM2.5** |
|---|---|---|
| **lbs/period** | **11829.46** | **1189.43** |
| **tons/period** | **5.915** | **0.595** |

EPA, AP-42, Section 13.2.2, Nov 2006.
Soil Moisture; 5% avg
Soil silt content: Plant road, AP-42, 6% (gravel covered service roads)
*value is the avg annual VMT per trip per vehicle on the unpaved roads

EXPECTED INTERNAL COMBUSTION ENGINE EMISSIONS

Liquid Fuel

Engine Service: Portable Generator

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Mfg: | Cummins or equivalent | | # of Identical Engines: | 2 | | | |
| | | | Stack Data (Optional) | | | | |
| Engine #: | | | Height: | 0 | Ft. | 0.00 | m |
| Kw | | | Diameter: | 0 | Ft. | 0.00 | m |
| BHP: | 175 | | Temp: | 0 | deg F | 255.2 | deg K |
| RPM: | 1760 | | ACFM: | 0 | | 0.00 | m3/sec |
| Fuel: | #2 ULS Diesel | | Area: | 0.0000 | Sq.Ft. | 0.0000 | m2 |
| Fuel Use: | 9.63 | Gph (1) | Velocity: | 0.00 | Ft/Sec | 0.00 | m/sec |
| Fuel HHV: | 139000 | Btu/gal | | | | | |
| mmbtu/hr: | 1.34 | HHV | # of Runs per Day: | 1 | | | |
| EPA Tier: | 4 Final | | Max Daily Op Hrs: | 8 | | | |
| | (applicable to 2013 and later) | | Max Annual Op Hrs: | 480 | | | |
| Fuel Wt: | 6.87 | Lbs/gal | | | | | |
| Fuel S: | 0.0015 | % wt. | | | | | |
| Fuel S: | 0.10305 | Lbs/1000 gal | | | | | |
| SO2: | 0.2061 | Lbs/1000 gal | | | | | |

| | | | **Single Engine** | | | | ***All Engines*** | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **EFs (g/bhp-hr)** | | **Source** | **Lb/Hr** | **Lb/Day** | **Lbs/Yr** | **Tons/Yr** | ***Lb/Hr*** | ***Lb/Day*** | ***Lbs/Yr*** | ***Tons/Yr*** |
| NOx | 0.26 | CARB | 0.80 | 0.80 | 384.85 | 0.192 | *1.60* | *1.60* | *769.69* | *0.385* |
| CO | 2.2 | CARB | 6.78 | 6.78 | 3256.39 | 1.628 | *13.57* | *13.57* | *6512.78* | *3.256* |
| VOC | 0.06 | CARB | 0.19 | 0.19 | 88.81 | 0.044 | *0.37* | *0.37* | *177.62* | *0.089* |
| PM10 | 0.008 | CARB | 0.02 | 0.02 | 11.84 | 0.006 | *0.05* | *0.05* | *23.68* | *0.012* |
| SOx | NA | | 0.0159 | 0.02 | 7.62 | 0.00381 | *0.03* | *0.03* | *15.24* | *0.00762* |
| | lbs/mmbtu | | | | | | | | | |
| CO2 | 163.052 | | 1746 | 1746 | 838105 | 419.05 | *3492* | *3492* | *1676210* | *838.11* |
| Methane | 0.00661 | | 0.0708 | 0.071 | 33.98 | 1.6988E-02 | *0.14* | *0.14* | *67.95* | *3.3976E-02* |
| N2O | 0.001323 | | 0.0142 | 0.014 | 6.80 | 3.4002E-03 | *0.03* | *0.03* | *13.60* | *6.8004E-03* |
| CO2e | | | | | | 420.490 | | | | *840.981* |
| | | | | | | | | | *Mtons* | *764.53* |

Notes:

1. fuel consumption based on 0.055 gal/hp-hr (avg EPA and SCAQMD values)
   if no value given by mfg for specific engine.
2. PM10 equals PM2.5.
3. PM10 used in HRA to represent DPM emissions.
4. GHG Efs: FR 74, #209, Part 98 Subpart C, 10-30-2009, Pg. 56409-56411, Tables C-1 and C-2. #2 Diesel Fuel.
   GWP values: 40 CFR 98, Subpart A, Table A-1
5. fuel density and heat values are EPA defaults unless otherwise specified

**Average Vehicle Weight Estimate for Operations Period**

**On Road Commute and Delivery**

| Vehicle Type | Weight tons | # Vehicles per day | Frac. of total vehicles | |
|---|---|---|---|---|
| Passenger LDP/LDT | 1.5 | 50 | 0.962 | Worker and support travel vehicles |
| HDD Loaded | 35 | 1 | 0.019 | |
| HDD Unloaded | 15 | 1 | 0.019 | Materials delivery trucks, service trucks, fuel trucks, concrete trucks, etc. |
| MDGT Loaded | 15 | 0 | 0.000 | |
| MDGT Unloaded | 5 | 0 | 0.000 | |
| | | 52 | 1.000 | |
| Vehicle Total | | 51 | | |

**Weighted Avg Vehicle Weight, tons : 2.4**

**Onsite Ops Vehicles**

| Vehicle Type | Weight tons | # Vehicles per day | Frac. of total vehicles | |
|---|---|---|---|---|
| Passenger LDP/LDT | 1.5 | 23 | 0.676 | |
| Tractor | 2 | 2 | 0.059 | |
| Port Gen Set | 1 | 2 | 0.059 | Onsite Equipment |
| ATV | 0.5 | 2 | 0.059 | |
| Water Trailer | 1.5 | 5 | 0.147 | |
| | | 34 | 1.000 | |
| Vehicle Total | | 27 | | |

**Weighted Avg Vehicle Weight, tons : 1.4**

Ref: Mission Rock Energy Center, AFC-Air Quality Analysis, Appendix 5.1E, 10/2015.

# APPENDIX D

## Biological Resources Report

**Prepared by**

**Live Oak Associates**

**October 2017**

LIVE OAK ASSOCIATES, INC.

an Ecological Consulting Firm

# WESTLANDS SOLAR PARK MASTER PLAN AND WSP GEN-TIE CORRIDORS PLAN BIOLOGICAL ASSESSMENT KINGS COUNTY, CALIFORNIA



Prepared by

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October 11, 2017 PN 1388-03

# EXECUTIVE SUMMARY

Live Oak Associates, Inc., conducted an investigation of the biological resources of the Westlands Solar Park (WSP) Master Plan area ("Plan Area") in Kings County, and the associated Gen-Tie Corridors extending into Fresno County, California, and evaluated likely impacts to such resources resulting from development of large scale photo-voltaic solar energy projects. The following report is a programmatic-level analysis of impacts to these resources from future projects potentially constructed. The 21,000-acre Plan Area is located in western Kings County approximately two miles north of Kettleman City and eight miles southwest of the City of Lemoore. In 2010, 2011, 2012, 2013, 2014, and 2015, Live Oak Associates (LOA) conducted multiple spring and summer surveys over the Plan Area for biotic habitats, the plants and animals occurring in those habitats, and significant habitat values that may be protected by state and federal law. The Gen-Tie Corridors consist of two transmission corridors connecting the WSP Plan Area to the Gates Substation approximately 11.5 miles west.

The Plan Area and Gen-Tie Corridors consist of agricultural lands within a region dominated by similar agricultural lands. Habitats/land uses identified within the Plan Area included cultivated fields, fallowed and pastured fields, canals/aquatic, and off-site tailwater pond. The WSP Plan Area and Gen-Tie Corridors do not provide suitable habitat for locally occurring special-status plant or animal species except for burrowing owls and foraging habitat for Swainson's hawks. However, a number of special status animal species may occur onsite. Suitable habitat was found for sixteen special status animal species that potentially occur as regular foragers or residents of the area. These include the western pond turtle, San Joaquin whipsnake, western snowy plover, Swainson's hawk, northern harrier, white-tailed kite, mountain plover, white-faced ibis, burrowing owl, loggerhead shrike, tricolored blackbird, Townsend's big-eared bat, pallid bat, California mastiff bat, San Joaquin kit fox, and American badger. Additional impacts to Swainson's hawks will be mitigated through avoidance of active nests found during required preconstruction surveys; and if active nests are found onsite or on adjacent lands, additional mitigation for loss of habitat may be required. Similar avoidance and preconstruction surveys will reduce impacts to burrowing owls, raptors, loggerhead shrike, and other nesting birds protected by the federal Migratory Bird Treaty Act. While there are no reported sightings of San Joaquin kit fox within or near the Plan Area (although there are some reported sightings along the California Aqueduct from the early 1980s), and no evidence of kit fox was found during LOA's field surveys, impacts to kit fox are potentially significant. Prior to the construction of each solar development within WSP, preconstruction surveys will be conducted. If kit fox are found, additional surveys and compensation strategy will be designed and implemented. All WSP solar projects will adhere to the USFWS *Standardized Recommendations for Protection of the San Joaquin Kit Fox Prior to or During Ground Disturbance*. Preconstruction surveys and avoidance measures will reduce impacts to American badgers from direct construction related mortality to a less-than-significant level. Impacts to wildlife movements and movement corridors will be minimized through the planned retention of canals as well as the construction of wildlife-friendly fencing. Waters of the U.S. are likely absent from the Plan Area and Gen-Tie Corridors. However, in the absence of a U.S. Army Corps of Engineers determination of the status of onsite waters, actual impacts to Potential Waters of Waters the U.S. are unknown at this time.

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# 1 INTRODUCTION

Live Oak Associates, Inc. (LOA) has prepared the following report. This report describes the biotic resources of the proposed 21,000-acre Westlands Solar Park (WSP) Master Plan area ("Plan Area"), and the associated Gen-Tie Corridors extending into Fresno County, and evaluates likely impacts to such resources from potential conversion of the WSP Plan Area from agricultural lands to a solar generation facilities. The WSP Plan Area is located in western Kings County approximately two miles north of Kettleman City and eight miles southwest of the City of Lemoore (Figure 1). The Plan Area and Gen-Tie Corridors are located within the Huron, Kettleman City, Stratford, and Westhaven U.S. Geological Survey (USGS) 7.5 minute quadrangles (Figure 2).

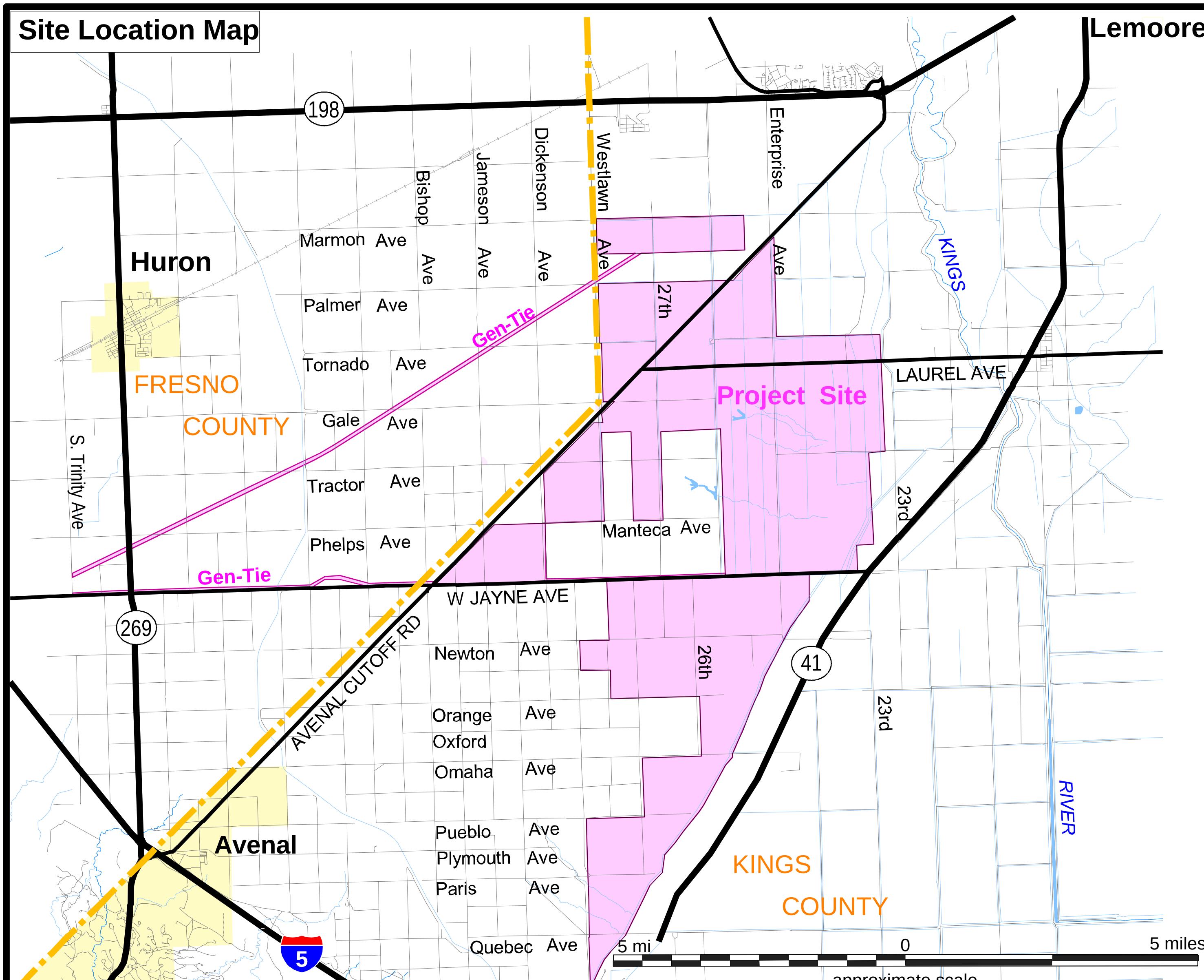
## 1.1 PROJECT DESCRIPTION

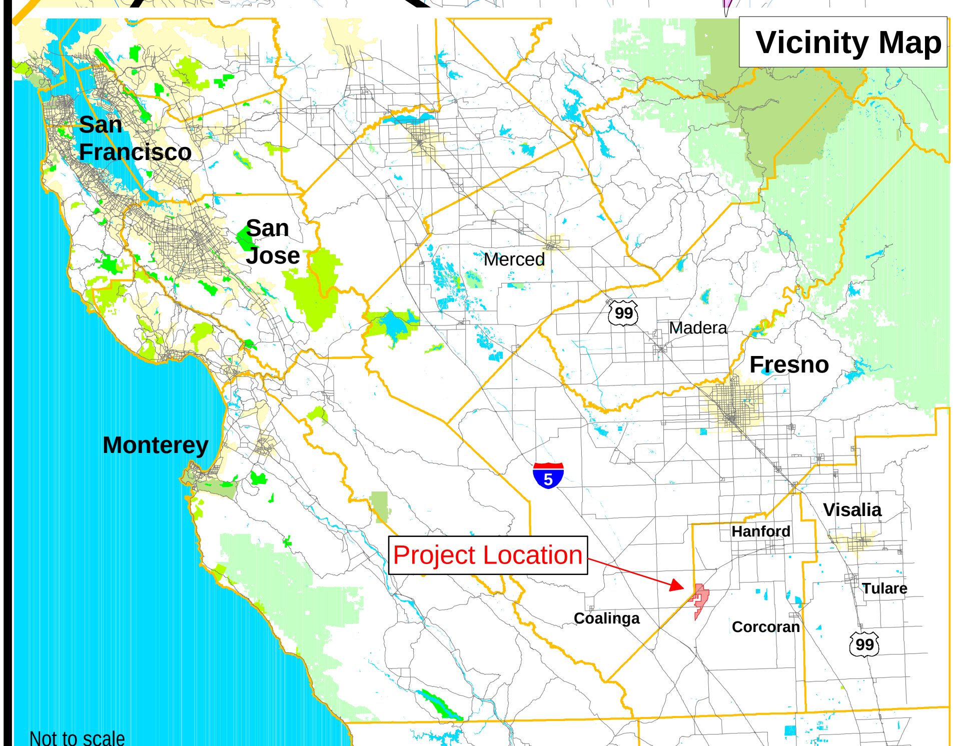
The Westlands Solar Park encompasses an area of approximately 21,000 acres in western Kings County where the project proponent plans to develop large-scale solar photovoltaic (PV) generating projects. These projects will consist of photo-voltaic arrays which will generate electric power for the State grid. This report is intended to provide an assessment of biological resources within the Plan Area and a program-level assessment of likely impacts from development of the entire 21,000 acres, in compliance with the requirements of the California Environmental Quality Act (CEQA).

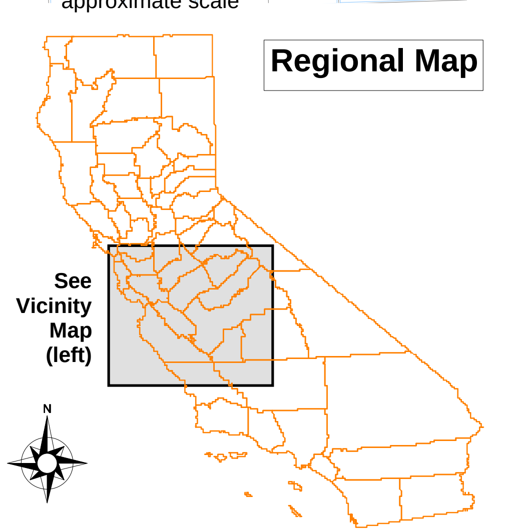
Two gen-ties lines are proposed for the WSP: the WSP-North Gen-Tie and the WSP-South Gen-Tie. The WSP-North Gen-Tie corridor extends from the northwestern portion of WSP across agricultural fields to the Gates Substation and the WSP-South Gen-Tie corridor extends from the middle of the WSP plan area near 25$^{th}$ Avenue to the Gates Substation along the northern side of Jayne Avenue/Nevada Avenue. The total length of the Gen-Tie Corridors is approximately 23 miles. The gen-tie corridors have a planned width of up to 350 feet. The transmission towers are planned to consist of tubular steel monopoles placed at intervals of approximately ¼ mile. Poles/towers for these gen-tie lines are flexible in their placement, and will be placed appropriately to avoid any special areas such as potential wetlands.

## 1.2 REPORT OBJECTIVES

The development of land can damage or modify biotic habitats used by sensitive plant and wildlife species. In such cases, site development may be regulated by state or federal agencies, subject to provisions of the California Environmental Quality Act (CEQA), and/or covered by policies and ordinances of Kings County. This report addresses issues related to: 1) sensitive biotic resources occurring within the Plan Area and Gen-Tie Corridors; 2) the federal, state, and local laws regulating such resources, and 3) mitigation measures which may be required to reduce the magnitude of anticipated impacts and/or comply with permit requirements of state and federal resource agencies. Since the proposed project has been defined at a general level to date, this report is intended to provide a program-level environmental assessment of onsite biological conditions and probable impacts, and is subject to further refinement once individual solar projects under the WSP Master Plan and the gen-tie lines are sufficiently defined to allow a project-specific impact analysis, in compliance with the



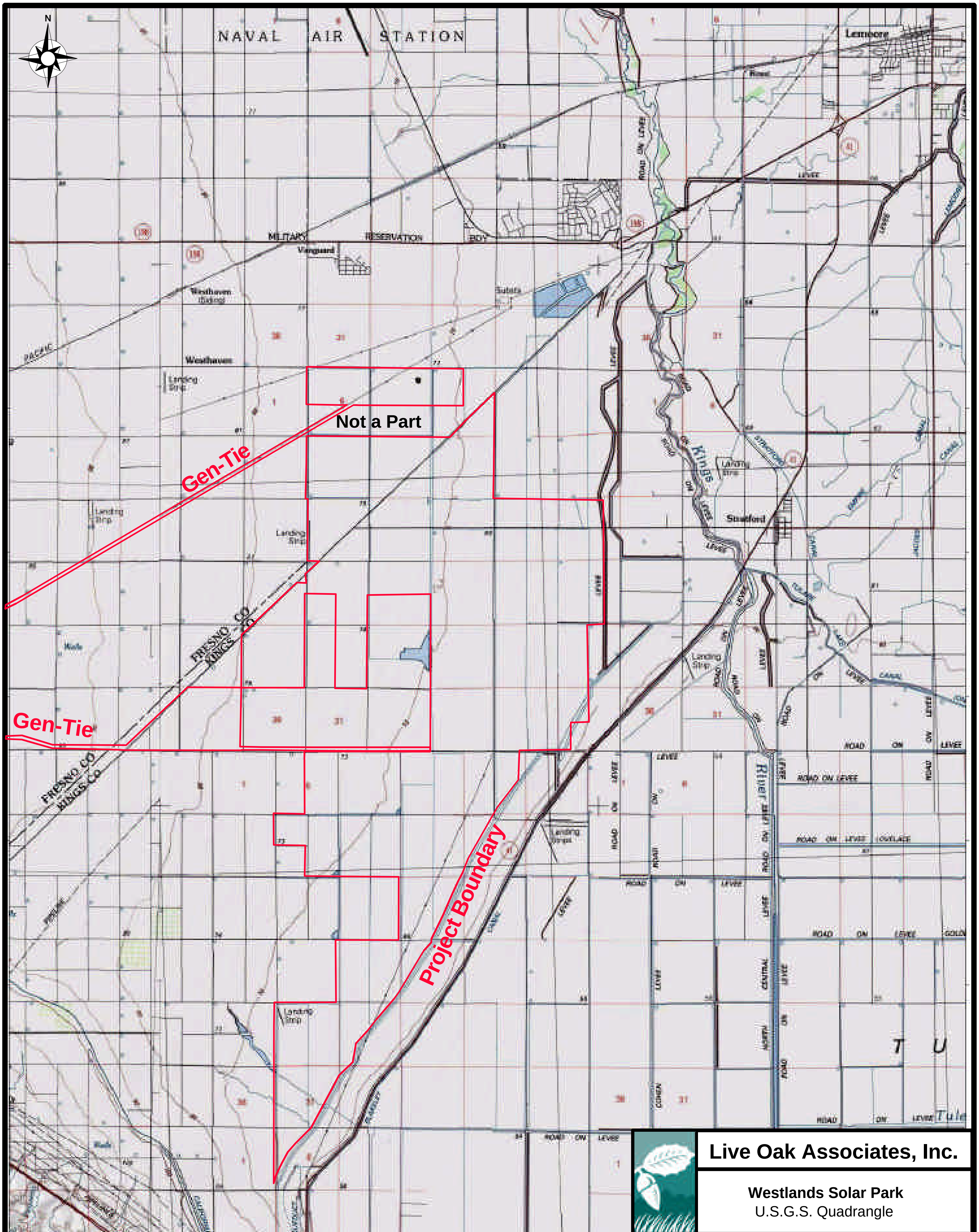




**Live Oak Associates, Inc.**

**Westlands Solar Park**
Site / Vicinity Map

| Date | Project # | Figure # |
| --- | --- | --- |
| 6/14/2017 | 1388-03 | 1 |




From USGS
Coalinga and Visalia 100k Quadrangles 1983

2 mi 0 2 miles
approximate scale

**Live Oak Associates, Inc.**

**Westlands Solar Park**
U.S.G.S. Quadrangle

| Date | Project # | Figure # |
|---|---|---|
| 6/14/2017 | 1388-03 | 2 |

requirements of the California Environmental Quality Act (CEQA). As such, the objectives of this report are to:

- Summarize all site-specific information related to existing biological resources, based on a review of the literature, a search of species databases, and field surveys conducted by LOA over the entire WSP Plan Area and Gen-Tie Corridors;

- In addition to species observed to be present within the Plan Area, make reasonable inferences about the other biological resources that could occur onsite based on habitat suitability and the proximity of the Plan Area and Gen-Tie Corridors to a species' known range;

- Summarize all state and federal natural resource protection laws that may be relevant to development of solar projects within the WSP Plan Area and Gen-Tie Corridors;

- Identify and discuss project impacts to biological resources likely to occur within the Plan Area and Gen-Tie Corridors within the context of CEQA or any state or federal laws; and

- Identify avoidance and mitigation measures that would reduce impacts to a less-than-significant impact (as identified by CEQA) and are generally consistent with recommendations of the resource agencies for affected biological resources.

## 1.3 STUDY METHODOLOGY

The analysis of impacts, as discussed in Section 3.0 of this report, is based on the known and potential biotic resources of the Plan Area and Gen-Tie Corridors discussed in Section 2.0. Sources of information used in the preparation of this analysis included: (1) the *California Natural Diversity Data Base* (CDFW 2010 and 2011), (2) the *Online Inventory of Rare and Endangered Vascular Plants of California* (CNPS 2010 and 2011), and (3) manuals, reports, and references related to plants and animals of the San Joaquin Valley region. A number of reconnaissance-level field surveys of the Plan Area were conducted from 2010 through 2015, as follows: 2010 - January 11, 12; May 12; and June 21, by LOA ecologists Jeff Gurule and Geoff Cline; 2011 - March 21; April 5 by LOA ecologists Katrina Krakow and Nathan Hale, April 12 and 13 by Ms. Krakow, April 19 and 20 by Ms. Krakow and LOA field ecologist Robert Shields, and May 3, and 17; June

7 and 21 by Ms. Krakow; 2012 – April 7 by LOA ecologists Ms. Krakow and Rebekah Jensen, May 3 by Ms. Krakow, May 4 by Ms. Krakow and Mr. Cline, May 23 by Ms. Krakow, and May 24 and 25 by Ms. Krakow and Mr. Cline; 2013 – May 13 by Ms. Krakow; 2014 – May 2 and 22 by Ms. Krakow an LOA ecologist Waring Laurendine; 2015 – April 15 by Ms. Krakow and Mr. Hale. Field surveys for the Gen-Tie Corridors were performed on May 4, 2017. These surveys consisted primarily of driving the perimeter of the fields and along onsite canals at which time the principal land uses of the site were identified and the constituent plants and animals of each were noted. If a particular area or resource of interest or importance was discovered the surveyors exited the vehicle to investigate conditions on foot.

Detailed surveys for sensitive biological resources were not conducted during the multiple site surveys of the Plan Area except the Swainson's hawk nest survey (April 27 and May 3 and 4, 2012) which included the Plan Area and a 10-mile buffer of the Plan Area. The level of effort undertaken during LOA's field surveys during other site surveys was sufficient to locate and establish the general extent of wetland and special-status species habitat that might be present, but was not sufficient to establish precise wetland boundaries or the extent of actual use of onsite habitats by special status species that are present. Field surveys conducted for this study were sufficient to assess the significance of potential biological impacts associated with the solar development of the 21,000-acre WSP Plan Area and Gen-Tie Corridors, and to assess the need for more detailed studies that could be warranted if sensitive biotic resources were identified in this program-level survey. Delineating all wetlands that may be present, conducting focused surveys for sensitive plant and wildlife species, or mapping the extent of any special-status species habitat present may be warranted prior to the development of individual solar projects and gen-tie lines within the WSP Plan Area and Gen-Tie Corridors. The need for any such subsequent surveys or delineations is identified in this report where appropriate.

# 2 EXISTING CONDITIONS

## 2.1 REGIONAL SETTING

Like most of California, the Central San Joaquin Valley (and the WSP Master Plan and Gen-Tie Corridors area) experiences a Mediterranean climate. Warm dry summers are followed by cool moist winters. Summer temperatures commonly exceed 90 degrees Fahrenheit, and the relative humidity is generally very low. Winter temperatures rarely rise much above 70 degrees Fahrenheit, with daytime highs often below 60 degrees Fahrenheit. Annual precipitation within the Plan Area is about 10 inches, almost 85% of which falls between the months of October and March. Nearly all precipitation falls in the form of rain.

The Kings County area of the Central San Joaquin Valley receives water from the Kings River, which is located approximately one mile east of the north end of the Plan Area. The Kings River historically drained into the Tulare Lake Basin which contained the vast Tulare Lake, which encompassed a large area of Kings County and at times extend to the eastern edge of the WSP plan area. The Kings River and Tulare Lake contained large areas of riparian, wetland, and aquatic ecosystems that supported large populations of diverse native plants and animals. Under present conditions, the Kings River supports only a fraction of the riparian habitat it once supported and the aquatic habitat has been greatly degraded from agricultural runoff and irregular flows. In essence the river currently provides water to a series of distributary channels supplying water to farmland in the region. Tulare Lake has long been drained and converted to farmland and urban uses.

Native upland biotic habitats of the Central San Joaquin Valley once consisted of grassland and shrubland, nearly all of which have been converted to farmland or urban use within the last 50 years or more. Native plant and animal species once abundant in the valley have become locally extirpated or have experienced large reductions in their populations. The native habitat that remains in the region is particularly valuable to native wildlife species including special status species that still persist in the region.

The lands surrounding the WSP Plan Area and Gen-Tie Corridors consist of agricultural land. The nearest natural habitats are the Kettleman Hills approximately two miles to the south and the Kings River drainage approximately one mile to the east at the north end of the Plan Area.

## 2.2 PROJECT SITE

The approximately 21,000-acre WSP Plan Area includes agricultural lands, artificial waterways, and local access roads. The Plan Area is generally bounded by Avenal Cutoff Road, the Fresno County Line, and Kent Avenue and to the northwest, Highway 41 to the east, and 28th Avenue to the southwest. Avenal Cutoff Road runs diagonally through the northwest portion of the site. Topographically, the site is relatively level, ranging in elevation from approximately 210 feet (64 m) National Geodetic Vertical Datum (NGVD) along the Westlands Main Canal near the southeastern Plan Area boundary to approximately 285 feet (87 m) NGVD along the western edge of the Plan Area at Avenal Cutoff Road (Figure 2).

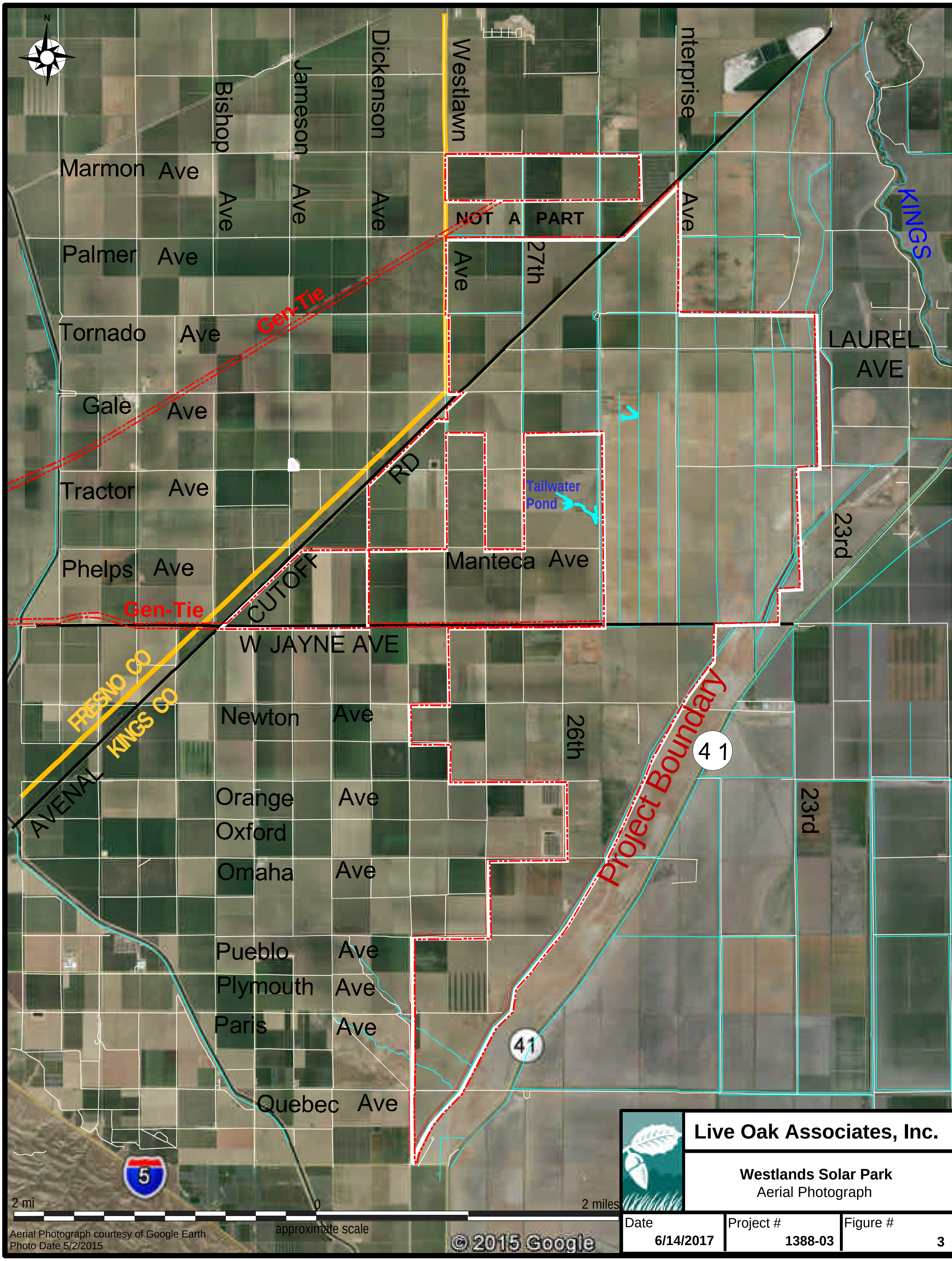
The South and North Gen-Tie Corridors traverse similar agricultural lands in Fresno County en route to the Gates Substation located approximately 6 to 10 miles west of the Kings County line, respectively. The ground elevations of the Gen-Tie Corridors rise gradually to the west, reaching elevations of approximately 400 feet NGVD at the Gates Substation.

Eleven soil mapping units from nine soil series were identified within the Plan Area. The Gen-Tie Corridors pass through five of these mapping units – Lethent clay loam, Excelsior sandy loam, Westhaven loam and Westhaven clay loam, and Calflax clay loam (Table 1). The soil series are slightly to moderately alkaline, and eight of the soil units are considered hydric (Houser clay, Lethent clay loam, Panoche clay loam, Pitco clay, Tulare variant clay, Twisselman silty clay, Westcamp loam, Westhaven clay loam). Hydric soils are soils that are saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions in the upper part; under sufficiently wet conditions, they support the growth and regeneration of hydrophytic vegetation. The soils within the Plan Area and Gen-Tie Corridors have been cultivated for decades and land preparation practices such as grading, deep ripping, and/or discing have almost certainly disrupted the native soil characteristics such that storm water readily infiltrates the soils of and surrounding the Plan Area. Therefore, any ponding that may have once occurred on hydric soils within the Plan Area would no longer occur, resulting in the absence of vernal pool habitat. Furthermore, any rare, threatened, or endangered plant species once potentially associated with native soil characteristics of the Plan Area and Gen-Tie Corridors would be absent due to extensive soil disturbance.

| **TABLE 1. SOILS OF THE PLAN AREA (FROM NRCS 2006, 2009).** | | | | |
|---|---|---|---|---|
| **Soil Series/Soil** | **Map Unit Symbol** | **Parent Material** | **Drainage Class** | **Hydric?** |
| **Calflax Series** Calflax clay loam, saline-sodic, 0-2% slopes | 480fw | Alluvium derived from calcareous sedimentary rock | Moderately well drained | No |
| **Houser Series** Houser clay, partially drained | 126 | Alluvium derived from igneous and sedimentary rock | Somewhat poorly drained | Yes |
| **Lethent Series** Lethent clay loam, 0-1% slopes | 139 | Alluvium derived from sedimentary rock | Moderately well drained | Yes |
| **Panoche Series** Panoche loam, 0-2% slopes<br>Panoche clay loam, saline-alkali, 0-1% slopes | 150<br>151 | Alluvium derived from sedimentary rock | Well drained | No<br>Yes |
| **Pitco Series** Pitco clay, partially drained, 0-1% slopes | 153 | Alluvium derived from igneous and sedimentary rock | Somewhat poorly drained | Yes |
| **Tulare Series** Tulare variant clay, partially drained, 0-1% slopes | 164 | Alluvium derived from igneous and sedimentary rock | Poorly drained | Yes |
| **Twisselman Series** Twisselman silty clay, saline-alkali, 0-1% slopes | 166 | Alluvium derived from sedimentary rock | Well drained | Yes |
| **Westcamp Series** Westcamp loam, partially drained, 0-2% slopes | 175 | Alluvium derived from igneous and sedimentary rock | Somewhat poorly drained | Yes |
| **Westhaven Series** Westhaven loam, 0-2% slopes<br>Westhaven clay loam, saline-alkali, 0-2% slopes | 176<br>178 | Alluvium derived from igneous and sedimentary rock | Moderately well drained | No Yes |

## 2.3 BIOTIC HABITATS/LAND USES

Five biotic habitats and one land use were observed on and adjacent to the Plan Area and Gen-Tie Corridors during the biological field surveys conducted from 2010 through 2017. These are described below and include: fallow/pasture/barren/shrubland, irrigated fields, orchard/vineyard, tailwater pond, and canal/aquatic as well as developed land use (Figures 3 and 4). The biotic habitats of the Plan Area and Gen-Tie Corridors, while providing habitat for a number of native wildlife species, are regularly disturbed or manipulated as a result of

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**Westlands Solar Park**
Aerial Photograph

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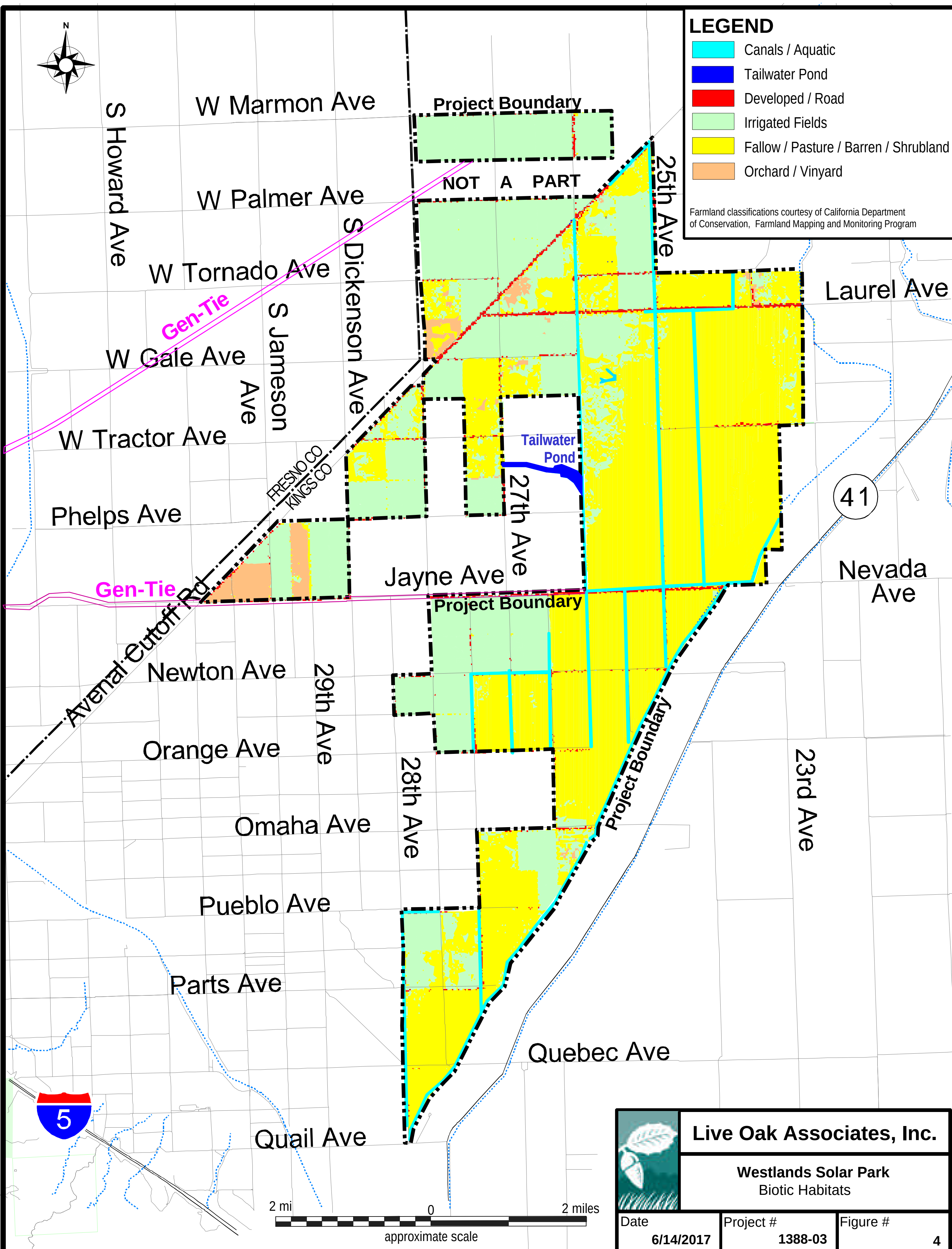


Live Oak Associates, Inc.

**Westlands Solar Park**
Biotic Habitats

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standard farming practices. A list of the vascular plant species observed within the Plan Area and Gen-Tie Corridors, and the terrestrial vertebrates using, or potentially using, the Plan Area and Gen-Tie Corridors are provided in Appendices A and B, respectively. Photos of the Plan Area and Gen-Tie Corridors are presented in Appendix C.

### 2.3.1 Fallow/Pasture/Barren/Shrubland

The vast majority of the Plan Area consists of fallow fields/pasture/barren/shrubland areas (see Figure 3), while the Gen-Tie Corridors contain relatively little of this habitat. Based on inspection of historical aerial photos, much of this area appears to have been fallowed for up to five years or more. Fallowed fields showed no sign of irrigation and were dominated by non-native grasses and forbs adapted to withstand the long hot dry season. Vegetation in these areas varied from low-growing to taller more dense herbaceous cover depending on the field. Pasture areas have livestock or dung present within a permanently fenced area. However, LOA biologists also observed some fallow fields temporarily fenced and grazed by sheep during the 2010-2015 field visits. At the time of the annual spring field surveys, pastured areas supported small numbers of grazing livestock. Barren areas also exist within the eastern portion of the site. Vegetation height and density is likely dependent upon soil characteristics and yearly rainfall. Grass and forb species common to this habitat/land use include fiddleneck, wild oat, soft chess brome (*Bromus hordeaceaus*), red brome (*Bromus madritensis* ssp. *rubens*), horseweed (*Conyza canadensis*), and prickly wild lettuce among others. Very little native vegetation such as Alkali mallow (*Malvella leprosa*) was observed in this habitat.

Wildlife species expected to occur in this habitat would be somewhat similar to those species occurring in the cultivated fields, described below. However, because this habitat is not regularly cultivated, an herbaceous groundcover has developed that provides forage and cover for regional and transient wildlife. Therefore, the fallow fields and pastures would support somewhat larger populations and a greater diversity of wildlife species than the cultivated fields.

The fallow fields/ pasture/barren/shrubland would support much of the same amphibian and reptile species as the irrigated fields; but at a greater density and with the possible addition of species such as western whiptails (*Cnemidophorus tigris*), coachwhips (*Masticophus flagellum*), and glossy snakes (*Arizona elegans*).

Birds observed foraging in the fallow fields/pasture/barren/shrubland during the surveys included the killdeer (*Charadrius vociferus*), mourning dove (*Zenaida macroura*), western kingbird (*Tyrannus verticalis*), loggerhead shrike (*Lanius ludovicianus*), American crow (*Corvus brachyrhynchos*), common raven (*Corvus corax*), horned lark (*Eremophilia alpestris*), northern mockingbird (*Mimus polyglottos*), American pipit, savannah sparrow (*Passerculus sandwichensis*), song sparrow (*Melospiza melodia*), white-crowned sparrow (*Zonotrichia leucophrys*), red-winged blackbird, western meadowlark. Raptors observed over fallow field/pasture include the red-tailed hawk and northern harrier. Other raptors that may forage on or over this habitat within Plan Area include the white-tailed kite, American kestrel, and various owl species such as the barn owl (*Tyto alba*) or western burrowing owl.

A number of mammal species may also occur within the fallow fields/pasture/barren/shrubland of the Plan Area. Small mammals such as deer mice (*Peromyscus maniculatus*), California voles (*Microtus californicus*), house mice (*Mus musculus*), California ground squirrels (*Otospermophilus beecheyi*), and Botta's pocket gophers (*Thomomys bottae*) would occur in fluctuating numbers depending on the season and available cover. Other small mammals likely to occur from time to time within these fields include black-tailed hares (*Lepus californicus*) and desert cottontail rabbits (Sy*lvilagus audubonii*). Various species of bat may also forage over the agricultural fields of the Plan Area for flying insects. Random walks into portions of the fallow fields revealed a low density of small mammal burrows, and walks into the idle cropland revealed a low to moderate density of burrows.

### 2.3.2 Irrigated Fields

After the fallow field/ pasture/barren/shrubland, the next most extensive habitat/land use of the Plan Area is irrigated fields. Within the Gen-Tie Corridors, irrigated fields comprise the predominant habitat/land use. These fields are disturbed by agricultural practices on a regular basis. During the field surveys that occurred during the early portion of the year (2010-2015), much of the fields were disced and barren of vegetation in preparation of the spring planting season. Crops identified during site surveys in 2010-2015 include wheat, garbanzo beans, tomatoes, onion, and alfalfa. Bare fields and other unidentified crops were also present. The sparse vegetation that was observed in the disced fields consisted primarily of non-native grasses and forbs such as fiddleneck (*Amsinckia* sp.), wild oat (*Avena* sp.), field mustard (*Brassica rapa*), Shepherd's purse (*Capsella bursa-pastoris*), jimsonweed (*Datura stramonium*), seaside heliotrope (*Heliotropium curassavicum*), prickly lettuce (*Lactuca serriola*), common mallow (*Malva neglecta*), Russian thistle (*Salsola tragus*), and escaped wheat (*Triticum* sp.), which are adapted to regular disturbance. Several lone willow trees (*Salix* sp.) were sparsely scattered throughout the margins of the cultivated fields. Vegetation in this community is highly managed, with cultivation, monocrop plantings, and weed abatement efforts defining the broad annual cycle. As a result, these fields provide only marginal habitat for most native wildlife. Nonetheless, some native wildlife species may use these fields, as described in more detail below.

Cultivated fields within the Plan Area and Gen-Tie Corridors provide limited habitat for amphibians and reptiles. Amphibian species, such as Pacific chorus frogs (*Pseudacris regilla*) and western toads (*Bufo boreas*) may use the adjacent irrigation canals for breeding and may also disperse through the cultivated fields during the winter and spring, but these fields provide marginal habitat value for these species at best. Reptile species that may forage in this habitat include the side-blotched lizard (*Uta stansburiana*), gopher snake (*Pituophis melanoleucus*), and common kingsnake (*Lampropeltis getulus*).

These fields provide foraging habitat for a number of avian species. Species observed in and around cultivated fields of the Plan Area and Gen-Tie Corridors include the mourning dove (*Zenaida macroura*), western kingbird (*Tyrannus verticalis*), loggerhead shrike (*Lanius ludovicianus*), Common raven (*Corvus corax*), American pipit (*Anthus rubescens*), horned lark (*Eremophila alpestris*), red-winged blackbird (*Agelaius phoeniceus*), western meadowlark (*Sturnella neglecta*), Brewer's blackbird (*Euphagus cyanocephalus*), and brown-headed cowbird (*Molothrus ater*). Raptors observed foraging over cultivated fields include the northern harrier (*Circus cyaneus*), red-tailed hawk (*Buteo jamaicensis*), and American kestrel (*Falco sparverius*).

Other common resident species likely to forage in the agricultural fields of the Plan Area and Gen-Tie Corridors include the European starling (*Sturnus vulgaris*). Winter migrants common to the area include white-crowned sparrows (*Zonotrichia leucorphrys*), and savannah sparrows (*Passerella sandwichensis*).

Mammal species utilizing the cultivated fields would be essentially the same as those likely to occur in the fallow fields/pasture/barren/shrubland.

The presence of birds and small mammals is likely to attract foraging raptors, such as red-tailed hawks, white-tailed kites (*Elanus leucurus*), and various owls such as the burrowing owl (*Athene cunicularia*). Mammalian predators occurring within the Plan Area and Gen-Tie Corridors would most likely be limited to raccoons (*Procyon lotor*), striped skunks (*Mephitis mephitis*), coyotes (*Canis latrans*) and red foxes (*Vulpes vulpes*), as these species are tolerant of human disturbance.

### 2.3.3 Orchard/Vineyard

This habitat occurs within the Plan Area and Gen-Tie Corridors and includes fruit, nut, and other tree crop orchards such as almonds, pistachios, and walnuts, as well as grapes. Animal species using expected to sparsely use these habitats include species in the adjacent habitats.

### 2.3.4 Tailwater Pond

One off-site pond was observed in the vicinity of the Plan Area near the center of the Plan Area (Figure 3). While this pond is not located within the Plan Area, its proximity to the Plan Area warranted detailed consideration of its habitat characteristics and value. This pond was approximately 2,160 feet long and 490 feet wide, and reportedly serves as a tailwater pond for storage of irrigation return flows from nearby fields. LOA's site surveys from 2010-2015 confirm the pond to be ephemeral in nature, as it was completely dry with deep crevices in the bottom during some site surveys and was inundated during others over the past six years. Inflow pumps and piping suggest that this managed pond is filled using a pump and/or from direct rainfall and the water is then used for adjacent agricultural fields when needed. The lack of vegetation in the center of the dry pond in 2010 suggests that it recently was filled with water and in most years the pond would provide relatively good aquatic habitat. Aside from trees along the levees, the pond area was sparsely vegetated during the March 2011 surveys with vegetation increasing significantly by late April. These observations were consistent through the following four years of surveys. The tailwater pond was observed to be fringed with hydrophytic vegetation including tall flatsedge (*Cyperus eragrostis*), seaside heliotrope, alkali mallow (*Malvella leprosa*), Harding grass (*Phalaris aquatica*), knotweed (*Polygonum* sp.), willow leaved dock (*Rumex salicifolius*), Goodding's willow (*Salix gooddingii*), athel tamarisk (*Tamarix aphylla*), and common cattail (*Typha latifolia*). Other vegetation observed in this habitat includes common nightshade (*Solanum americanum*), common cudweed (*Gnaphalium luteo-album*), saltbush (*Atriplex* sp.), common sunflower (*Helianthus annuus*), cheeseweed (*Malva parviflora*), and summer mustard (*Hirschfeldia incana*).

The aquatic habitat and riparian vegetation associated with the tailwater pond are expected to support some amphibian species and numerous avian species. Species observed within or in the vicinity of the pond during the field surveys included: a desiccated bullfrog (*Rana catesbeiana*); further evidence of normally perennial waters), a great horned owl (*Bubo virginianus*), a nesting pair of barn owls, peregrine falcon (*Falco peregrinus*), prairie falcon (*Falco mexicanus*), and Swainson's hawk. Various wading birds such as the American avocet (*Recurvirostra americana*), long-billed dowitcher (*Limnodromus scolopaceus*), great egrets (*Casmerodius alba*), great blue herons (*Ardea herodias*), and a small rookery of black-crowned night herons (*Nycticorax nycticorax*), as well as mallards (*Anas platyrhynchos*) were observed using this habitat.

During the 2010 field surveys, Swainson's hawks were observed flying overhead. During the 2011 field surveys, a pair of Swainson's hawks was observed flying over the tailwater pond, and a pair of red-tailed hawks (*Buteo jamaicensis*) was also observed over the pond. The trees surrounding the pond supported two nesting great horned owls (*Bubo virginianus*), one nest with one owlet and the other nest with two owlets. During the 2012-2014 field surveys, Swainson's hawks were observed flying over the pond area, and red-tailed hawks and great-horned owls were also observed at the pond. During the April 15, 2015 field survey, LOA ecologists observed two Swainson's hawks land in a tree at the tailwater pond although no evidence of nesting was observed.

Other birds observed in the immediate area of the pond include the mallard (*Anas platyrhynchos*), snowy egret (*Egretta thula*), turkey vulture (*Cathartes aura*), killdeer (*Charadrius vociferous*), black-necked stilt (*Himantopus mexicanus*), American avocet (*Recurvirostra Americana*), spotted sandpiper (*Actitis macularius*), greater yellowlegs (*Tringa melanoleuca*), whimbrel (*Numenius* *phaeopus*), least sandpiper (*Calidris minutilla*), mourning dove (*Zenaida macroura*), western kingbird (*Tyrannus verticalis*), loggerhead shrike (*Lanius ludovicianus*), Common raven (*Corvus corax*), horned lark (*Eremophila alpestris*), northern rough-winged swallow (*Stelgidopteryx serripennis*), red-winged blackbird (*Agelaius phoeniceus*), western meadowlark (*Sturnella neglecta*), both individuals and nestlings of Brewer's blackbird (*Euphagus cyanocephalus*), and brown-headed cowbird (*Molothrus ater*).

The riparian trees and shrubs associated with the pond provide considerable habitat for a diversity of avian species. The taller shrubs and trees provide roosting and nesting habitat for various resident species such as the yellow-billed magpie (*Pica nuttallii*), common raven, and red-tailed hawk. This vegetation provides cover for many migrant species moving north from Mexico and Central America during the spring or moving south from the Pacific Northwest and Canada during the fall. The more densely vegetated areas may be used as nesting habitat by spring migrants such as house wrens (*Troglodytes aedon*) and Bullock's orioles (*Icterus bullockii*).

Breeding California toads (*Bufo boreas*), breeding American bullfrogs (*Rana catesbeiana*), and gopher snakes (*Pituophis catenifer*) were observed near the pond. Mammal species associated with the tailwater pond would be limited to those species found in the surrounding cultivated fields such as the various small mammals observed on the dikes around the pond, including desert cottontail (*Sylvilagus audubonii*), California ground squirrel burrows, mice, including one dead in a plant, presumably a loggerhead shrike cash, and one being eaten by a gopher snake, as well as a dead shrew. A coyote skull (*Canis latrans*), raccoon prints (*Procyon lotor*), one domestic horse (*Equus caballus*) with rider, and domestic sheep (*Ovis aries*) were also observed near the pond. Various bat species would find ample foraging habitat along the edges and over the pond.

### 2.3.5 Canal/Aquatic

For the purposes of this discussion, "canal/aquatic" refers to relatively permanent earthen-banked irrigation water conveyance structures and drainage ditches within the Plan Area, most of which contained water during the multi-year field surveys and/or supported wetland vegetation. Earthen ditches which may be created and/or removed from one season or crop season to the next, or which rarely contain water are not considered to be aquatic habitat, but are considered part of the cultivated and fallow field habitats described above.

A number of irrigation canals and agricultural drainage ditches occur within the Plan Area, all of which have earthen beds and banks (Figure 4). The largest canal runs along the south side of Laurel Avenue and connects to secondary and tertiary canals in the eastern half of the Plan Area. The eastern part of the Plan Area, along with the off-site tailwater pond, supported the greatest biodiversity of any areas on the Plan Area. Vegetation occurred in some of the canals; however, signs of vegetation removal within some canals were observed, providing evidence of regular management of the canals to maintain and maximize flows. Wetland and upland native and non-native plant species such as common sunflower, Russian thistle, prickly lettuce, salt grass (*Distichlis spicata*), Mexican sprangeltop (*Leptochloa uninervia*), cocklebur (*Xanthium strumarium*), and alkali heath (*Frankenia salina*), to name a few, were all regularly observed in the dry canals. Canals that were inundated during surveys supported some emergent vegetation such as narrow-leaf cattail.

The canals within the Plan Area provide habitat for several amphibian and reptile species. Amphibian species observed in the canals during the survey included the Pacific chorus frog, breeding California toad, and breeding bullfrog. The presence of amphibians would attract predators such as the common garter snake (*Thamnophis sirtalis*). Gopher snakes (*Pituophis catenifer*) were observed on the roads (dikes) next to canals. An unidentified turtle was observed in a canal near the eastern boundary of the Plan Area.

Several bird species are likely to forage over the canals for invertebrate prey; avian species observed in this habitat include the mallard, pied-billed grebe (*Podilymbus podiceps*), great blue heron (with two juveniles in 2011), great egret, snowy egret (*Egretta thula*), green heron (*Butorides virescens*), black-crowned night heron, northern harrier, red-shouldered hawk (*Buteo lineatus*), common moorhen (*Gallinula chloropus*), American coot (*Fulica americana*), killdeer, black-necked stilt, greater yellowlegs, least sandpiper (*Calidris minutilla*), long-billed dowitcher, herring gull (*Larus argentatus*), mourning dove, black phoebe (*Sayornis nigricans*) Say's phoebe (*Sayornis saya*), western kingbird, loggerhead shrike, American crow, northern rough-winged swallow, cliff swallow (observed nesting in concrete culverts), European starling, American pipit, yellow-rumped warbler (*Dendroica coronata*), lark sparrow, savanna sparrow, song sparrow, white-crowned sparrow, Brewer's blackbird, and house sparrow were observed in this habitat. Several common ravens' nests were observed throughout the Plan Area, mostly in power poles/towers, often along the edges of the canals. California ground squirrels and western burrowing owls were observed along the sides of dry and/or inundated canals. A few coyote dens were observed along dry canals.

The canals provide habitat for aquatic species as well. Mosquito fish (*Gambusia affinis*), carp (*Cyprinus carpio*), and an unknown species of crayfish were observed in the canals. Various species of catfish are known to inhabit perennial canal habitats as well.

There are few irrigation canals or agricultural drainage ditches in the Gen-Tie Corridors area, although both gen-tie corridors pass over the San Luis Canal/California Aqueduct to the west of the Plan Area. The agricultural canals and ditches in the corridors area are periodically maintained and do not support native vegetation associated with wetlands or riparian habitats. There are also several tailwater ponds or irrigation regulating ponds in the vicinity, but these were all created as part of agricultural infrastructure and do not include wetland or riparian habitat.

### 2.3.6 Developed

Developed areas within a near the Plan Area and Gen-Tie Corridors are limited to public and private roads consisting of both paved and dirt roads. The margins of these roads support weedy plant species.

## 2.4 WILDLIFE MOVEMENT CORRIDORS

Wildlife movement corridors are areas where regional wildlife populations regularly and predictably move during dispersal or migration. Movement corridors in California are typically associated with valleys, rivers and creeks supporting riparian vegetation, and ridgelines. In the San Joaquin Valley, which lacks many of the more pronounced topographic features found in the surrounding foothills, wildlife will often move across ill-defined undeveloped habitat patches, or regional movement is facilitated along existing linear features such as ditches, canals, farm roads, and creeks. In areas of intense farming, these existing linear features tend to be used disproportionately for movement when compared to the adjacent, intensely farmed lands. While actively farmed fields are not barriers in themselves, they are used less often than the linear features that cut through them.

The intense farming throughout the San Joaquin Valley over the last century has long altered the more traditional regional movement patterns of wildlife. While regionally-occurring wildlife do in fact move across the broad range of the Valley, they do so less effectively than they once did, relying more extensively on various linear features such as canals, ditches and creeks. Regionally, the nearest areas believed to provide for regional wildlife movement include areas in the surrounding Sierra and inner coast range foothills that have not been substantially altered.

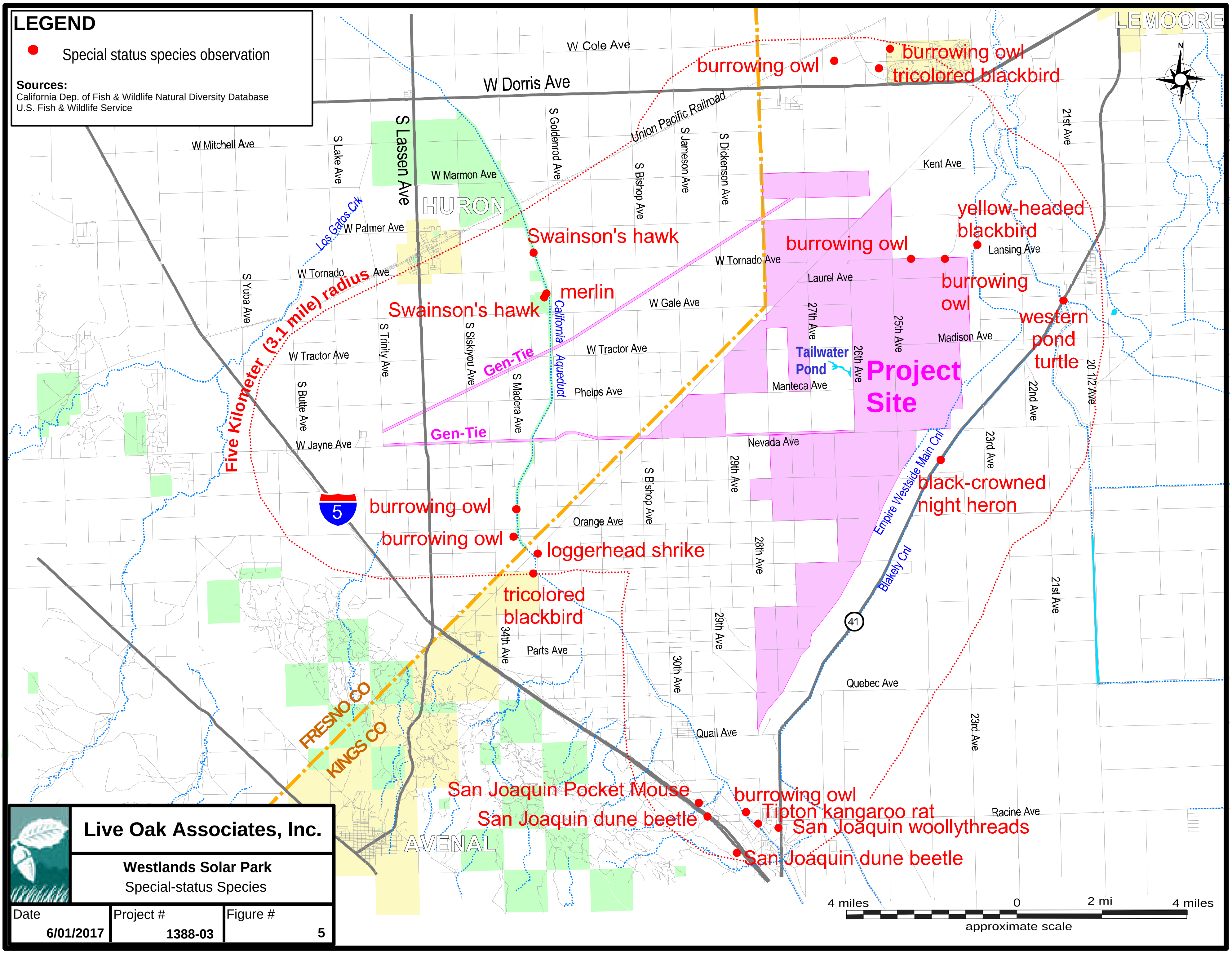
The WSP Plan Area and Gen-Tie Corridors consist mainly of agricultural fields or fallowed pasture fields with minor areas of ruderal/developed and canal habitat. A number of medium to large canals are located within the Plan Area, which in agricultural areas of the San Joaquin Valley can function as movement corridors for the regular home range or dispersal movements of native wildlife, including special status species. The San Luis Canal/California Aqueduct also likely functions as a movement corridor for local wildlife. The vast area comprising the Plan Area (approximately 33 sq. mi.) likely has value for the regional movements of some wildlife species, when placed in a regional context. However, it is noted that the USFWS' *Recovery Plan for Upland Species of the San Joaquin Valley* (Recovery Plan) does not show movement corridors within or near the WSP Plan Area or the Gen-Tie Corridors. The Recovery Plan shows the foothills to the west as a north-south movement corridor (USFWS 1998). The nearest significant riparian corridor that likely facilitates regional movement of wildlife is the Kings River to the northeast of the Plan Area. This riparian area is located just over 1.3 miles to the east of the Plan Area at its nearest point.

## 2.5 SPECIAL STATUS PLANTS AND ANIMALS

Several species of plants and animals within the state of California have low populations and/or limited distributions. Such species may be considered "rare" and are vulnerable to extirpation as the state's human population grows and the habitats these species occupy are converted to agricultural and urban uses. As described more fully in Section 3.2, state and federal laws have provided the California Department of Fish and Wildlife (CDFW) and the U.S. Fish and Wildlife Service (USFWS) with a mechanism for conserving and protecting the diversity of plant and animal species native to the state. A sizable number of native plants and animals have been formally designated as "threatened" or "endangered" under state and federal endangered species legislation. Others have been designated as candidates for such listing. Still others have been designated as "species of special concern" by the CDFW. The California Native Plant Society (CNPS) has developed its own set of lists of native plants considered rare, threatened, or endangered (CNPS 2010). Collectively, these plants and animals are referred to as "special status species."

A number of special status plants and animals occur in the vicinity of the WSP Plan Area (Figures 5 and 6). These species, and their potential to occur in the Plan Area, are listed in Table 2 in the following pages. Sources of information for this table included *California's Wildlife, Volumes I, II, and III* (Zeiner et. al 1988-1990), *California Natural Diversity Data Base* (CDFW 2016), *Endangered and Threatened Wildlife and Plants* (USFWS 2016), *Annual Report on the Status of California State Listed Threatened and Endangered Animals and Plants* (CDFW 2016), and *The California Native Plant Society's Inventory of Rare and Endangered Vascular Plants of California* (CNPS 2016). This information was used to evaluate the potential for special status plant and animal species to occur within the Plan Area and the Gen-Tie Corridors. It is important to note that the California Natural Diversity Data Base (CNDDB) is a volunteer database.

A search of published accounts for all of the relevant special status plant and animal species was conducted for the Westhaven and Kettleman City USGS 7.5-minute quadrangle within which the majority of the Plan Area is located, and for the 10 surrounding quadrangles (Calfax, Vanguard, Lemoore, Huron, Stratford, La Cima, and Stratford SE, Kettleman Plain, Los Viejos, and Dudley Ridge) using the California Natural Diversity Data Base Rarefind 2010.



LEGEND
Special status species observation
Sources:
California Dep. of Fish & Wildlife Natural Diversity Database
U.S. Fish & Wildlife Service
Live Oak Associates, Inc.
Westlands Solar Park
Special-status Species
Date
6/01/2017
Project #
1388-03
Figure #
5
LEMOORE
HURON
AVENAL
Project Site
Tailwater Pond
Five Kilometer (3.1 mile) radius
Gen-Tie
FRESNO CO
KINGS CO
California Aqueduct
Los Gatos Crk
Union Pacific Railroad
Empire Westside Main Cnl
Blakely Cnl
W Cole Ave
W Dorris Ave
W Mitchell Ave
W Marmon Ave
W Palmer Ave
W Tornado Ave
W Tractor Ave
W Jayne Ave
W Gale Ave
Phelps Ave
Orange Ave
Parts Ave
Quail Ave
Quebec Ave
Racine Ave
Nevada Ave
Manteca Ave
Madison Ave
Laurel Ave
Lansing Ave
Kent Ave
S Lassen Ave
S Lake Ave
S Yuba Ave
S Butte Ave
S Trinity Ave
S Siskiyou Ave
S Madera Ave
S Goldenrod Ave
S Bishop Ave
S Jameson Ave
S Dickenson Ave
21st Ave
20 1/2 Ave
22nd Ave
23rd Ave
25th Ave
26th Ave
27th Ave
28th Ave
29th Ave
30th Ave
34th Ave
5
41
burrowing owl
tricolored blackbird
yellow-headed blackbird
Swainson's hawk
merlin
western pond turtle
black-crowned night heron
loggerhead shrike
San Joaquin Pocket Mouse
San Joaquin dune beetle
Tipton kangaroo rat
San Joaquin woollythreads
4 miles
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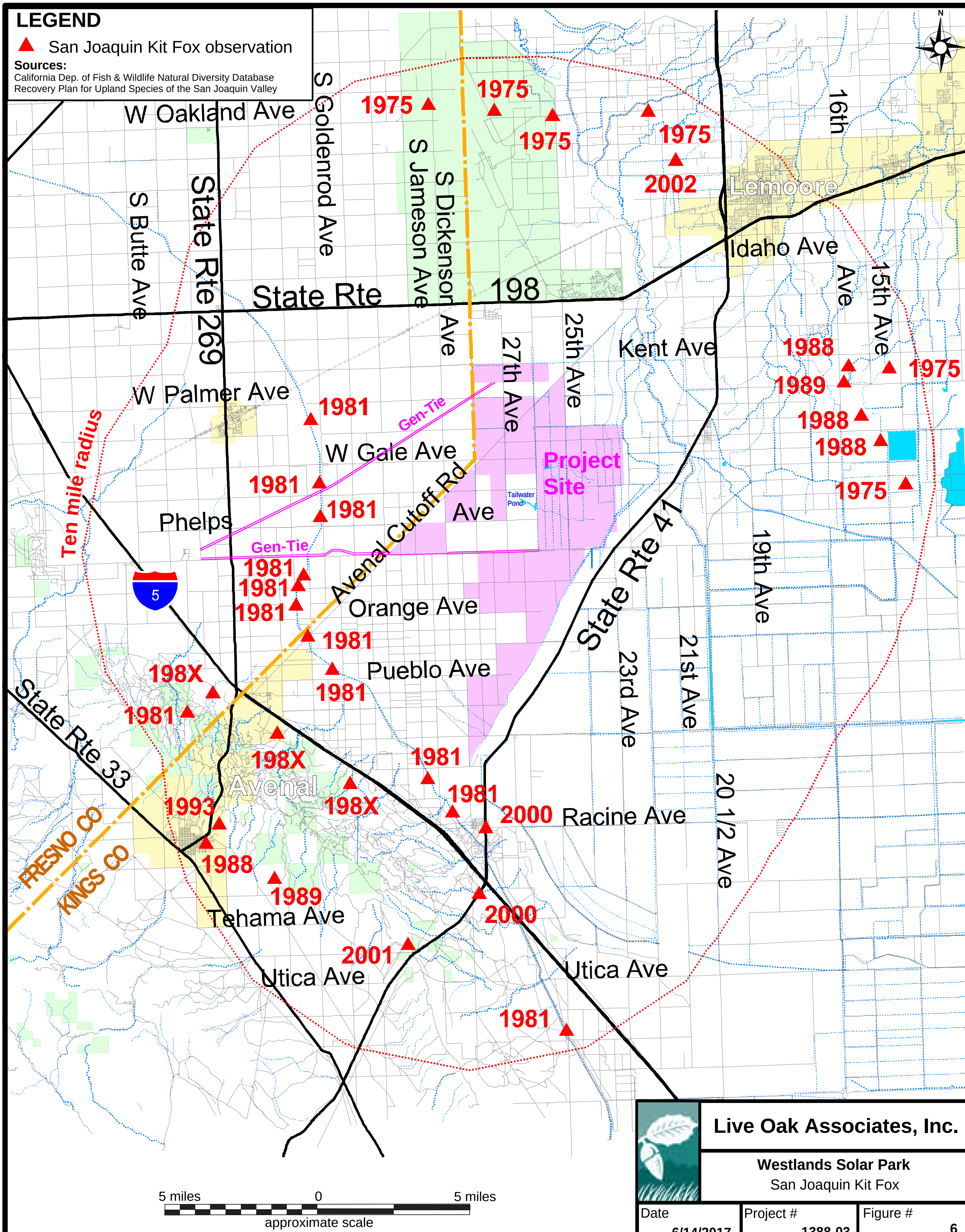

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Westlands Solar Park
San Joaquin Kit Fox

| Date | Project # | Figure # |
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**TABLE 2. LIST OF SPECIAL STATUS SPECIES THAT COULD OCCUR IN THE WSP AND GEN-TIE CORRIDORS VICINITY**

*PLANTS (adapted from CDFW 2016 and CNPS 2016)*
*Species Listed as Threatened or Endangered under the State and/or Federal Endangered Species Act*

| Species | Status | Habitat | *Occurrence in the Plan Area |
|---|---|---|---|
| California jewel-flower *(Caulanthus californicus)* | FE, CE, CNPS 1B | Chenopod scrub, pinyon and juniper woodland, and sandy valley and foothill grassland at elevations between 70 and 1000 meters. Blooms February-May. | **Absent.** Suitable habitat for this species is absent from the Plan Area. Any suitable habitat that may have once been present has been highly modified for human use. |
| San Joaquin woolly threads *(Monolopia congdonii)* | FT, CNPS 1B | Chenopod scrub and valley and foothill grassland at elevations between 60 and 800 meters. Blooms February-May. | **Absent.** Suitable habitat for this species is absent from the Plan Area. Any suitable habitat that may have once been present has been highly modified for human use. |

*Other Species under the CNPS*

| Species | Status | Habitat | *Occurrence in the Plan Area |
|---|---|---|---|
| Round leaved filaree *(California macrophylla)* | CNPS 1B | Grasslands and foothills at elevations between 200 and 2,000 feet. Blooms March-May. | **Absent.** Suitable habitat for this species is absent from the Plan Area. Any suitable habitat that may have once been present has been highly modified for human use. |
| Lemmon's jewel-flower (*Caulanthus lemmonii*) | CNPS 1B | Habitat: Occurs in pinion and juniper woodland and valley and foothill grasslands. Elevation: 80-1220 meters. Blooms: March-May. | **Absent.** Suitable habitat for this species is absent from the project site. Furthermore, this species is not known to occur within the interior of the San Joaquin Valley. The nearest documented occurrence is approximately 9.25 miles southwest of the project site, from a 1962 occurrence centered in the City of Avenal (CDFW 2017). |
| Recurved larkspur (*Delphinium recurvatum*) | CNPS 1B | Habitat: Occurs in chenopod scrub, cismontane woodland, and valley and foothill grasslands. Elevation: 3-750 meters. Blooms: March-June. | **Unlikely.** Suitable habitat for this species is absent from the project site. The nearest documented occurrence is approximately 12 miles northwest of the project site in undisturbed foothill grassland (CDFW 2017). Past farming activities in fallow fields of the site that currently support non-native grassland habitat would have eliminated any recurved larkspur that may have occurred there. Furthermore, many miles of cultivated agricultural fields lie between these fallow fields and all distant documented occurrences of this species or any suitable habitat, making colonization of this species onto onsite fallow fields highly unlikely. |

## TABLE 2. LIST OF SPECIAL STATUS SPECIES THAT COULD OCCUR IN THE WSP AND GEN-TIE CORRIDORS VICINITY

*PLANTS (adapted from CDFW 2016 and CNPS 2016)*
*Other Species under the CNPS*

| Species | Status | Habitat | *Occurrence in the Plan Area |
|---|---|---|---|
| Kern Mallow (*Eremalche parryi ssp. kernensis*) | CNPS 1B | Habitat: Occurs on dry, open sandy to clay soils, often at the edge of balds in chenopod scrub, pinion and juniper woodland, and valley and foothill grassland habitats. Elevation: 70-1290 meters. Blooms: January-May | **Unlikely.** Suitable habitat for this species is absent from the project site. Furthermore, the project site is just outside the northern edge of this species documented distribution. The nearest documented occurrence is approximately 7.5 miles southwest of the project site, from a 1973 occurrence in foothill grassland northeast of the City of Avenal (CDFW 2017). Past farming activities in fallow fields of the site that currently support non-native grassland habitat would have eliminated any Kern mallow that may have occurred there. Furthermore, many miles of cultivated agricultural fields lie between these fallow fields and all distant documented occurrences of this species or any suitable habitat, making colonization of this species onto onsite fallow fields highly unlikely. |

*ANIMALS (adapted from CDFW 2016 and USFWS 2016)*
*Species Listed as Threatened or Endangered under the State and/or Federal Endangered Species Act*

| Species | Status | Habitat | *Occurrence in the Plan Area |
|---|---|---|---|
| Vernal pool fairy shrimp *(Branchinecta lynchi)* | FT | Occurs in vernal pools of California. | **Absent.** Suitable habitat in the form of vernal pools is absent from the Plan Area. |
| Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus)* | FT | Lives in mature elderberry shrubs of California's Central Valley and Sierra Foothills. | **Absent.** Suitable habitat in the form of elderberry shrubs is absent from the Plan Area. |
| California tiger salamander *(Ambystoma californiense)* | FT, CT | Breeds in vernal pools and stock ponds of central California; adults aestivate in grassland habitats adjacent to the breeding sites. | **Absent.** No historic or current records of this species are known within the region. Intensively cultivated lands provide unsuitable habitat for this species. The nearest recorded observation is more than 22 miles to the northeast of the Plan Area (CNDDB 2016). |

## TABLE 2. LIST OF SPECIAL STATUS SPECIES THAT COULD OCCUR IN THE WSP AND GEN-TIE CORRIDORS VICINITY

*ANIMALS – cont'd.*

*Species Listed as Threatened or Endangered under the State and/or Federal Endangered Species Act*

| Species | Status | Habitat | *Occurrence in the Plan Area |
|---|---|---|---|
| Giant garter snake *(Thamnophis gigas)* | FT, CT | Habitat requirements consist of (1) adequate water during the snake's active season (early-spring through mid-fall) to provide food and cover; (2) emergent, herbaceous wetland vegetation, such as cattails and bulrushes, for escape cover and foraging habitat during the active season; (3) grassy banks and openings in waterside vegetation for basking; and (4) higher elevation uplands for cover and refuge from flood waters during the snake's dormant season in the winter. | **Unlikely.** Marginal breeding and overwintering habitat is available along major irrigation canals along the eastern edge of the Plan Area. However, the nearest recorded observation is more than 13 miles to the north and is a historic record from a published account in 1941 (CNDDB 2016). See expanded discussion following this table. |
| Blunt-nosed leopard lizard *(Gambelia silus)* | FE, CE, CP | Frequents grasslands, alkali meadows and chenopod scrub of the San Joaquin Valley from Merced south to Kern County. | **Unlikely.** Habitats required by this species have been highly disturbed or eliminated as a result of agricultural activities. The nearest recorded observation is more than 8 miles to the southwest (CNDDB 2016). |

**TABLE 2. LIST OF SPECIAL STATUS SPECIES THAT COULD OCCUR IN THE WSP AND GEN-TIE CORRIDORS VICINITY**

*ANIMALS – cont'd.*

*Species Listed as Threatened or Endangered under the State and/or Federal Endangered Species Act*

| Species | Status | Habitat | *Occurrence in the Plan Area |
|---|---|---|---|
| Swainson's hawk *(Buteo swainsoni)* | CT | Breeds in stands with few trees in juniper-sage flats, riparian areas, and in oak savannah. Requires adjacent suitable foraging areas such as grasslands or alfalfa fields supporting rodent populations. | **Present.** Foraging habitat is available throughout the project area in both fallow and agricultural fields. Breeding habitat is present in riparian trees along the off-site tailwater pond. A pair of Swainson's hawks was observed flying over the tailwater pond in 2010-2014 and a pair was observed landing in a tree at the tailwater pond during 2015 surveys. LOA's 2012 nest survey observed four active SWHA nests off-site. One of the four nests was incidentally observed during the 2017 nesting season and was found to be active. All four nests were re-visited after the 2017 nesting season; and was revisited during the September assessment; the nest known to be active in 2017 was found to be fully intact. The second nest appeared to be partially broken down and whether or not nesting occurred this year is inconclusive. The third nest was on top of a mistletoe clump in a cottonwood tree along Los Gatos Creek, and may have supported nesting during the 2017 season; 2017 nesting however could not be positively confirmed. The forth nest in a clump of tamarisk on the west side of Los Gatos Creek was absent. Whether or not an alternative nest site was active in 2017 in this area of the river is not known. In addition, Estep (2017) surveyed most of the project site and observed several nests along the Kings River northeast of the site. |
| California least tern (*Sterna antillarum browni*) | FE, CE, CP | Occurs in coastal central to southern California April to November. Found in and near coastal habitat including coasts, beaches, bays, estuaries, lagoons, lakes, and rivers. When found inland, they are near large bodies of water. | **Unlikely.** California least terns are most prevalent on the coast of central to southern California for breeding. Although records exist of them occurring inland, they are observed near large bodies of water. As the Study Area does not support large bodies of water, the California least tern would be unlikely to occur within the Study Area, although, they may fly over the Study Area from time to time during migration. |
| Western yellow-billed cuck (*Coccyzus americanus occidentalis*) | FC, CE | Breed in large blocks of riparian habitats, particularly cottonwoods and willows. | **Absent.** Dense riparian habitat required by this species is absent from the Plan Area. |

**TABLE 2. LIST OF SPECIAL STATUS SPECIES THAT COULD OCCUR IN THE WSP AND GEN-TIE CORRIDORS VICINITY**

*ANIMALS – cont'd.*

*Species Listed as Threatened or Endangered under the State and/or Federal Endangered Species Act*

| Species | Status | Habitat | *Occurrence in the Plan Area |
|---|---|---|---|
| Western snowy plover (*Charadrius alexandrines nivosus)* | FT, CSC | Uses human-made agricultural wastewater ponds and reservoir margins. Breeds on barren to sparsely vegetated ground at alkaline or saline lakes, reservoirs, ponds, and riverine sand bars. | **Possible.** Breeding and foraging habitat is available along agricultural canals and nearby ponds, including the tailwater pond adjacent to the Plan Area. The nearest recorded observation is approximately 3 miles to the east of the Plan Area (CNDDB 2016). |
| Nelson's antelope squirrel *(Ammospermophilus nelsoni)* | CT | Frequents open shrublands and annual grassland habitats. | **Absent.** Habitats required by this species are absent from the Plan Area and surrounding agricultural lands due to intensive agricultural use. |
| Giant kangaroo rat *(Dipodomys ingens)* | FE, CE | Inhabits grasslands on gentle slopes generally less than 10°, with friable, sandy-loam soils. | **Absent**. Habitats required by this species are absent from the Plan Area and surrounding agricultural lands due to intensive agricultural use. |
| Tipton kangaroo rat (*Dipodomys nitratoides nitratoides*) | FE, CE | Inhabits arid land with grassland or salt scrub on level or near-level terrain on the San Joaquin Valley floor with alluvial fan and floodplain soils. | **Absent.** The habitat of the Study Area has been disturbed for agricultural use for many years, therefore, Tipton's kangaroo rat would not be expected to recolonize the Study Area. The nearest recorded observation of the TKR is from 1951 and is approximately 2.5 miles south of the Study Area south of Kettleman City near the California Aqueduct (CNDDB 2017). |
| Fresno kangaroo rat *(Dipodomys nitratoides exilis)* | FE, CE | Inhabits grassland on gentle slopes generally less than 10°, with friable, sandy-loam soils. | **Absent.** Habitats required by this species are absent from the Plan Area and surrounding agricultural lands due to intensive agricultural use. |
| San Joaquin kit fox *(Vulpes macrotis mutica)* | FE, CT | Frequents desert alkali scrub and annual grasslands and may forage in adjacent agricultural habitats. Utilizes enlarged (4 to 10 inches in diameter) ground squirrel burrows as denning habitat. | **Unlikely.** Burrows observed within the Plan Area during the multi-year field surveys were of suitable size for the kit fox. However, nearly all these burrows were within the vicinity of California ground squirrels or actively used by ground squirrels. An extensive burrow survey was not conducted. The Plan Area has been highly modified for agricultural use and, as a result, provides only marginal foraging and breeding habitat for the kit fox. Fallow land provides more suitable foraging habitat than agricultural fields. There are no documented sightings of this species within the Plan Area, but there have been numerous documented sightings within a ten mile radius of the Plan Area (see Figure 5), between 1971 and 2002 (CNDDB 2016). Therefore, kit foxes are unlikely to breed within the Plan Area, but may occasionally forage within the Plan Area, and may use the Plan Area for dispersal movements. |

# TABLE 2. LIST OF SPECIAL STATUS SPECIES THAT COULD OCCUR IN THE WSP AND GEN-TIE CORRIDORS VICINITY

*ANIMALS (adapted from CDFW 2016 and USFWS 2016)*
*State Species of Special Concern*

| | | | |
|---|---|---|---|
| Western spadefoot *(Scaphiopus hammondii)* | CSC | Primarily occurs in grasslands, but also occurs in valley and foothill hardwood woodlands. Requires vernal pools or other temporary wetlands for breeding. | **Unlikely.** Vernal pools required for breeding are absent from the Plan Area. Terrestrial habitat required for aestivation is absent from cultivated fields and marginally available in fallow fields. |
| Western pond turtle *(Actinemys marmorata)* | CSC | Intermittent and permanent waterways including streams, marshes, rivers, ponds and lakes. | **Possible.** Habitat for this species is available in and along the larger agricultural canals. An unidentified turtle was observed in such a canal during the 2010 field survey of the Plan Area. The nearest documented occurrence is less than 2 miles to the east of the Plan Area (CNDDB 2016). |
| Silvery legless lizard *(Anniella pulchra pulchra)* | CSC | Occurs in sparsely vegetated areas of beach dunes, chaparral, pine-oak woodlands, desert scrub, sandy washes, and stream terraces with sycamores, cottonwoods, or oaks. | **Unlikely.** Habitat for this species is not available. |
| Coast horned lizard *(Phrynosoma blainvillii)* | CSC | Grasslands, scrublands, oak woodlands, etc. of central California. Common in sandy washes with scattered shrubs. | **Unlikely.** Habitats required by this species are absent because they have been heavily modified for human use. The nearest documented observation of this species is more than 27 miles to the northwest of the Plan Area (CNDDB 2016). |
| San Joaquin whipsnake *(Masticophis flagellum ruddocki)* | CSC | Open, dry habitats with little or no tree cover. Found in valley grasslands and saltbush scrub in the San Joaquin Valley. | **Possible.** Some habitat for this species occurs in fallowed lands along the eastern portion of the Plan Area. The nearest documented occurrence of this species is more than 3 miles south of the Plan Area. |
| American white pelican (nesting) *(Pelecanus erythrorhynchos)* | CSC | Nests on islands in large lakes or on ephemeral islands in shallower wetlands. | **Unlikely.** Nesting habitat is absent from this Plan Area. This species was observed flying over the Plan Area, however, the species is unlikely to stop and nest within the Plan Area. |
| White-faced ibis *(Plegadis chihi)* | CSC | Salt and freshwater marsh as well as grain and alfalfa fields. | **Possible.** Marginal foraging habitat required for this species is present in the form of alfalfa, grain, and fallow fields within the Plan Area. Breeding habitat is absent. In 2010, a dead white-faced ibis was observed on a road shoulder by LOA biologists Jeff Gurule and Geoff Cline 5.5 miles east of the Plan Area. |
| Northern harrier *(Circus cyaneus)* | CSC | Frequents meadows, grasslands, open rangelands, freshwater emergent wetlands; uncommon in wooded habitats. | **Present.** Harriers were observed foraging over agricultural fields within the Plan Area in both 2010 and 2011. |

# TABLE 2. LIST OF SPECIAL STATUS SPECIES THAT COULD OCCUR IN THE WSP AND GEN-TIE CORRIDORS VICINITY

*ANIMALS – cont'd.*
*State Species of Special Concern*

| Species | Status | Habitat | *Occurrence in the Plan Area |
|---|---|---|---|
| White-tailed kite *(Elanus leucurus)* | CP | Open grasslands and agricultural areas throughout central California. | **Possible.** Suitable breeding and foraging habitat occurs for this species within the Plan Area. |
| Mountain plover *(Charadrius montanus)* | CSC | Forages in short grasslands and freshly plowed fields of the Central Valley. | **Possible.** The Plan Area provides suitable winter foraging habitat for this species. |
| Burrowing owl *(Athene cunicularia)* | CSC | Frequents open, dry annual or perennial grasslands, deserts, and scrublands characterized by low growing vegetation. Dependent upon burrowing mammals, most notably the California ground squirrel, for nest burrows. | **Present.** Multiple burrowing owls were observed within the Plan Area along dry agricultural canals and dry banks of larger wet canals. Nesting habitat in the form of ground squirrel burrows exist onsite and were in use by owls during the multi-year surveys. |
| Black swift *(Cypseloides niger)* | CSC | Migrants found in many habitats of state; in Sierra nests are often associated with waterfalls. | **Absent.** The Plan Area does not provide suitable breeding or foraging habitat for this species. |
| Vaux's swift *(Chaetura vauxi)* | CSC | Migrants move through the foothills of the western Sierra in spring and late summer. Some individuals breed in the region. | **Absent.** The Plan Area does not provide suitable breeding or foraging habitat for this species. |
| Loggerhead shrike *(Lanius ludovicianus)* | CSC | Frequents open habitats with sparse shrubs and trees, other suitable perches, bare ground, and low herbaceous cover. Can often be found in cropland. | **Present.** This species was observed throughout the project area in agricultural fields and canals and fallow/pasture fields in both 2010 and 2011. |
| Tricolored blackbird *(Agelaius tricolor)* | CSC | Breeds near fresh water, primarily emergent wetlands, with tall thickets. Forages in grassland and cropland habitats. | **Possible.** Suitable foraging habitat occurs onsite for this species. Marginal breeding habitat occurs at the tailwater pond and large canals. The nearest recorded observation is more than 5 miles to the west of the Plan Area (CNDDB 2016). |

## TABLE 2. LIST OF SPECIAL STATUS SPECIES THAT COULD OCCUR IN THE WSP AND GEN-TIE CORRIDORS VICINITY

*ANIMALS – cont'd.*
*State Species of Special Concern*

| Species | Status | Habitat | *Occurrence in the Plan Area |
|---|---|---|---|
| Tulare grasshopper mouse *(Onychomys torridus)* | CSC | Arid shrubland communities in hot, arid grassland and scrub desert associations. These include blue oak woodlands at 450 m (1476 feet); upper Sonoran subshrub scrub community; alkali sink and mesquite associations on the valley floor; and grasslands associations on the sloping margins of the San Joaquin Valley and Carrizo Plain region. | **Absent.** Suitable shrubland habitat is not present within the Plan Area. |
| Townsend's Big-eared bat *(Corynorhinus townsendii)* | CSC | Primarily a cave-dwelling bat that may also roost in buildings. Occurs in a variety of habitats. | **Possible.** Suitable foraging habitat for this species is present within the Plan Area, roosting habitat is absent. |
| Pallid bat *(Antrozous pallidus)* | CSC | Roosts in rocky outcrops, cliffs, and crevices with access to open habitats for foraging. May also roost in caves, mines, hollow trees and buildings. | **Possible.** Suitable roosting and foraging habitat for this species is present within the Plan Area. |
| California mastiff bat *(Eumops perotis ssp.* californicus) | CSC | Frequents open, semi-arid to arid habitats, including conifer, and deciduous woodlands, coastal scrub, grasslands, palm oasis, chaparral and urban. Roosts in cliff faces, high buildings, trees and tunnels. | **Possible.** Suitable roosting and foraging habitat for this species is present within the Plan Area. The nearest recorded observation is less than 8 miles to the west of the Plan Area (CNDDB 2016). |
| American badger *(Taxidea taxus)* | CSC | Found in drier open stages of most shrub, forest and herbaceous habitats with friable soils. | **Possible.** No burrows of the size and shape suitable for this species were observed within the Plan Area. However, an exhaustive search was not conducted. It is possible this species may establish burrows within the Plan Area in fallow/pasture fields with sparse to moderately dense vegetation within the Plan Area. The nearest documented observation is 6 miles to the west of the Plan Area (CNDDB 2016). |
| Ringtail *(Bassariscus astutus)* | CP | Riparian and heavily wooded habitats near water. | **Unlikely.** Marginal habitat for this species is present in the riparian area around the off-site tailwater pond. |

**Explanation of Occurrence Designations and Status Codes*
Present: Species observed within the Plan Area at time of field surveys or during recent past.
Likely: Species not observed within the Plan Area, but it may reasonably be expected to occur there on a regular basis.
Possible: Species not observed within the Plan Area, but it could occur there from time to time.

Unlikely: Species not observed within the Plan Area, and would not be expected to occur there except, perhaps, as a transient.
Absent: Species not observed within the Plan Area, and precluded from occurring there because habitat requirements not met.

STATUS CODES

| | |
|---|---|
| FE | Federally Endangered |
| FT | Federally Threatened |
| FPE | Federally Endangered (Proposed) |
| FC | Federal Candidate |
| CE | California Endangered |
| CT | California Threatened |
| CR | California Rare |
| CP | California Fully Protected |
| CSC | California Species of Special Concern |

| | |
|---|---|
| CNPS | California Native Plant Society Listing |
| 1A | Plants Presumed Extinct in California |
| 1B | Plants Rare, Threatened, or Endangered in California and elsewhere |
| 2 | Plants Rare, Threatened, or Endangered in California, but more common elsewhere |
| 3 | Plants about which we need more information – a review list |
| 4 | Plants of limited distribution – a watch list |

## 2.6 ENDANGERED, THREATENED, OR SPECIAL STATUS ANIMAL SPECIES MERITING FURTHER DISCUSSION

### 2.6.1 Western Pond Turtle (*Actinemys marmorata*).

**Federal Listing Status: None; State Listing Status: Species of Special Concern.**

*Life history and ecology*. The western pond turtle is the only native freshwater turtle in California and normally associates with permanent or nearly permanent aquatic habitats, including streams, lakes, and ponds. Historically, this species occurred in Pacific Coast drainages from Washington to Mexico. This species occurs in aquatic habitats with 1) basking sites such as rocks and logs, 2) dense stands of submergent or emergent vegetation, 3) abundant aquatic invertebrate resources, 4) suitable nearby nesting sites, and 5) the lack of native and exotic predators (Bury 1972; Jennings and Hayes 1994). This species can move along streams up to 3.1 miles (5 kilometers) in a short period of time, and they can tolerate at least 7 days without water (Jennings and Hayes 1994).

*Potential to occur within the Plan Area and Gen-Tie Corridors*. One unidentified turtle was observed during LOA's field survey on the eastern edge of the Plan Area in a large canal adjacent to Laurel Avenue. A previous sighting of a western pond turtle occurred just to the east of this location at the junction of Highway 41 and the Kings River in 1996 (CNDDB 2010). Therefore, there is a potential that the western pond turtle may occur in portions of the Plan Area and Gen-Tie Corridors containing perennial or near perennial waters.

### 2.6.2 Blunt-Nosed Leopard Lizard (*Gambelia silus*).

**Federal Listing Status: Endangered; State Listing Status: Endangered; California Protected.**

In addition to being state and federally-endangered, the blunt-nosed leopard lizard (BNLL) is one of fewer than forty species that has a "fully protected" status through provisions of the California State Fish & Game Code. The CDFW cannot issue a "take" permit for fully protected species, and projects with fully protected species are required to completely avoid direct "take" of the species. In this instance, "take" refers to direct harm, injury, or killing of an individual, not to habitat modifications.

*Life history and ecology*. The blunt-nosed leopard lizard is a large, long-lived lizard whose short, blunt snout and pale crossbars on its back and tail give it its common name. It inhabits sparsely vegetated plains, alkali flats, low foothills, grasslands, canyon floors, large river washes, and arroyos. These opportunistic foragers feed primarily on insects—particularly grasshoppers, crickets and moths—other lizards, and occasionally plant material (CDFW 2004).

The species was originally found throughout the San Joaquin Valley and adjacent foothills, from San Joaquin County southward and into eastern San Luis Obispo County. Its distribution has been reduced by conversion of habitat to cropland. The blunt-nosed leopard lizard now occurs in scattered locations in the valley and in the eastern portions of the Coast Ranges, including the Antelope and Carrizo Plains and Cuyama Valley.

*Potential to occur within the Plan Area and Gen-Tie Corridors*. The BNLL is known to occur west of Interstate 5, several miles from the southern end of the Plan Area and Gen-Tie Corridors. A few sightings of this species have been documented in the Kettleman Hills, just west of Kettleman City, the nearest being made in 1994 more than eight miles southwest of the Plan Area and Gen-Tie Corridors. Given the decades of ground disturbance the Plan Area and Gen-Tie Corridors have experienced from agricultural use the Plan Area provides no habitat in cultivated fields and extremely marginal habitat in fallowed areas of the Plan Area. Therefore, it would be extremely unlikely that BNLL would occur within the Plan Area or the Gen-Tie Corridors.

### 2.6.3 Giant Garter Snake (*Thamnophis gigas*).

**Federal Listing Status: Threatened; State Listing Status: Threatened.**

By the time it was listed as federally threatened on October 20, 1993, the giant garter snake population had suffered severe declines as a result of habitat loss due to urbanization and agricultural activities. A draft recovery plan was submitted for the giant garter snake in 1999, but a final recovery plan has not been adopted to date.

*Life history and ecology*. The giant garter snake is one of the largest garter snakes, reaching a total length of at least 63 inches. Females typically weigh 1 to 1.5 pounds and tend to be slightly longer and proportionately heavier than males. Dorsal background coloration varies from brownish to olive with a checkered pattern of black spots, separated by a yellow dorsal stripe and two light colored lateral stripes. Background coloration and prominence of a black checkered pattern and the three light stripes are geographically and individually variable. The ventral surface (the snake's underside) is cream to olive or brown and sometimes infused with orange, especially in northern populations. Giant garter snakes feed primarily on small fishes, tadpoles, and frogs (USFWS 2007).

The giant garter snake inhabits small mammal burrows and other soil crevices above prevailing flood elevations throughout its winter dormancy period. Giant garter snakes typically select burrows with sunny exposure along south- and west-facing slopes. Their breeding season extends through March and April, and females give birth to live young from late July through early September. Brood size is variable, ranging from 10 to 46 young, who immediately scatter into dense cover and absorb their yolk sacs, after which they begin feeding on their own. Sexual maturity averages three years for males and five years for females (USFWS 2007).

Although giant garter snakes generally remain in close proximity to aquatic and wetland habitats, they have been observed foraging or dispersing through upland habitats up to 800 feet from marshes and pools. The giant garter snake is generally inactive during the winter and seeks cover in rodent burrows that may be as much as 800 feet from marshes and ponds.

*Potential to occur within the Plan Area and Gen-Tie Corridors*. As has been previously noted, the Plan Area and Gen-Tie Corridors have been highly disturbed by agricultural activities. While some of the larger irrigation canals provide potentially suitable habitat for this species, all the nearest known populations of giant garter snakes are associated with the San Joaquin River drainage in areas near Mendota approximately 40 miles northwest of the Plan Area. The nearest documented occurrence is more than 13 miles to the north in the Kings River drainage and is an historic record from a published account in 1941 (CNDDB 2010). Therefore, based on the highly disturbed nature of the Plan Area and the Gen-Tie Corridors and the lack of recent documentation of this species in the immediate region, the giant garter snake is unlikely to occur within the Plan Area or the Gen-Tie Corridors.

### 2.6.4 Swainson's Hawk (*Buteo swainsoni*).

**Federal Listing Status: None; State Listing Status: Threatened.**

The Swainson's hawk is designated as a California Threatened species. The loss of agricultural lands (i.e., foraging habitat) to urban development and additional threats such as riverbank protection projects have contributed to its decline.

*Life history and ecology*. Swainson's hawks are large, broad-winged, broad-tailed hawks. Male and female Swainson's hawks have similar body types, with a length generally between 17 and 22 inches and a wingspan between 47 and 57 inches. They weigh up to 2.5 pounds.

Swainson's hawks migrate to Mexico or Argentina for the non-nesting season and return to nesting habitat (such as the Central Valley of California in March or April, with a high degree of mate and territorial fidelity. Their nests, measuring three to four feet in diameter, can take up to two weeks to complete. The nest is likely to be a stick nest constructed in a tree. In the Central Valley, Swainson's hawks typically nest in large trees in or peripherally to riparian systems adjacent to suitable foraging habitats. The female will lay and incubate two to four eggs for approximately 28 to 35 days. The male helps with incubation when the female leaves the nest to feed. The young hatch sometime between March and July and do not leave the nest until some 4 to 6 weeks later. Other suitable nest sites include lone trees, groves of trees such as oaks, other trees in agricultural fields, and mature roadside trees. Swainson's hawks forage in large, open fields with abundant prey, including grasslands or lightly grazed pastures, alfalfa and other hay crops, and certain grain and row croplands.

As Swainson's hawks arrive to their nesting territories to begin their nesting season in March or April, many other raptors already have active nests in place. Therefore, for Swainson's hawks nesting in the Central Valley, limiting factors include adequate nest sites and good forage abundance. This means that there must be enough nest trees in the area for the late-arriving Swainson's hawk to restore or build a new nest in an adequate nest tree and have suitable foraging habitat within a 10-mile radius of that nest tree.

*Potential to occur within the Plan Area and Gen-Tie Corridors*. Swainson's hawks are known to forage in areas surrounding the entire Plan Area and Gen-Tie Corridors. The trees surrounding the off-site tailwater pond adjacent to the Plan Area as well as other groupings of trees and trees along the nearby Kings River, provide suitable nesting and perching habitat, and the fallow and agricultural lands within the Plan Area provide suitable foraging habitat.

On June 21, 2010 LOA biologists Jeff Gurule and Geoff Cline observed a pair of Swainson's hawks soaring above and around the tailwater pond. The two hawks vocalized an alarm call when first encountered flying low over the pond and then soared high into the air. The hawks were encountered again within 30 minutes flying low over the off-site tailwater pond. Although approximately 30 minutes was spent in a thorough search for a nest, no Swainson's hawk nest was observed in the trees associated with the tailwater pond. An active barn owl nest was found however. Although the behavior of the Swainson's hawks observed indicated the possibility that a nest may occur in the trees associated with the tailwater pond.

In 2011, surveys for Swainson's hawks were made on March 21 and April 5 by LOA ecologists Katrina Krakow and Nathan Hale, April 12 and 13 by Katrina Krakow, April 19 and 20 by Katrina Krakow and biologist Robert Shields, and May 3, and 17 by Katrina Krakow. The majority of surveys focused on the tailwater pond area where the majority of the onsite trees within Phase I exist. Shorter surveys were made near the King's River along Jackson Road where Swainson's hawks have been observed in previous years. A pair of Swainson's hawks was observed off of Jackson Road near the Kings River on 21 March, and 5, 12, and 13 April 2011. Only one individual was observed at a time (both individuals were observed separately) starting on April 19th, which may indicate the beginning of nesting, although no nest was located. On 3 May 2011, a Swainson's hawk was observed over the housing of the Lemoore Air Base along Highway 198. A pair of Swainson's hawks were observed over the tailwater pond beginning on 19 April 2011 by LOA ecologist Katrina Krakow and biologist Robert Shields, and only one individual was observed at a time (both individuals were observed separately) starting on 3 May by LOA ecologist Katrina Krakow, which may indicate the beginning of nesting for this pair. These individuals were observed interacting with a pair of red-tailed hawks, by 3 May, the red-tailed hawks were also observed only singularly near the pond. Two great horned owl nests were observed in trees along the south side of the pond, on 19 April, one owlet was observed in one nest and two owlets were observed in the other nest. Presently, Swainson's hawks do not appear to be nesting within the Westlands Solar Park plan area or the Gen-Tie Corridors. However, as at least two pair of Swainson's hawks were observed either over or in the vicinity of the Plan Area, both observed pairs of this species most likely forages onsite.

Further multi-year surveys of the tailwater pond area were conducted by LOA biologists during subsequent breeding seasons 2012-2015. Although Swainson's hawks were reliably observed flying over the tailwater pond in each of these years, these surveys likewise failed to detect the presence of a Swainson's hawk nest within the trees at the tailwater pond. The April 15, 2015 survey was the only survey that LOA biologists observed Swainson's hawks land in a tree at the tailwater pond. All other observations were of Swainson's hawks flying overhead.

In the spring of 2012, LOA conducted a Swainson's hawk nest survey of the Plan Area as well as accessible lands within a buffer of 10 miles from the Plan Area. These surveys took place on April 27 by Ms. Krakow and Ms. Jensen; May 3 by Ms. Krakow; and May 4 by Ms. Krakow and Mr. Cline. Accessible lands within the 10-mile radius were surveyed completely except for those lands previously surveyed by ESTEP Ecological Consulting (2011 and 2012). Four active Swainson's nests were observed, all occurring off-site (Figure 7). Active nests were revisited on May 24 by Ms. Krakow and Mr. Cline. Two nests were located to the northwest of the site in trees bordering a drainage (Los Gatos Creek) located northwest of the Town of Huron, one nest was located to the southeast of the site just east of Kettleman City in a stand of eucalyptus trees, and one nest was located in a cottonwood tree located south of the southern limit of the WSP Plan Area just off-site on the eastern side of the canal adjacent to the site near Quail Avenue. During the 2013-2015 spring surveys, this nest was observed to be in active use by a pair of breeding Swainson's hawks. This pair likely uses the WSP Plan Area for foraging. As shown in Figure 7, there are no known Swainson's hawk nests within or in the immediate vicinity of the gen-tie corridors.

Therefore, Swainson's hawks are present within the Plan Area and Gen-Tie Corridors vicinity and likely forage onsite throughout the months of March through September, and may possibly nest in off-site trees at the tailwater pond and just outside the southern limit of the Plan Area in some years. Section 4 includes a cumulative impact analysis for potential impacts to Swainson's hawk foraging habitat.

Estimates of an annual nesting population for the Study Area were based on 2017 nesting surveys conducted by Estep for within 10 miles of the Mustang 2 project site which included the majority of the Study Area and supplemented active nests identified by LOA in 2012, the last year full nesting surveys were conducted in the "gap" (i.e., areas within the Study Area not surveyed by in 2017 by Estep) area (Estep 2017). While it is not possible to rely on Estep's detection of active nests from his 2017 surveys for the entire Study Area, LOA ecologist Katrina Krakow, in an attempt to confirm the validity of the 2012 survey results for the small area not covered by Estep's 2017 surveys, visited the location of the four active 2012 Swainson's hawk nests within the "gap" area September 2017 to evaluate their likely relevance for inclusion as "active nests" for the 2017 analysis. One of the four nests from 2012 was observed incidentally by Ms. Krakow during the 2017 nesting season to be active, and was revisited during the September assessment; this nest was found to be fully intact. The second nest appeared to be partially broken down and whether or not nesting occurred this year is inconclusive. The third nest was on top of a mistletoe clump in a cottonwood tree along Los Gatos Creek, and may have supported nesting during the 2017 season; 2017 nesting however could not be positively confirmed. The forth nest in a clump of tamarisk on the west side of Los Gatos Creek was absent. Whether or not an alternative nest site was active in 2017 in this area of the river is not known.

### 2.6.5 Burrowing Owl (*Athene cunicularia*).

**Federal Listing Status: None; State Listing Status: Species of Special Concern.**

The burrowing owl is designated as a California Species of Special Concern. This designation was based on the species' declining population within the state over the past 40 years. The population decline is mainly due to habitat destruction resulting from development and agricultural practices.

*Life history and ecology*. The burrowing owl is a small, long-legged bird that averages a height of 9.5 inches, has an average wingspan of 23 inches, and weighs an average of 5.25 ounces. Burrowing owls are unique in that they are the only owl that regularly lives and breeds in underground nests. In California, these birds typically occur in the Central and Imperial Valleys, primarily utilizing ground squirrel burrows (or the burrows of other animals, e.g., badgers, prairie dogs and kangaroo rats) found in grasslands, open shrub lands, deserts, and, to a lesser extent, grazed and agricultural lands. Burrowing owls in this region are typically found at elevations below 250 ft. and exhibit strong site fidelity. Pairs have been known to return to the same area year after year, and some pairs are known to utilize the same burrow as the previous year. Burrowing owls are colonially nesting raptors, and colony size is indicative of habitat quality. It is not uncommon to find burrowing owls in developed and cultivated areas where California ground squirrels are active.

Burrowing owls feed on various small mammals including deer mice, voles, and rats. They also prey on various invertebrates including crickets, beetles, grasshoppers, spiders, centipedes, scorpions and crayfish. Peak hunting periods occur around dusk and dawn.

*Potential to occur within the Plan Area and Gen-Tie Corridors.* As noted in Table 2, burrowing owls were observed utilizing existing burrows along canals in the eastern and southern portions of the Plan Area. The Plan Area provides suitable habitat for this species in the form of California ground squirrel burrows present in fallow fields and canal banks. Field surveys did not consist of 100% coverage surveys and were conducted mainly as driving surveys on public roads, farm roads, and canal levees with short walking surveys when animals of plants of particular biological note were observed. Many of these owls were paired and presumably nesting with a minimum of 8 pair in 2011, a minimum of 12 pair in 2012, and a minimum of 8 pair in 2014 (Figure 9). Suitable nesting habitat for burrowing owls was present in the fallow fields and along the canal banks in the form of California ground squirrel burrows. As 100% coverage surveys were not conducted, the precise extent of burrowing owls within the Plan Area is unknown, however, LOA has identified approximately 59% of the Plan Area to be year-round suitable habitat (11,056 acres; which includes year-round forage and burrow habitat + year-round burrow habitat) and an additional approximately 38% to be seasonably suitable habitat (7,833 acres) (see Section 3.3.7 for details). Within the Gen-Tie Corridors vicinity, burrowing owls have been observed along and near the California Aqueduct within 3 miles of the southern Gen-Tie Corridor. Thus, suitable nesting habitat likely occurs in the vicinity of the Gen-Tie Corridors.

### 2.6.6 San Joaquin Kit Fox (*Vulpes macrotus mutica*).

**Federal Listing Status: Endangered; State Listing Status: Threatened.**

By the time the U.S. Fish and Wildlife Service listed it as an endangered species under the authority of the Federal Endangered Species Act on 11 March 1967, the San Joaquin kit fox had been extirpated from much of its historic range. In 1998, the USFWS adopted a final recovery plan for the San Joaquin kit fox. On 27 June 1971, the State of California listed the kit fox as a threatened species.

*Life history and ecology.* The San Joaquin kit fox, the smallest North American member of the dog family (Canidae), historically occupied the dry plains of the San Joaquin Valley, from San Joaquin County to southern Kern County (Grinnell et al. 1937). Critical habitat has yet to be established for the San Joaquin kit fox. Local surveys, research projects, and incidental sightings indicate that kit foxes currently occupy available habitat on the San Joaquin Valley floor and in the surrounding foothills.

Kit foxes prefer habitats of open or low vegetation with loose soils. In the northern portion of their range, they occupy grazed grasslands and, to a lesser extent, valley oak woodlands. In the southern and central portion of the Central Valley, kit foxes are found in valley sink scrub, valley saltbrush scrub, upper Sonoran subshrub scrub, and annual grassland (USFWS 1998). Kit foxes may also be found in grazed grasslands, urban settings, and in areas adjacent to tilled or fallow fields (USFWS 1998).

Kit fox diets vary geographically, seasonally, and annually. In the central portion of their range, which includes lands around the Plan Area, known prey includes white-footed mice, insects, California ground squirrels, black-tailed hares, San Joaquin antelope squirrels, kangaroo rats, desert cottontails, and ground-nesting birds (Archon 1992; Jensen 1972).

The kit fox requires underground dens to raise pups, regulate body temperature, and avoid predators and other adverse environmental conditions (Golightly and Ohmart 1984). In the central portion of their range, they usually occupy burrows excavated by small mammals, such as ground squirrels. Denning habitat consists of ground squirrel complexes in which some burrows have been enlarged to 4 to 6 inches in diameter for the length of a human arm (approximately 2 ft.).

*Potential to occur within the Plan Area and Gen-Tie Corridors.* Lands surrounding the Plan Area and the Gen-Tie Corridors consist of cultivated and fallow agricultural fields and the State Route 41 corridor as well as undeveloped rangeland further out to the south and southwest in the Kettleman Hills. The lands within Plan Area and Gen-Tie Corridors have been heavily managed for agricultural uses for decades. Agricultural lands are not generally suitable for the San Joaquin kit fox.

A few burrows were observed that were of suitable dimensions for kit fox, most of these burrows were or appeared to be occupied by California ground squirrels or burrowing owls; however, protocol-level surveys consisting of 100% visual coverage were not conducted for the Plan Area or the Gen-Tie Corridors. Having been modified for agricultural use, the Plan Area and Gen-Tie Corridors provide a limited prey base especially in the cultivated fields and, therefore, constitutes poor foraging habitats for kit fox.

Of primary interest for this assessment are kit fox records from the vicinity of the Plan Area and Gen-Tie Corridors. According to the CNDDB there have been a total of thirty-two historical sightings within ten miles of the Plan Area, none of which occurred within the Plan Area itself (Figure 6) (CDFW 2016). These sightings occurred to the east, west, south, and north of the Plan Area. Many of these sightings are largely historic sightings with 88% from 1975-1993, with the most recent record in 2002. Multiple large irrigation canals run through the Plan Area which may act as movement corridors; however, should a kit fox utilize these corridors, the fox would have to travel through miles of marginal to poor habitat before reaching the Plan Area, which itself holds little habitat value. In the vicinity of the Gen-Tie Corridors, there were 6 sightings of kit fox along the California Aqueduct in 1981. This indicates that kit fox may utilize the Aqueduct as a movement corridor.

In summary, the Plan Area and Gen-Tie Corridors offer marginal habitat primarily in fallowed fields; the surrounding lands provide similar habitat; and thirty-two historical kit fox sightings occur within ten miles of the Plan Area and Gen-Tie Corridors, but not within the Plan Area or Gen-Tie Corridors themselves. Considering the highly disturbed condition of the Plan Area and Gen-Tie Corridors, their isolation from extant kit fox populations, and their marginal to poor suitability as foraging or denning habitat, it is unlikely any kit fox have taken up residence within the Plan Area and Gen-Tie Corridors. The Plan Area and Gen-Tie Corridors may, however, be used by occasional dispersing kit foxes. The WSP solar development will utilize wildlife friendly fencing that will allow for kit fox movement through the Plan Area. All permanent irrigation canals will be avoided by the Plan Area and are planned to continue operations as they currently do. Therefore, any kit foxes currently using the Plan Area for movement are expected to continue to use the Plan Area after buildout. The Gen-Tie Corridors vicinity similarly provide poor kit fox habitat, and the gen-tie lines would not impede movement of kit fox across and through the gen-tie corridors.

## 2.7 JURISDICTIONAL WATERS

Jurisdictional waters include rivers, creeks, and drainages that have a defined bed and bank and which, at the very least, carry ephemeral flows. Jurisdictional waters also include lakes, ponds, reservoirs, and wetlands. Such waters may be subject to the regulatory authority of the U.S. Army Corps of Engineers (USACE), the California Department of Fish and Wildlife (CDFW), and the California Regional Water Quality Control Board (RWQCB). See Section 3.2.4 of this report for additional discussion of these agencies' roles and responsibilities. Formal wetland delineations of the Plan Area or the Gen-Tie Corridors have not been conducted, but the jurisdictional status of onsite waters has been surmised by LOA based on the aforementioned surveys and investigation of aerial photography and maps of the Plan Area and Gen-Tie Corridors.

The nearest known Water of the U.S. is the Kings River which runs to the north and east of the Plan Area, and is 1.5 miles from the nearest eastern boundary of the Plan Area. A number of irrigation canals run through the Plan Area; however, these canals do not receive water from the Kings River, which is at a lower elevation than the Plan Area. Artificial waterways such as canals are typically not claimed by the agencies unless they receive water from a Known Water of the U.S., and then return water to a Known Water of the U.S. Thus, even if the onsite canals received water from a Known Water of the U.S., the Kings River, those waters do not return to the Kings River. Therefore, it is unlikely that the onsite canals would fall under the jurisdiction of the USACE. Furthermore, the adjacent tailwater pond would also likely fall outside the jurisdiction of the USACE due to its isolation from a Known Water of the U.S. under federal law. However, only the USACE can make a jurisdictional determination of onsite waters. Furthermore, onsite waters, while likely not regulated by the USACE may be claimed as jurisdictional by the RWQCB or CDFW under the broader definition of Waters of the State under the Porter-Cologne Water Quality Act, which encompasses any surface or groundwater within the boundaries of the state. Thus, although the canals and the off-site tailwater pond may not fall under federal jurisdiction, the RWQCB may assert jurisdiction over those portions of the canals that function as wetlands. The CDFW typically only asserts jurisdiction over ponds, lakes, and natural drainages or manmade features that replace natural drainages and, therefore, is unlikely to regulate alterations to the manmade canals mentioned above.

In the vicinity of the Gen-Tie Corridors, the nearest known Water of the U.S., besides the California Aqueduct, is Los Gatos Creek which runs to the north and west of the Gen-Tie Corridors, and is 4 miles from the Gen-Tie Corridors at its nearest approach. Since there is no hydrologic connection between the Gen-Tie Corridors and Los Gatos Creek, and the gen-tie projects will avoid the California Aqueduct, it is unlikely that any portion of the Gen-Tie Corridors would fall under the jurisdiction of the USACE.

To summarize, any alteration of the canals within the Plan Area or the Gen-Tie Corridors is unlikely to be regulated by the USACE; however, the RWQCB and CDFW may assert jurisdiction over some of these features. Jurisdiction would need to be evaluated on a case-by-case basis. It is important to note that these three agencies are the final arbiters and would need to be consulted regarding their jurisdiction over some or all of these features.

# 3 IMPACTS AND MITIGATIONS

## 3.1 SIGNIFICANCE CRITERIA

Approval of general plans, area plans, and specific projects is subject to the provisions of the California Environmental Quality Act (CEQA). The purpose of CEQA is to assess the impacts of proposed projects on the environment before they are carried out. CEQA is concerned with the significance of a proposed project's impacts. For example, a proposed development project may require the removal of some or all of a site's existing vegetation. Animals associated with this vegetation could be destroyed or displaced. Animals adapted to humans, roads, buildings, pets, etc., may replace those species formerly occurring on the site. Plants and animals that are state and/or federally listed as threatened or endangered may be destroyed or displaced. Sensitive habitats such as wetlands and riparian woodlands may be altered or destroyed.

Whenever possible, public agencies are required to avoid or minimize environmental impacts by implementing practical alternatives or mitigation measures. According to Section 15382 of the CEQA Guidelines, a significant effect on the environment means a "substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project, including land, air, water, minerals, flora, fauna, ambient noise, and objects of historic or aesthetic interest."

Specific project impacts to biological resources may be considered "significant" if they would:

- Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service;

  - Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service;

- Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means;
- Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites;
- Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance; or

- Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan.

Furthermore, CEQA Guidelines Section 15065(a) states that a project may trigger the requirement to make a “mandatory findings of significance” if the project has the potential to:

“Substantially degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of an endangered, rare or threatened species, or eliminate important examples of the major periods of California history or prehistory.”

## 3.2 RELEVANT GOALS, POLICIES, AND LAWS

### 3.2.1 Threatened and Endangered Species

State and federal “endangered species” legislation has provided the California Department of Fish and Wildlife (CDFW) and the U.S. Fish and Wildlife Service (USFWS) with a mechanism for conserving and protecting plant and animal species of limited distribution and/or low or declining populations. Species listed as threatened or endangered under provisions of the state and federal endangered species acts, candidate species for such listing, state species of special concern, and some plants listed as endangered by the California Native Plant Society are collectively referred to as “species of special status.” Permits may be required from both the CDFW and USFWS if activities associated with a proposed project will result in the “take” of a listed species. “Take” is defined by the state of California as "to hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture or kill" (California Fish and Game Code, Section 86). "Take" is more broadly defined by the federal Endangered Species Act to include "harm" (16 USC, Section 1532(19), 50 CFR, Section 17.3). Furthermore, as "responsible agencies" under CEQA, the CDFG and the USFWS both review CEQA documents involving projects which may have an impact on state- and/or federally-protected species in order to determine the adequacy of their treatment of protected species issues and to make project-specific recommendations for their conservation.

### 3.2.2 Migratory Birds

State and federal laws also protect most birds. The Federal Migratory Bird Treaty Act (16 U.S.C., sec. 703, Supp. I, 1989) prohibits killing, possessing, or trading in migratory birds, except in accordance with regulations prescribed by the Secretary of the Interior. This act encompasses whole birds, parts of birds, and bird nests and eggs.

### 3.2.3 Birds of Prey

Birds of prey are also protected in California under provisions of the State Fish and Game Code, Section 3503.5, which states that it is "unlawful to take, possess, or destroy any birds in the order *Falconiformes* or *Strigiformes* (birds of prey) or to take, possess, or destroy the nest or eggs of any such bird except as otherwise provided by this code or any regulation adopted pursuant thereto." Construction disturbance during the breeding season could result in the incidental loss of fertile eggs or nestlings, or otherwise lead to nest abandonment. Disturbance that causes nest abandonment and/or loss of reproductive effort is considered "taking" by the CDFW.

### 3.2.4 Wetlands and Other Jurisdictional Waters

Natural drainage channels and adjacent wetlands may be considered "Waters of the United States" (hereafter referred to as "jurisdictional waters") subject to the jurisdiction of the U.S. Army Corps of Engineers (USACE). The extent of jurisdiction has been defined in the Code of Federal Regulations but has also been subject to interpretation of the federal courts. Jurisdictional waters generally include:

- All waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;
- All interstate waters including interstate wetlands;
- All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation or destruction of which could affect interstate or foreign commerce;
- All impoundments of waters otherwise defined as waters of the United States under the definition;
- Tributaries of waters identified in paragraphs (a)(1)-(4) (i.e., the bulleted items above).

As determined by the United States Supreme Court in *Solid Waste Agency of Northern Cook County v. U.S. Army Corps of Engineers* (the SWANCC decision), channels and wetlands isolated from other jurisdictional waters cannot be considered jurisdictional on the basis of their use, hypothetical or observed, by migratory birds. However, the U.S Supreme Court decisions Rapanos v. United States and Carabell v. U.S. Army Corps of Engineers (referred together as the Rapanos decision) impose a "significant nexus" test for federal jurisdiction over wetlands. In June 2007, the USACE and U.S. Environmental Protection Agency (USEPA) established guidelines for applying the significant nexus standard. This standard includes: 1) a case-by-case analysis of the flow characteristics and functions of the tributary or wetland to determine if they significantly affect the chemical, physical, and biological integrity of downstream navigable waters; and 2) consideration of hydrologic and ecologic factors (USEPA and USACE 2007).

The USACE regulates the filling or grading of such waters under the authority of Section 404 of the Clean Water Act. The extent of jurisdiction within drainage channels is defined by “ordinary high water marks” on opposing channel banks. Wetlands are habitats with soils that are intermittently or permanently saturated, or inundated. The resulting anaerobic conditions select for plant species known as hydrophytes that show a high degree of fidelity to such soils. Wetlands are identified by the presence of hydrophytic vegetation, hydric soils (soils saturated intermittently or permanently saturated by water), and wetland hydrology according to methodologies outlined in the 1987 Corps of Engineers Wetlands Delineation Manual (USACE 1987).

All activities that involve the discharge of fill into jurisdictional waters are subject to the permit requirements of the USACE (Wetland Training Institute, Inc. 1991). Such permits are typically issued on the condition that the applicant agrees to provide mitigation that result in no net loss of wetland functions or values. No Section 404 permit can be issued until the California Regional Water Quality Control Board issues a Water Quality Certification (or waiver of such certification) under Section 401 of the Clean Water Act, certifying that the proposed activity will meet state water quality standards. The filling of isolated wetlands, over which the USACE has disclaimed jurisdiction under the SWANCC decision, is still regulated by the RWQCB under the Porter-Cologne Water Quality Act. Under the Porter-Cologne Act, it is unlawful to fill isolated wetlands without filing a Notice of Intent with the RWQCB. The RWQCB may impose waste discharge requirements (WDRs) if fill material is to be placed into the Waters of the State. In the wake of the SWANCC decision discussed above, the State Water Resources Control Board, in coordination with the CDFW, is currently in the process of preparing policy guidance for the definition and delineation of wetlands subject to State jurisdiction, as well as waste discharge requirements applicable to the filling of such wetlands. Based on the draft wetland protection policies, the State's definition of wetlands is expected to closely follow the federal definition of wetlands under Section 404 of the Clean Water Act, except that the State definition will apply to isolated wetlands (i.e., areas no longer under federal jurisdiction) and may apply to surface waters lacking vegetation (i.e., un-vegetated areas experiencing prolonged soil saturation and/or prolonged inundation). While the state definition of a wetland has yet to be finalized, it appears that all surface waters of the state, whether natural or man-made, vegetated or un-vegetated could be defined as a wetland subject to the jurisdiction to the state of California.

The RWQCB is also responsible for enforcing National Pollution Discharge Elimination System (NPDES) permits, including the General Construction Activity Storm Water Permit. All projects with federal funding must also comply with Executive Order 11990 (Protection of Wetlands).

The California Department of Fish and Wildlife (CDFW) has jurisdiction over the bed and bank of natural drainages according to provisions of Section 1601 and 1602 of the California Fish and

Game Code (2003). Activities that would disturb these drainages are regulated by the CDFW via a Streambed Alteration Agreement. Such an agreement typically stipulates that certain measures will be implemented which protect the habitat values of the drainage in question. Since there are no natural drainage channels within the WSP Plan Area or Gen-Tie Corridors, no Streambed Alteration Agreement would be required from CDFW.

### 3.2.5 Local Policies or Habitat Conservation Plans

- The Resource Conservation Elements of the 2035 Kings County General Plan contains a number of goals and policies on biological resources. These County policies are outlined below.
- Wetland and Riparian Areas. The County's goal is to conserve the functions and values of wetland communities and riparian areas while allowing compatible uses where appropriate.
- Fish and Wildlife Habitat. The County's goal is to protect, restore, and enhance habitats in Kings County that support fish and wildlife species so that populations are maintained at viable levels.
- Vegetation. The County's goal is to protect the valuable vegetation resources of each County.
- The Open Space and Conservation Element of the Fresno County General Plan contains a number of policies related to Natural Resources. These policies are directed specifically to the protection of special habitat areas such as wetlands and riparian areas, as well as fish and wildlife habitat.

## 3.3 POTENTIALLY SIGNIFICANT PROJECT IMPACTS/MITIGATION

The Westlands Solar Park is planned to include several utility-scale solar PV generating facilities. Although no site plans for individual solar PV projects within WSP have been prepared, each solar project will mainly consist of fields of solar arrays with supporting electrical equipment such as transformers, inverters, substations, power collection lines, and Operations and Maintenance facilities. It is intended that WSP solar development will avoid all irrigation canals and the off-site tailwater pond, as depicted in Figures 3 and 4. Thus, for purposes of this biological impact analysis, it is assumed that all cultivated and fallowed or pastured lands within the Plan Area will be subject to disturbance and alteration related to solar development.

The WSP gen-tie lines would consist of a series of tubular steel monopoles placed at approximately ¼ mile intervals along a total corridor length of about 23 miles. The area subject to disturbance at each tower site would be about one acre, and the area subject to permanent displacement at each transmission tower would be approximately 700 square feet. (The total combined area of permanent displacement along both gen-tie corridors would be less than 2 acres.) The monopoles are planned to be placed within or alongside existing agricultural fields, and the planning and design of the gen-tie lines would allow sufficient flexibility to adjust tower locations in order avoid impacts to wetlands, riparian zones, and other sensitive habitats.

Potentially significant project impacts to biological resources and mitigations are discussed below.

### 3.3.1 Loss of Habitat for Special Status Plants

**Potential Impacts.** Three special-status vascular plant species are known to occur in the vicinity of the Plan Area, California jewel-flower (*Caulanthus californicus*), San Joaquin woolly threads (*Monolopia congdonii*), and round leaved filaree (*California macrophylla*) (see Table 2). Due to the many decades of agricultural disturbance of the Plan Area and the Gen-Tie Corridors, habitat for these three plant species is absent from the area. Therefore, the planned WSP solar development and associated gen-tie lines would not affect regional populations of these species and potential impacts would be less-than-significant.

**Mitigation.** Mitigation measures are not warranted.

### 3.3.2 Loss of Habitat for Special Status Animals

**Potential Impacts.** Of the 33 special-status animal species potentially occurring in the region, eighteen species would be absent or unlikely to occur within the Plan Area or the Gen-Tie Corridors due to unsuitable habitat conditions. These include the vernal pool fairy shrimp, valley elderberry longhorn beetle, California tiger salamander, western spadefoot, silvery legless lizard, coast horned lizard, blunt-nosed leopard lizard, giant garter snake, American white pelican (nesting), black swift, Vaux's swift, western yellow-billed cuckoo, Nelson's antelope squirrel, giant kangaroo rat, Fresno kangaroo rat, Tulare grasshopper mouse, San Joaquin kit fox, and ringtail. Development of individual WSP solar projects and gen-tie lines would have no effect on loss of habitat for these species because there is little or no likelihood that they are present.

Two species that may regularly or occasionally utilize the Plan Area and Gen-Tie Corridors vicinity for foraging other than the Swainson's hawk, discussed above in Section 2.6.4, include the mountain plover and white-faced ibis. The WSP Plan Area or Gen-Tie Corridors do not provide regionally important foraging habitat for these species. Migrant species such as the mountain plover pass through or over many types of habitats en route to breeding or wintering habitat. White-faced ibis may possibly forage in agricultural fields of the Plan Area and Gen-Tie Corridors vicinity from time to time, this species would still have abundant foraging habitat in the region after full buildout of the Westlands Solar Park and the gen-tie lines. Considerable habitat suitable for migratory movements and winter foraging would continue to be available for these species on other lands within the region following WSP solar development and construction of the associated gen-tie lines. Therefore, the WSP solar projects and the gen-tie lines would result in a less-than-significant impact on these species.

An additional 13 special-status animal species from Table 2 potentially may occur frequently as regular foragers and may be resident to the area. These include the western pond turtle, San Joaquin whipsnake, western snowy plover, Swainson's hawk, northern harrier, white-tailed kite, burrowing owl, loggerhead shrike, tricolored blackbird, Townsend's big-eared bat, pallid bat, California mastiff bat, and American badger. Given the very large area of the Plan Area (approximately 33 sq. mi.), the WSP solar development would result in a substantial reduction of foraging, denning, and/or roosting habitat available regionally, depending on the species. However, the WSP solar development would not affect existing canals, which would continue to be operated and managed as they are under current conditions. The gen-tie towers would also avoid any canals and other aquatic features. Thus the foraging, nesting, denning, breeding, and roosting habitat for resident special-status species (as well as other native wildlife) provided by these canals would be maintained. However, impacts to several of the special-status species utilizing the Plan Area would be potentially significant. These species include Swainson's hawk, burrowing owl, American badger, and nesting raptors and migratory birds noted above. With respect to the Gen-Tie Corridors, the burrowing owl, other raptors and migratory birds would be potentially subject to impacts if gen-tie construction occurred in the vicinity of existing nests.

**Mitigation.** For species that are subject to potentially significant impacts due to WSP solar development gen-tie construction, mitigation measures are identified below for each as follows: raptors and migratory birds (Mitigation 3.3.3); American badger (Mitigation 3.3.5); Swainson's hawk (Mitigation 3.3.6) and; burrowing owl (Mitigation 3.3.7).

### 3.3.3 Disturbance to Active Raptor and Migratory Bird Nests

**Potential Impacts.** In addition to the Swainson's hawk and burrowing owl (discussed below in Sections 3.3.6, 3.3.7, and 4), several other raptor species such as the northern harrier, prairie falcon, peregrine falcon, and red-tailed hawk were observed foraging over the Plan Area and Gen-Tie Corridors, and barn owls, great horned owls, and red-tailed hawks were observed nesting at the off-site tailwater pond during the multi-year surveys from 2010-2017. Additionally, the Plan Area provides nesting habitat for a number of migratory bird species. Nearly all native bird species are protected by the federal Migratory Bird Treaty Act. The trees surrounding the off-site tailwater pond as well as large trees in existing orchards within and adjacent to the Plan Area and Gen-Tie Corridors provide potential nesting habitat for these species. Emergent vegetation and barren ground also provide nesting habitat for some bird species. Although the WSP solar and gen-tie projects will avoid the habitats most suitable for nesting raptors and other birds, some areas of the Plan Area and Gen-Tie Corridors such as orchards provide suitable nesting habitat and fallow fields and other undisturbed areas provide suitable nesting habitat for several ground-nesting birds. If birds were to nest in these areas in the future prior to construction, such project-related activities could result in the abandonment of active nests or direct mortality to these birds. Construction activities that adversely affect the nesting success of raptors or result in mortality of individual birds constitute a violation of state and federal laws (see Section 3.2.2 and 3.2.3) and would be considered a significant impact under CEQA.

**Mitigation.** In order to minimize construction disturbance to active raptor and other bird nests, the following measure(s) as necessary prior to the construction of each WSP solar development project and gen-tie project:

***Mitigation 3.3.3a* (*Pre-construction surveys*).** If tree removal, site preparation, grading, or construction is planned to occur within the breeding period (i.e., between February 1 and August

31), a qualified biologist will conduct pre-construction surveys for active nests of migratory birds within 14 days of the onset of these activities. If construction activity is planned to commence outside the breeding period, no pre-construction surveys are required for nesting birds and raptors.

***Mitigation 3.3.3b* (*Establish Buffers*).** Should any active nests be discovered in or near proposed construction zones, the biologist will consult with the California Department of Fish and Wildlife to identify a suitable construction-free buffer around the nest. This buffer will be identified on the ground with flagging or fencing, and will be maintained until the biologist has determined that the young have fledged.

***Mitigation 3.3.3c* (*Tailgate Training*).** All construction and operations workers on each solar project site shall be trained by a qualified biologist. The tailgate training shall include a description of the Migratory Bird Treaty Act, instructions on what to do if an active nest is located, and the importance of capping pipes and pipe-like structures standing upright in order to avoid birds falling into the pipes and getting stuck.

Implementation of the above measures would ensure that WSP solar development and gen-tie construction would have no impact on nesting raptors and migratory birds and that all construction activity would be in compliance with state and federal laws protecting nesting birds.

### 3.3.4 Impacts to San Joaquin Kit Fox

**Potential Impacts.** Over 90 percent of the Plan Area and the Gen-Tie Corridors consist of agricultural habitat. Of primary interest for this assessment are kit fox records from the area. According to the CNDDB there have been a total of thirty-two historical sightings within ten miles of the Plan Area, none of which occurred within the Plan Area itself (Figure 6) (CDFW 2016). These sightings occurred to the east, west, south, and north of the Plan Area. Many of these sightings are largely historic sightings with 88% from 1975-1993, with the most recent record in 2002. Multiple large irrigation canals run through the Plan Area which may act as movement corridors; however, should a kit fox utilize these corridors, the fox would have to travel through miles of marginal to poor habitat before reaching the Plan Area, which itself holds little habitat value. Although a few burrows were observed during the 2010-2015 surveys that were of suitable dimensions for kit fox, most of these burrows were or appeared to be occupied by California ground squirrels or burrowing owls. As discussed in Section 2.6.6, a majority of the Plan Area provides poor habitat and fallow fields and canals offer marginal habitat for this species.

In the vicinity of the Gen-Tie Corridors, there were 6 sightings of kit fox along the California Aqueduct in 1981. This indicates that kit fox may utilize the Aqueduct as a movement corridor.

While it is unlikely kit fox have or would take up residence within the WSP Plan Area or the Gen-Tie Corridors under current site conditions, kit foxes from populations reported from the surrounding areas may pass through and possibly forage within the area from time to time during regular dispersal movements. To be prudent, the following measures shall be implemented:

**Mitigation.** The following measures shall be implemented in conjunction with WSP solar development and Gen-Tie line construction.

***Mitigation Measure 3.3.4a (Pre-construction surveys).*** Pre-construction surveys shall be conducted no less than 14 days and no more than 30 days prior to the beginning of ground disturbance, construction activities, and/or any project activity likely to impact the San Joaquin kit fox. These surveys shall be conducted in accordance with the USFWS Standard Recommendations. The primary objective is to identify kit fox habitat features (e.g., potential dens and refugia) on the solar project and gen-tie sites and evaluate their use by kit foxes. If an active kit fox den is detected within or immediately adjacent to the area of work, the USFWS shall be contacted immediately to determine the best course of action.

***Mitigation Measure 3.3.4b (Avoidance).*** Should kit fox be found to be using a project site during preconstruction surveys, the project shall avoid the habitat occupied by kit fox and the Sacramento Field Office of the USFWS and the Fresno Field Office of CDFW shall be notified.

***Mitigation Measure 3.3.4c (Tailgate Training).*** All workers on the solar and gen-tie projects shall attend a tailgate training that includes a description of the species, a brief summary of their biology, and minimization measures and instructions on what to do if a San Joaquin kit fox is observed on a project site.

***Mitigation Measure 3.3.4d (Minimization of Potential Disturbance to Kit Fox)***. Whether or not kit foxes are found to be present, all permanent and temporary construction activities and other types of project-related activities shall be carried out in a manner that minimizes potential disturbance to kit foxes. Minimization measures include, but are not limited to: restriction of project-related vehicle traffic to established roads, construction areas, and other designated areas; inspection and covering of structures (e.g., pipes), as well as installation of escape structures, to prevent the inadvertent entrapment of kit foxes; restriction of rodenticide and herbicide use; and proper disposal of food items and trash.

***Mitigation Measure 3.3.4e (Mortality Reporting)*.** The Sacramento Field Office of the USFWS and the Fresno Field Office of CDFW shall be notified in writing within three working days in case of the accidental death or injury to a San Joaquin kit fox during project-related activities. Notification must include the date, time, location of the incident or of the finding of a dead or injured animal, and any other pertinent information.

Implementation of these measures would reduce impacts to the San Joaquin kit fox to a less-than-significant level and would minimize the risk that construction activities during the development of WSP solar and gen-tie projects would result in mortality to individual kit foxes. Should kit fox be found within an individual solar or gen-tie project site, the applicant may wish to contact the USFWS for implementation of a Safe Harbor Agreement. If allowed, this agreement will allow the applicant "assurances that additional land use restrictions as a result of their voluntary conservation actions would not be imposed by the USFWS" (USFWS, 1998).

### 3.3.5 Impacts to American Badgers

**Potential Impacts.** Given the observations of American badgers, a California Species of Special Concern, on nearby lands with similar habitats to those of the WSP Plan Area and the Gen-Tie Corridors, the potential exists that the American badger may reside within the Plan Area or Gen-Tie Corridors vicinity. No badgers or badger burrows were observed within the WSP Plan Area during any of the multi-year site surveys. However, the surveys were conducted primarily through driving field edges with limited foot coverage of the Plan Area and during the day when badgers are not typically active above ground. Potential badger habitat was found on the Plan Area in the form of fallow fields. Conditions in or Gen-Tie Corridors are similar those of the Plan Area. Therefore, WSP solar development and gen-tie construction could result in loss of foraging, breeding and denning habitat, and may result in harm or injury to individuals of this species. The potential for badgers to suffer mortality during project construction would constitute a significant adverse impact to American badgers.

**Mitigations.** Implementation of the following measures prior to the construction of each WSP solar and gen-tie project will reduce impacts to American badgers from direct mortality to a less-than-significant level.

***Mitigation Measure 3.3.5a (Pre-construction Surveys).*** During the course of the preconstruction surveys for other species, a qualified biologist shall also determine the presence or absence of badgers prior to the start of each individual solar project. If badgers are found to be absent, a report shall be written to the applicant so stating and no other mitigations for the protection of badgers shall be warranted.

***Mitigation Measure 3.3.5b (Avoidance and Monitoring).*** If an active badger den is identified during pre-construction surveys within or immediately adjacent to an area subject to construction, a construction-free buffer of up to 300 feet shall be established around the den. Once the biologist has determined that badger has vacated the burrow, the burrow can be collapsed or excavated, and ground disturbance can proceed. Should the burrow be determined to be a natal or reproductive den, and because badgers are known to use multiple burrows in a breeding burrow complex, a biological monitor shall be present onsite during construction activities in the vicinity of the burrows to ensure the buffer is adequate to avoid direct impact to individuals or natal/reproductive den abandonment. The monitor will be required onsite until it is determined that young are of an independent age and construction activities would not harm individual badgers.

***Mitigation Measure 3.3.5c (Tailgate Training).*** All workers on the solar and gen-tie projects shall attend a tailgate training that includes a description of the species, a brief summary of their biology, and minimization measures and instructions on what to do if an American badger is observed on a solar project site.

Implementation of the above measures would reduce potential impacts to the American badger to a less-than-significant level.

### 3.3.6 Impacts to Nesting Swainson's Hawks

Potential Impacts. Swainson's hawks are known to nest within a half-mile of the Plan Area and Gen-Tie Corridors. Swainson's hawks were observed over the off-site tailwater pond during the LOA field surveys in 2010-2014 and were observed landing in a tree at the pond in 2015 (see Section 2.6.4). Few willows occur singly at various areas across the Plan Area, but these trees provide unlikely nesting habitat for Swainson's hawks. Larger trees associated with agricultural and residential structures occur on lands adjacent to the Plan Area and the Gen-Tie Corridors. The most likely habitat for nesting Swainson's hawks occurs in large Gooding's willows in riparian habitat around the off-site tailwater pond and the cottonwood tree just east of the southern end of the Plan Area, which has supported an active Swainson's hawk nest for several years. Project-related activities occurring near these areas (Figure 8), could result in the abandonment of active Swainson's hawk nests or direct mortality to these birds should they be nesting in onsite or adjacent trees. Construction activities that adversely affect their nesting success or result in mortality of individual birds constitute a violation of state and federal laws (see Section 3.2.2 and 3.2.3) and would be considered a significant impact under CEQA.

Additionally, four active Swainson's hawk nests were observed within 10 miles of the Plan Area during the 2012 Swainson's hawk nest survey (Figure 7). During the scheduled 12-year development period, WSP solar projects could result in the loss of Swainson's hawk foraging habitat.

As discussed in Section 4 below, LOA biologists conducted a detailed analysis of foraging habitat within a 10-mile radius of the Plan Area and concluded that the abundant habitat that would remain after development of the WSP, and all other cumulative projects within this 10-mile radius, would be more than sufficient to support all of the known Swainson's hawk nests within this radius, with surplus capacity to support additional nesting pairs. Estimates of an annual nesting population for the Study Area were based on 2017 nesting surveys conducted by Estep (2017) and active nests identified by LOA in 2012, the last year full nesting surveys were conducted in the "gap" (See Sections 2.6.4 and 4 for more detail). In an attempt to confirm the validity of the 2012 survey results for the small area not covered by Estep's 2017 surveys, visited the location of the four active 2012 Swainson's hawk nests within the "gap" area September 2017 to evaluate their likely relevance for inclusion as "active nests" for the 2017 analysis. One of the four nests from 2012 was observed as active in 2017, one may have been intact and supported nesting, one was partially broken down, and one was missing. It was concluded that the WSP solar development and gen-tie line construction would not significantly impact Swainson's hawk foraging habitat.

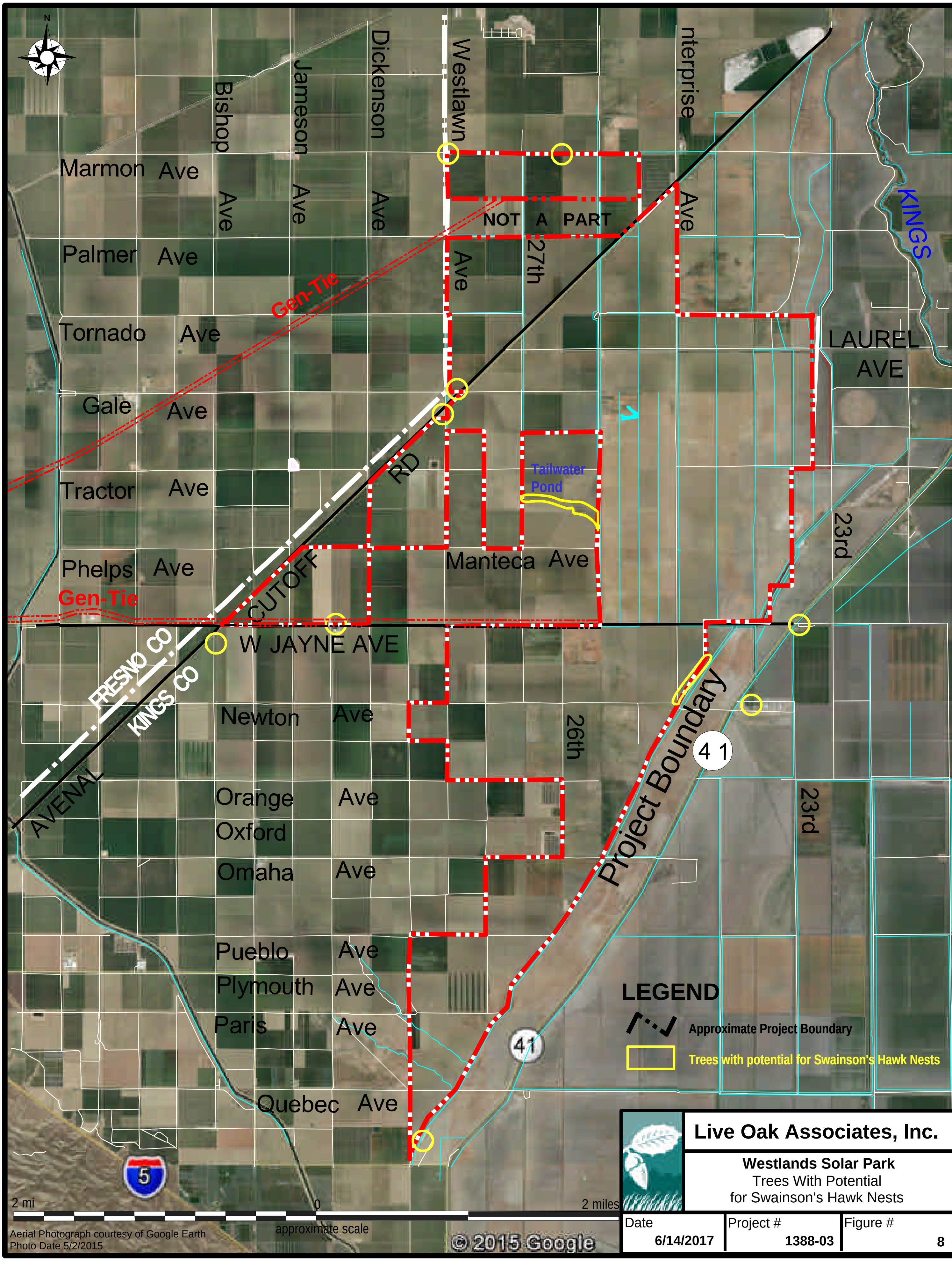
Implementation of the following mitigations will reduce impacts to nesting Swainson's hawks to a less-than-significant level.

**Mitigation.** Prior to the construction of each future WSP solar project and gen-tie project the following measures will be implemented.

***Mitigation 3.3.6a (Pre-construction Surveys).*** During the nesting season prior to the construction of any WSP solar project or gen-tie project within a half-mile of a potential nest tree (Figure 8), preconstruction surveys will be conducted on the project site and adjacent lands to identify any nesting pairs of Swainson's hawks. These surveys will conform to the guidelines of CDFW as presented in *RECOMMENDED TIMING AND METHODOLOGY FOR SWAINSON'S HAWK NESTING SURVEYS IN CALIFORNIA'S CENTRAL VALLEY*, Swainson's Hawk Technical Advisory Committee, May 31, 2000. This preconstruction survey is not necessary for individual solar projects that are further than a half-mile from a potential nest tree (Figure 8).

***Mitigation 3.3.6b (Establish Buffers).*** Should any active nests be discovered in or near proposed construction zones, the qualified biologist will establish a suitable construction-free buffer around the nest. This buffer will be identified on the ground with flagging or fencing, and will be maintained until the biologist has determined that the young have fledged.

***Mitigation Measure 3.3.6c (Tailgate Training).*** All workers on the solar projects shall attend a tailgate training that includes a description of the species, a brief summary of their biology, and minimization measures and instructions on what to do if a Swainson's hawk is observed on a solar project site.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Approximate Project Boundary
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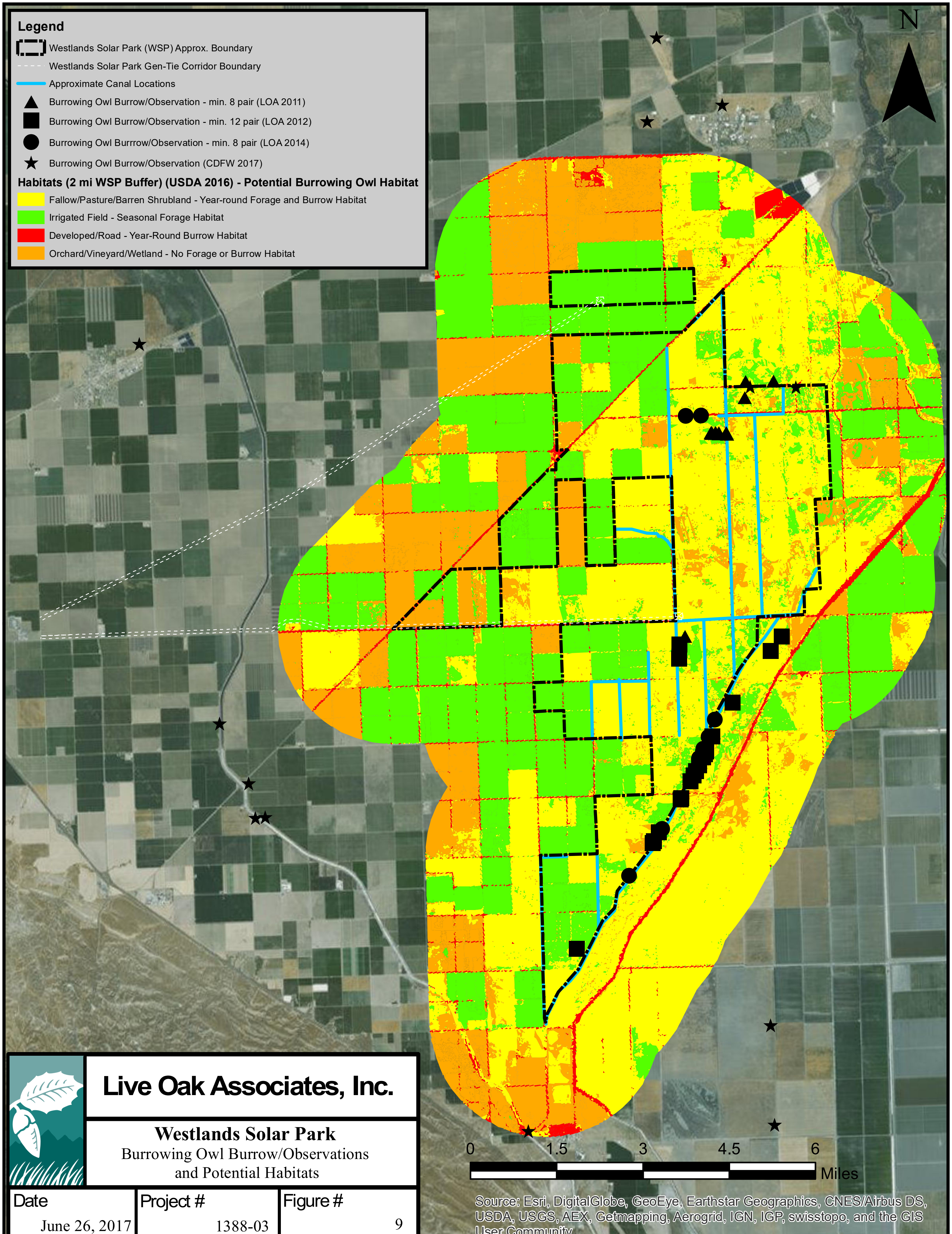
Aerial Photograph courtesy of Google Earth
Photo Date 5/2/2015
© 2015 Google
Live Oak Associates, Inc.
Westlands Solar Park
Trees With Potential
for Swainson's Hawk Nests
Date
6/14/2017
Project #
1388-03
Figure #
8

Implementation of these measures would reduce impacts to Swainson's hawks to a less-than-significant level.

### 3.3.7 Impacts to Burrowing Owls

**Potential Impacts.** A number of burrowing owls were observed occupying existing burrows within the WSP Plan Area during the field surveys conducted in 2010-2015. These field surveys did not consist of 100% coverage surveys and were conducted mainly as driving surveys on public roads, farm roads, and canal levees with short walking surveys when animals of plants of particular biological note were observed. Many of these owls were paired and presumably nesting with a minimum of 8 pair in 2011, a minimum of 12 pair in 2012, and a minimum of 8 pair in 2014 (Figure 9). To date, no surveys were completed specifically for burrowing owls in 2016 or 2017. Suitable nesting habitat for burrowing owls was present in the fallow fields and along the canal banks in the form of California ground squirrel burrows. As 100% coverage surveys were not conducted, the precise extent of burrowing owls within the Plan Area is unknown. LOA used the most recently available cropland data (USDA 2016) to prepare a map of potentially suitable habitat for burrowing owls within the Plan Area (Figure 9). Crops were categorized into four categories for their suitability to support burrowing owl burrows and foraging habitat by using the cropland data (USDA 2016; Figure 9):

1) *Fallow/Pasture/Barren/Shrubland - Year-Round Forage and Burrow Habitat.* Potentially suitable crop/habitat types to support burrowing owl forage and burrow habitat year-round as identified in the cropland data include barren, fallow/idle cropland, grass/pasture, and shrubland.
2) *Irrigated Field - Seasonal Forage Habitat.* Potentially suitable crop/habitat types to support burrowing owl seasonal forage habitat include alfalfa, asparagus, barley, cantaloupes, carrots, corn, cotton, double crop barley/sorghum, double crop oats/corn, double drop winter wheat/corn, and double crop winter wheat/sorghum, dry beans, durum wheat, garlic, herbs, lettuce, oats, onions, other hay/non-alfalfa, peas, safflower, sorghum, tomatoes, triticale, and winter wheat.
3) *Developed/Road - Year-Round Burrow Habitat.* As this category within the WSP Plan area is limited to roadways, this category also provides year-round burrow habitat, as burrowing




**Live Oak Associates, Inc.**

**Westlands Solar Park**
Burrowing Owl Burrow/Observations
and Potential Habitats

| Date | Project # | Figure # |
|---|---|---|
| June 26, 2017 | 1388-03 | 9 |

owls are known to use roadsides for burrow habitat; these habitat types include developed/high intensity, developed/low intensity, developed/medium intensity, developed/open space, and open water.

4) *Orchard/Vineyard/Wetland - No Forage or Burrow Habitat*. This category includes almonds, apricots, grapes, open water, oranges, pistachios, pomegranates, and walnuts.

For the WSP Plan Area, LOA identified 11,056 acres (53.33% of site) of habitat suitable for burrowing owls year-round (which includes year-round forage and burrow habitat + year-round burrow habitat, see Table 5 below), 7,833 acres (37. 79% of site) suitable seasonally, and 1,841 acres (8.88% of site) of unsuitable habitat (Table 5; Figure 9).

**TABLE 5. LAND COVER TYPE ACREAGE AND PERCENT TOTAL OF WSP PLAN AREA AND A 2-MILE BUFFER (USDA 2016).**

| Habitat Type | Value as BUOW Habitat | WSP Plan Area Acres (Percent of Total) | WSP Plan Area and a 2-mile Buffer Acres (Percent of Total) |
|---|---|---|---|
| Fallow/Pasture/Barren/Shrubland | Year-round forage and burrow habitat | 10,622 (51.24%) | 32,413 (40.26%) |
| Irrigated Field | Seasonal forage habitat | 7,833 (37.79%) | 28,090 (34.89%) |
| Developed/Road | Year-round burrow habitat | 434 (2.09%) | 3,012 (3.74%) |
| Orchard/Vineyard/Wetland | No forage or burrow habitat | 1,841 (8.88%) | 17,000 (21.11%) |
| Total | | 20,729 (100%)* | 80,514 (100%) |

*Total acreage differs slightly from assessor parcel total of 20,938 acres.

The development of WSP solar projects could result in the loss of foraging and breeding habitat for burrowing owls. Known locations of burrowing owl burrows along canals will be avoided, as the project will not be impacting the canals, and the canals will continue to be managed as they are currently managed, which will also benefit other species using the canal system to move through the Plan Area. The majority of burrowing owls observed were along the eastern edge of the Plan Area. Adequate suitable foraging habitat exists to the east of the Plan Area to support these owls. For any burrowing owls occurring within the Plan Area but outside the canal systems, both breeding and foraging habitat could be lost; this would constitute a significant impact to burrowing owl foraging and breeding habitat.

The Gen-Tie lines would result in very little loss of foraging habitat and likely no loss of breeding habitat for burrowing owls, although gen-tie construction could result in disturbance to any nesting burrowing owls in the vicinity.

Ground disturbance from project construction may also result in the mortality of burrowing owls, as they are known to retreat into their burrows ahead of approaching grading activity. These small raptors are protected under the federal Migratory Bird Treaty Act and the California Fish and Game Code. Mortality of individual birds would be a violation of state and federal law. The mortality of individual burrowing owls and the loss of a large area of known breeding and foraging habitat would constitute a significant environmental impact.

**Mitigation.** Prior to the construction of WSP solar projects and gen-tie projects, the following measures shall be implemented which will reduce impacts to the burrowing owl to a less-than-significant level:

***Mitigation Measure 3.3.7a (pre-construction surveys).*** Pre-construction surveys shall be conducted for burrowing owls by a qualified biologist no more than 14 days in advance of the on-set of ground-disturbing activity at each solar development site. These surveys shall be conducted according to methods described in the *Staff Report on Burrowing Owl Mitigation* (CDFG 2012) or the most recent CDFW guidelines. The surveys shall cover all areas of suitable burrowing owl habitat within each individual solar development site.

***Mitigation Measure 3.3.7b (Avoidance of active nests during breeding season).*** If pre-construction surveys are undertaken during the breeding season (February through August) and active nest burrows are located within or near construction zones, a construction-free buffer of 250 feet shall be established around all active owl nests. The buffer areas shall be enclosed with temporary fencing, and construction equipment and workers shall not be allowed to enter the enclosed setback areas. Buffers shall remain in place for the duration of the breeding season. After the breeding season (i.e., once all young have left the nest), passive relocation of any remaining owls may take place, but only under the conditions described below.

***Mitigation Measure 3.3.7c (Avoidance of occupied burrows during non-breeding season, and passive relocation of resident owls).*** During the non-breeding season (September through January), any burrows occupied by resident owls in areas planned for development shall be protected by a construction-free buffer with a radius of 250 feet around each active burrow. Passive relocation of resident owls is not recommended by CDFW where it can be avoided. If passive relocation is not avoidable, resident owls may be passively relocated according to a relocation plan prepared by a qualified biologist.

***Mitigation Measure 3.3.7d (Tailgate Training).*** All workers on the solar projects shall attend a tailgate training that includes a description of the species, a brief summary of their biology, and minimization measures and instructions on what to do if a burrowing owl is observed on a project site.

***Mitigation Measure 3.3.7e (Mitigation for Loss of Breeding and/or Foraging Habitat).*** If it is determined that burrowing owl nest(s) are located on or near a project site, the biologist shall coordinate with the project applicant to determine whether these nests are to be unavoidably relocated. If so, measure #1 below (off-site conservation easement) would apply. If the onsite or nearby nests are to remain in place, the biologist shall determine whether sufficient foraging habitat is available on adjacent or nearby lands, and if so, no further mitigation is required. (Approximately 200 acres of year-round foraging habitat within about 2 miles of the burrowing owl burrow is required to support a burrowing owl pair.) If it is determined that there is insufficient nearby foraging habitat, the biologist shall determine the amount of off-site foraging habitat that is required to sustain the burrowing owl nest. In this case, the potential impact to foraging habitat shall be either avoided through implementation of measure #2 below (onsite buffer zone), or compensated through implementation of measure #1 (conservation easement) or measure #3 (long-term agreement on adjacent lands) below:

1). Establishment of a conservation easement with a 1:1 ratio for foraging/breeding habitat preservation. These easements would include habitats determined to be suitable for foraging and/or breeding year-round and seasonal use.

2) Establishment of permanent buffer zones of adequate size around current burrowing owl locations. These buffer zones would require adequate management for the life of the project and buffer zones to ensure the buffer area remains suitable for burrowing owls. Annual monitoring of the suitability of management activities may be required by CDFW.

3) Short or long-term compensation for foraging habitat by providing farmers in adjacent lands incentives to plant particular crops known to be suitable forage habitat for burrowing owls (i.e. winter wheat, alfalfa, etc.) and to enact a farmer burrowing owl safety program where farmers are trained how to reduce burrowing owl mortalities on their lands and farm roads. A 1:1 ratio would be required to be in the program as long as the project is active.

Compliance with the above mitigation measures would reduce impacts to burrowing owls to a less-than-significant level.

### 3.3.8 Impacts to Wildlife Movement Corridors

**Potential Impacts.** As discussed in Section 2.6.6, given the large scale of the WSP Plan Area, it is likely that some species use onsite canals as movement corridors, including San Joaquin kit fox. The large area comprising the Plan Area (approximately 33 sq. mi.) likely has value for the regional movements of some wildlife species, when placed in a regional context. However, the WSP solar development would not affect existing canals, which would continue to be operated and managed by Westlands Water District as they are under current conditions. Thus it is expected that wildlife that currently uses the canals for movement will continue to use the canal system to move through the site at project build-out.

To allow for ground movement of wildlife through the Plan Area, all fencing enclosing the WSP solar facilities is planned to consist of "wildlife friendly" fencing with a continuous 5-inch separation from the top of the ground to the lowest point of the bottom of the fence along the entire fence. Such fencing will not be electrified.

In the vicinity of the Gen-Tie Corridors, the California Aqueduct is likely used as a movement corridor for local wildlife. However, given the very light footprint of the gen-tie lines, it is unlikely that they would affect local wildlife movement along the Aqueduct or any other linear feature.

Therefore, wildlife currently using the Plan Area and Gen-Tie Corridors for movement are expected to continue to use the area after project construction is complete, as wildlife friendly fencing will be used and the canal system will be retained within the Plan Area in order to allow for wildlife movement through the Plan Area.

Impacts to movement corridors for local wildlife are less-than-significant.

**Mitigations.** Mitigation for impacts to wildlife movements is not warranted.

### 3.3.9 Disturbance to Native Wildlife Nursery Sites

**Potential Impacts.** The aquatic habitat associated with the irrigation canals within the WSP plan area and the off-site tailwater pond, including tree cavities in willows around the tailwater pond, could provide nursery sites for native wildlife. Since all of these features would be avoided by WSP solar development and gen-tie construction, the potential impacts to wildlife nursery sites would be less-than-significant.

**Mitigation.** No mitigation is warranted.

### 3.3.10 Disturbance to Waters of the United States and Riparian Habitats

**Potential Impacts.** All onsite waters, as contained in irrigation canals and ditches and small irrigation overflow basins which exist along the margins of the work areas as well as the off-site tailwater pond, appear not to meet the jurisdictional requirements of the USACE as Waters of the United States (see Section 2.7). However, only the USACE can make a jurisdictional determination of onsite waters. Therefore, in the absence of a wetland delineation verified by the USACE, the jurisdictional status of onsite waters is unconfirmed. However, these features may be subject to the jurisdiction of the State of California. WSP solar development and gen-tie construction is not planned or expected to encroach upon or physically alter the onsite canals (and associated riparian zones) that are identified in Figure 4. The projects will avoid all permanent canals. However, should construction be planned to occur in areas that would result in the placement of fill in any canals or the off-site tailwater pond, a wetland delineation would be required to determine the extent of USACE jurisdiction over such features. If the waters to be filled are determined to be Waters of the U.S. the following permits may be required 1) a Clean Water Act permit from the USACE, 2) a Water Quality Certification from the RWQCB, and/or 3) a Lake or Stream Alteration Agreement from the CDFW. These permits are usually issued on the condition that a mitigation plan be prepared and approved by the applicable state and federal regulatory agencies noted above. Although the WSP solar project sites and gen-tie corridors are not anticipated to include wetland features, the full coverage biological field surveys and reports required in conjunction with CEQA review prior to approval of Conditional Use Permits for each WSP solar project and gen-tie project would confirm the presence or absence of potentially affected wetlands within proposed disturbance areas and identify avoidance measures, as appropriate.

Potential impacts to the irrigation canals and ditches and irrigation overflow basins within the project site will be avoided by not building arrays within them; the gen-tie tower planning and design will also have sufficient flexibility to enable placement and installation of the towers to avoid impacts to these features. Because WSP solar development and gen-tie construction is intended to avoid potential Waters of the U.S. and riparian areas, potential impacts to Waters of the U.S. and riparian habitat would constitute a less-than-significant adverse impact under CEQA.

**Mitigation.** Potential impacts to Waters of the U.S. and riparian habitat would be avoided; therefore, no mitigation is warranted.

### 3.3.11 Local Policies or Habitat Conservation Plans

**Potential Impacts.** The WSP solar development would be in compliance with the provisions of Kings County, and the gen-tie projects would be in compliance Fresno County General Plan polices. In particular, the avoidance of onsite canals and the adjacent tailwater pond would assure that biological resources of concern to Kings County and Fresno County would be avoided and preserved.

The USFWS has adopted the *Recovery Plan for Upland Species of the San Joaquin Valley* (USFWS 1998) which covers 34 species of plants and animals that occur in the San Joaquin

Valley. The majority of these species occur in arid grasslands and scrublands of the San Joaquin Valley and the adjacent foothills and valleys. The plan includes information on recovery criteria, habitat protection, umbrella and keystone species, monitoring and research program, adaptive management, and economic and social considerations. The only species addressed in the recovery plan that potentially occurs in the WSP and Gen-Tie Corridors vicinity is the San Joaquin kit fox, although no sightings of this species have been recorded in the immediate vicinity of the WSP Plan Area since 2002, and no sightings have been recorded in the vicinity of the Gen-Tie Corridors since 1981, as discussed above. The Recovery Plan does not identify the WSP Plan Area, the Gen-Tie Corridors, or any other lands in the vicinity as areas that should be protected as Specialty Reserve Areas, Wildlife-Compatible Farmland to be Maintained, or Areas Where Connectivity and Linkages Should be Promoted. The nearest area identified as a connectivity and linkage area is the Kettleman Hills to Anticline Ridge Movement Corridor, located west of I-5, approximately 4 miles west of the western end of the gen-tie corridors at the Gates Substation.

Neither the WSP Plan Area or Gen-Tie Corridors is covered by any existing Habitat Conservation Plan (HCP) or Natural Community Conservation Plan (NCCP), or any other conservation plan adopted at the local, regional, state, or federal level.

**Mitigation.** No mitigations are warranted.

# 4 CUMULATIVE IMPACT ANALYSIS FOR SWAINSON'S HAWK FORAGING HABITAT

The purpose of this analysis is to evaluate whether or not the project will contribute to a cumulative loss of foraging habitat available for the regional nesting Swainson's hawk population. This analysis presumes that a significant cumulative loss of foraging habitat would compromise growth rates of the Swainson's hawk as it would reduce nutritional capacity and adversely affect annual nesting production.

This analysis completes the Cumulative Impacts Assessment for the project in support of Section 15130 of the California Environmental Quality Act (CEQA) Guidelines. These guidelines require that cumulative impacts of a project are discussed when a project's incremental effects are cumulatively considerable (15065(a)(3)). A cumulative impact consists of an impact which is created as a result of the combination of the project evaluated in the EIR together with other projects causing related impacts (15355). CEQA guidelines define cumulatively considerable as follows: "the incremental effects of an individual project are significant when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probably future projects."

In accordance with CEQA Guidelines, the following discussion of cumulative impacts reflects the standards of practicality and reasonableness, and focuses on the cumulative impact to which the identified other projects contribute to the cumulative impact. A list of past, present, and probable future projects producing related or cumulative impacts was provided by Bert Verrips and the County of Kings.

This analysis focuses on the project's possible cumulative effects on the Swainson's hawk (SWHA) (*Buteo swainsonii*), a California threatened species that relies largely on agricultural lands to meet its foraging needs. As noted in Section 2.6.4, Swainson's hawk populations in California are limited by available nest trees with suitable foraging habitat within 10 miles of the nests. Therefore, the objectives of this analysis include using available data to:

1) Identify past, current and probable future projects for cumulative impacts assessment;

2) Determine distribution and abundance of nesting Swainson's hawk in the Study Area for a given year (i.e., for the purpose of estimating annual nutritional needs for the regional nesting population);
3) Determine foraging habitat requirements in the Study Area that might affect annual Swainson's hawk production; and
4) Assess the cumulative impacts of the proposed Westlands Solar Park on the distribution and abundance of annual foraging habitat.

**STUDY AREA**

The Study Area, (e.g., geographic scope) for this analysis is defined by a 10-mile radius surrounding the proposed approximately 21,000-acre project footprint of the Westlands Solar Park. This radius was selected because published studies have identified this radius as the flight distance between active nests sites and suitable foraging habitats (Estep 1989, Babcock 1995). The area encompassed by the 10-mile radius is 442,802 acres (approximately 692 square miles). Note: Since the Gen-Tie Lines would occupy a negligible area of land (i.e., total land area permanently displaced by transmission monopoles would be less than 2 acres), the 10-mile radius does not extend 10 miles from the Gen-Tie Corridors, but only from the WSP plan area boundaries.

The proposed project site (i.e., WSP Plan Area) is located in the center of the Study Area approximately nine miles southwest of the City of Lemoore, CA. The entire project site consists of cultivated fields, fallow fields/pastures, agricultural roads, and irrigation canals and ditches.

With the exception of the City of Lemoore, the Naval Air Station Lemoore, and the census designated places of Lemoore Station, Stratford and the east side of Huron, the surrounding lands are similar to the Project Site with fallow/idle cropland, grass/pasture, tomatoes, and cotton dominating the landscape (USDA 2016). Avenal, Huron, Kettleman City, Lemoore, Lemoore Station, Naval Air Station Lemoore, and Stratford are located entirely within the Study Area. California state highway 41 is approximately 0.4 miles east and highway 198 is approximately 2 miles north of the site.

A few natural features are located within the Study Area. Natural Resource Conservation Service Wetlands Reserve Program land is located approximately 5 miles to the northeast of the site and the Arroyo Pasajero Westside Detention Basin is located approximately 5 miles to the west of the site, which contain more natural habitats and may be subject to flooding. Bureau of Land Management Areas of Critical Environmental Concern are located approximately 4 miles west and southwest of the site. Portions of the North Fork, South Fork and Clarke Fork of the Kings River are present within the Study Area, most of which contain riparian habitat and more natural riverine features. Irrigation canals and ditches are also located throughout the Study Area.

**RECENT AND PROPOSED PROJECTS OF THE STUDY AREA**

Twenty-one other solar projects were identified within the Study Area for this cumulative impact assessment. These include the Sun City (180 acres), Sand Drag (240 acres), Avenal Park (86.29 acres), American Kings (978 acres), Sunpower Henrietta (836 acres), Kansas South (230 acres), Aurora Solar (186 acres), Kansas (200 acres), Mustang (1,422 acres), Orion (200 acres), Kent South (200 acres), Kettleman Solar (220 acres), Lemoore 14 (60.39 acres), 2275 Hattesen (15.70 acres), Java Solar (96.14 acres), Mustang 2 (2,459.15 acres), and NAS Lemoore (930 acres) projects within Kings County, and PG&E Huron (~240 acres), PG&E Gates (~70 acres), and Westlands Solar Farm (90.5 acres), SC&R (1,594 acres) projects within Fresno County. These 21 projects together encompass approximately 10,534 acres of the Study Area. With the addition of the proposed project (approximately 20,938 acres), the total area covered by the cumulative projects is approximately 31,472 acres. (Note: Westside Solar Phases 1 and 2 (187 acres) and Aquamarine Solar (1,860 acres) are included within the WSP Plan Area and therefore are not listed as separate projects above.)

**METHODS**

Estimates of an annual nesting population for the Study Area were based on 2017 nesting surveys conducted by Estep for within 10 miles of the Mustang 2 project site which included the majority of the Study Area and supplemented active nests identified by LOA in 2012, the last year full nesting surveys were conducted in the "gap" (i.e., areas within the Study Area not surveyed by in 2017 by Estep) area (Estep 2017).

The primary objective of this analysis was to estimate the foraging needs of 2017 Swainson's hawk population with the Study Area. While it is not possible to rely on Estep's detection of active nests from his 2017 surveys for the entire Study Area, LOA ecologist Katrina Krakow, in an attempt to confirm the validity of the 2012 survey results for the small area not covered by Estep's 2017 surveys, visited the location of the four active 2012 Swainson's hawk nests within the "gap" area September 2017 to evaluate their likely relevance for inclusion as "active nests" for the 2017 analysis.

One of the four nests from 2012 was observed incidentally by Ms. Krakow during the 2017 nesting season to be active, and was revisited during the September assessment; this nest was found to be fully intact. The second nest appeared to be partially broken down and whether or not nesting occurred this year is inconclusive. The third nest was on top of a mistletoe clump in a cottonwood tree along Los Gatos Creek, and may have supported nesting during the 2017 season; 2017 nesting however could not be positively confirmed. The forth nest in a clump of tamarisk on the west side of Los Gatos Creek was absent. Whether or not an alternative nest site was active in 2017 in this area of the river is not known.

While it was only possible to confirm that a single nest from 2012 was active in 2017, for the purposes of this analysis, it was assumed that all four 2012 nests were active. This is a conservative approach that would more likely trigger a significant adverse cumulative impact, than assuming only one nest was active. Therefore, as noted above, this analysis relies on Estep's 2017 nest surveys for the majority of the Study Area LOA's 2012 nest surveys for the remainder.

**Foraging Habitats**

Land uses and habitat types were identified using the 2016 United States Department of Agriculture (USDA) National Agricultural Statistics Service Cropland Data Layer (CDL) (Han et al. 2012; Boryan et al. 2011). The CDL is a raster, geo-referenced, crop-specific land cover data layer created annually for the continental United States using moderate resolution satellite imagery and extensive agricultural ground truthing (USDA 2016). For the purposes of this study, the CDL layer was limited to the Study Area which included 66 cover types.

Foraging habitat associations were based on 6 cover type aggregates, instead of the 66 specific cover types because agricultural crop management is a dynamic process; crop types may change annually and seasonally. In order to capture long-term land use patterns specific crop types were grouped into broad categories. These were used to characterize relative foraging habitat suitability on the landscape (Estep 2017). The six land use/cover type categories used for the Study Area include:

- Alfalfa
- Irrigated Cropland
- Orchard/Vineyard
- Developed/Open Water
- Pasture/Barren
- Natural woodlands

Foraging habitat classes were based on Biology, Movements, and Habitat Relationships of the Swainsons's Hawk in the Central Valley of California (Estep 1989) and California Partners in Flight Riparian Bird Conservation Plan: Swainson's Hawk (Buteo swainsoni) (Woodbridge 1998). Based on these documents alfalfa, irrigated cropland, and pasture/barren were determined to constitute suitable foraging habitat for the Swainson's hawk.

**Data Preparation**

The CDL was queried using the Study Area boundary as the defined area of interest that was imported into USDA's National Agricultural Statistics Service Cropscape – Cropland Data Layer website (https://nassgeodata.gmu.edu/CropScape/). Land use/cover types within the Study Area were then exported to excel and reclassified into the above categories, which included acreages. The Study Area includes roads and highways which are not classified habitat types in the CDL; therefore, acreages may minimally exceed the actual acreage for any given class. For the purposes of this study, this effect is considered negligible because it accounts for a very small percentage of the Study Area and does not affect habitat distribution and abundance. In addition, CDL acreage counts are not official estimates (USDA 2016).

**RESULTS**

## Nest Proximity

A total of 32 SWHA nests were documented within the Study Area (CDFW 2017; LOA 2012; Estep 2017). Figure 10 shows the nest distribution across the Study Area. The nearest SWHA nest is approximately 120 feet east of the southern tip of the project site along the Blakeley Canal and 9 other nests are within five miles of the site. Twenty-two SWHA nests are between five and ten miles of the site.

## Land Use Cover Types

There are 6 cover types in the 442,802-acre Study Area. Relative abundance for each cover type and their SWHA forage value is listed Table 3 and described below.

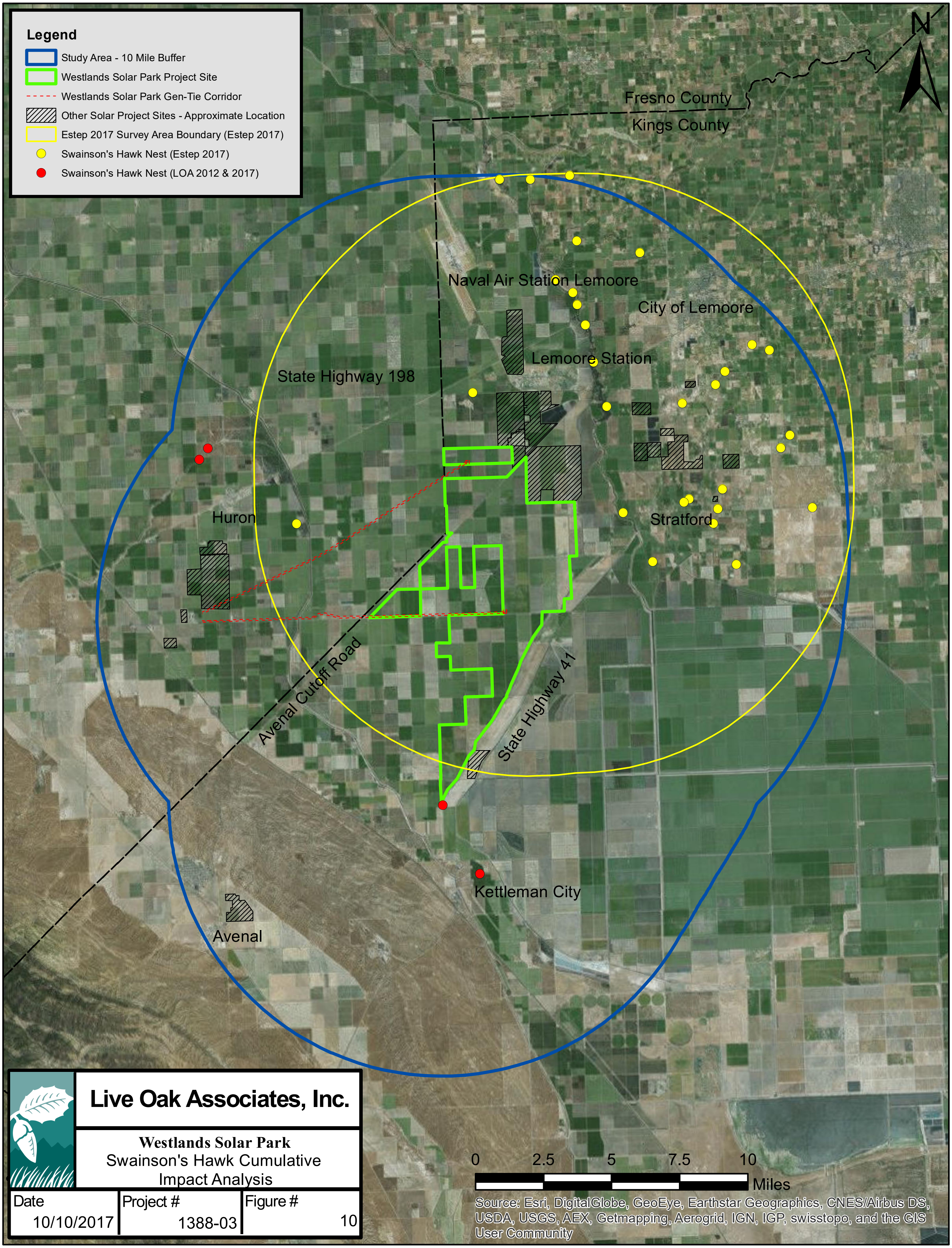
**Table 3. Land Cover Type Acreage and Percent Total of Study Area (USDA 2016).**

| Land Cover Type | SWHA Forage Value | WSP Plan Area Acres (Percent of Total) | Study Area Acres (Percent of Total) |
|---|---|---|---|
| Alfalfa | High | 105 (0.51%) | 11,905 (2.69%) |
| Pasture/Barren | Medium-High | 10,622 (51.24%) | 186,240 (42.10%) |
| Irrigated Cropland | Medium | 7,728 (37.28%) | 142,159 (32.13%) |
| Orchard/Vineyard | Low-None | 1,841 (8.88%) | 72,056 (16.29%) |
| Developed/Open Water | None | 434 (2.09%) | 29,972 (6.77%) |
| Natural Forested | None | 0 | 61 (0.01%) |
| Total | | 20,729 (100%)*,** | 442,393 (100%)** |

* Acreage differs from assessor parcel amount.
** CDL acreage counts are not official estimates.

**Alfalfa**. Alfalfa is considered to have the highest foraging value for SWHA (Estep 1989, 2012, 2017). This crop remains in fields for up to 5 years. Alfalfa management includes mowing and irrigation which can expose rodent prey and make prey more accessible to SWHA (Estep 2012, 2017).

**Pasture/Barren**. This cover type includes fallow/idle cropland, grass/pasture, barren, shrubland, and herbaceous wetlands. Other grassland surrogates such as herbs are also included in this category. Fallow/idle croplands represent the majority of this cover type. This cover type may provide medium to high forage value to SWHA depending upon prey availability.




Live Oak Associates, Inc.

**Westlands Solar Park**
Swainson's Hawk Cumulative Impact Analysis

| Date | Project # | Figure # |
|---|---|---|
| 10/10/2017 | 1388-03 | 10 |

**Irrigated Cropland**. This cover type includes crops such as tomatoes, cotton, safflower, and winter wheat, which represent the majority of this category. Other crops, such as asparagus, melons, carrots, and peas, are also included; however, these represent a very small percentage of the total. This cover type may provide medium foraging habitat value to SWHA (Estep 1989). Foraging value for this type may be dependent upon timing of harvest and planting.

**Orchard/Vineyards**. This cover includes fruit, nut, and other tree crop orchards, and grapes, and represents little to no foraging value to SWHA due to a lack of accessibility for SWHA (Woodbridge 1998). Due to the little to no foraging value, this habitat is not included as foraging habitat for this analysis.

**Developed/Open Water**. This cover type represents developed areas with low, moderate and high intensities such as the towns of Avenal, Huron, Kettleman City, Lemoore, Lemoore Station, Naval Air Station Lemoore, and Stratford and rural developments (e.g., cattle corrals and other infrastructure). This cover type contributes no forage value, however trees located on these properties may provide nesting habitat. Open water also represents no forage value to SWHA. A small percentage of the open water mapped in the CDL may be flooded fields, a temporary feature. Therefore, this cover type may be overrepresented; however, this effect is considered negligible in comparison to the overall Study Area.

**Natural Forested**. This type is represented by mixed forest and woody wetlands. These areas may provide nesting habitat for SWHA; however, they provide no forage habitat value for SWHA.

**Foraging Habitat Cumulative Analysis**

Estep (1989, 2012, 2017) has proposed that if a cumulative loss of agricultural foraging habitat, from the proposed project and other projects, results in a reduction of surplus habitat to less than 70% relative to pre-project conditions, then the cumulative impact is deemed significant. Surplus habitat represents the number of available foraging acres that exceed the minimum required available foraging acres to support known Swainson's hawk nesting pairs. The significance threshold is derived from reviewing habitat land cover data to estimate the existing foraging habitat baseline condition and including the existing Swainson's hawk population foraging habitat requirements to estimate the required foraging habitat necessary to support the nesting population (Estep 1989, 2012, 2017). This methodology is used for this study.

Estep (1989) calculated that an area of 6,820 acres of foraging habitat is required for each nesting pair. The total foraging habitat acreage required for the nesting population is calculated by multiplying the number of pairs in the Study Area by 6,820 acres. Table 4 presents the Study Area analysis for foraging habitat requirements for 32 pairs located in the Study Area.

**TABLE 4. CUMULATIVE IMPACT ANALYSIS FOR SWHA FORAGING HABITAT WITHIN THE STUDY AREA**

| Foraging Habitat | Acres | Percent |
|---|---|---|
| (a) Available Foraging Habitat within Study Area | 340,304 | - |
| (b) Unadjusted Foraging Habitat required to support 32 SWHA pairs | 218,240 | - |
| (c) Adjusted Foraging habitat required to support 32 SWHA pairs (adjusted for 30% range overlap) | 152,768 | - |
| (d) Surplus SWHA foraging habitat (a-c) | 187,536 | - |
| (e) Cumulative impact of project impact and 21 other solar projects (on foraging habitat) (assumes that all acreage within the cumulative projects is suitable foraging habitat). | 31,472 | - |
| (f) Remaining available foraging habitat following cumulative impacts (a-e) | 308,832 | 90.8% |
| (g) Remaining available surplus SWHA foraging habitat following cumulative impacts (d-e) | 156,064 | 83.2% |

Cumulative analysis for foraging habitat shows that there is a greater amount of foraging habitat available than that required to support 32 nesting pairs. Following Estep (2012 & 2017), the total foraging habitat required was adjusted down to account for foraging habitat overlap within the Study Area. Estep (2012 & 2017) considers the availability of the surplus foraging habitat acres in addition to the required foraging habitat to be sufficient to support a growing population. If available foraging habitat required to sustain the nesting population plus at least 70% (i.e., 131,275acres) of the existing surplus habitat remains, the habitat removal resulting from the project and the other projects in the Study Area is not expected to significantly affect either the existing population or substantially affect opportunities for future population expansion. Therefore, the cumulative impacts would be considered less-than-significant.

There are currently 21 solar projects within the Study Area (including the proposed project) with a total area of approximately 31,472 acres. If it is conservatively assumed that 100-percent of the solar projects within the Study Area represent potential foraging habitat, these projects equal approximately 9.2% of the total potential foraging habitat in the Study Area. Table 4 shows that the impact areas of the proposed project and the 21 other solar projects do not reach or go below the 70% threshold of significance (131,275 acres) as defined by Estep (2012 & 2017). The remaining available surplus habitat (156,064 acres) exceeds the 70% threshold of significance. Therefore, the cumulative impact to Swainson's hawk foraging habitat is less-than-significant.

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## APPENDIX A: VASCULAR PLANTS OF THE WSP PLAN AREA

The plants species listed below were observed on the Plan Area during annual spring and summer surveys conducted by Live Oak Associates, Inc. in 2010-2015. The U.S. Fish and Wildlife Service wetland indicator status of each plant has been shown following its common name.

OBL - Obligate
FACW - Facultative Wetland
FAC - Facultative
FACU - Facultative Upland
UPL - Upland
+/- - Higher/lower end of category
NR - No review
NA - No agreement
NI - No investigation

| | | |
|---|---|---|
| **AMARANTHACEAE – Pigweed Family** | | |
| *Amaranthus* sp. | Amaranth | - |
| **ASTERACEAE – Sunflower Family** | | |
| *Baccharis salicifolia* | Mulefat | - |
| *Conyza canadensis* | Canada Horseweed | FAC |
| *Gnaphalium luteo-album* | Common cudweed | - |
| *Helianthus annuus* | Common Sunflower | FAC- |
| *Lactuca serriola* | Prickly wild lettuce | FAC |
| *Silybum marianum* | Milk Thistle | UPL |
| *Sonchus asper* | Prickly Sow-thistle | FAC |
| *Xanthium strumarium* | Cocklebur | FAC+ |
| **BORAGINACEAE – Borage Family** | | |
| *Amsinckia sp.* | Fiddleneck | UPL |
| *Heliotropium curassavicum* | Seaside Heliotrope | OBL |
| **BRASSICACEAE - Mustard Family** | | |
| *Brassica nigra* | Black Mustard | UPL |
| *Capsella bursa-pastoris* | Shepherd's Purse | FAC- |
| *Hirschfeldia incana* | Summer Mustard | UPL |
| *Lepidium nitidum* ssp. *nitidum* | Peppergrass | UPL |
| *Raphanus sativa* | Wild Radish | UPL |
| *Sisymbrium irio* | London Rocket | UPL |
| **CHENOPODIACEAE – Goosefoot Family** | | |
| *Atriplex* sp. | Saltbush | - |
| *Chenopodium sp.* | Goosefoot | - |
| *Chenopodium album* | Lamb's Quarters | FAC |
| *Chenopodium murale* | Nettle leaf goosefoot | UPL |
| *Salsola tragus* | Russian thistle | FACU |
| **CYPERACEAE – Sedge Family** | | |
| *Carex sp.* | Sedge | FACW/OBL |
| *Cyperus eragrostis* | Flatsedge | FACW |

| | | |
|---|---|---|
| **EUPHORBIACEAE – Spurge Family** | | |
| *Eremocarpus setigerus* | Dove Weed | UPL |
| **FABACEAE - Pea Family** | | |
| *Medicago lupulina* | Black Medic | FAC |
| **FRANKENIACEAE – Frankenia Family** | | |
| *Frankenia salina* | Alkali heath | FACW+ |
| **GERANEACEAE - Geranium Family** | | |
| *Erodium cicutarium* | Filaree | UPL |
| **MALVACEAE – Mallow Family** | | |
| *Malva neglecta* | Common Mallow | UPL |
| *Malvella leprosa* | Alkali mallow | FAC* |
| **MYRTACEAE – Myrtle Family** | | |
| *Eucalyptus* sp. | Eucalyptus | UPL |
| **POACEAE – Grass Family** | | |
| *Avena* sp. | Wild Oat | UPL |
| *Bromus hordeaceaus* | Soft Chess | FACU |
| *Bromus madritensis* ssp. *rubens* | Red Brome | UPL |
| *Cynodon dactylon* | Bermuda Grass | FAC |
| *Distichlis spicata* | Saltgrass | FACW |
| *Hordeum murinum* ssp. *leporinum* | Barnyard Barley | NI |
| *Leptochloa uninervia* | Mexican sprangeltop | FACW |
| *Phalaris minor* | Little seed canarygrass | - |
| *Phalaris aquatica* | Harding Grass | FAC+ |
| *Polypogon monspeliensis* | Rabbit's Foot Grass | FACW |
| *Triticum* sp. | Cultivated Wheat | - |
| *Vulpia myuros* ssp. *hirsuta* | Rattail Fescue | FACU |
| **POLYGONACEAE – Buckwheat Family** | | |
| *Polygonum lapathifolium* | Willow weed | OBL |
| *Polygonum* sp. | Knotweed | - |
| *Rumex crispus* | Curly Dock | FACW |
| *Rumex salicifolius* | Willow Leaved Dock | FACW |
| **PORTULACACEAE - Purselane Family** | | |
| *Portulaca oleracea* | Purslane | FAC |
| **SALICACEAE – Willow Family** | | |
| *Salix gooddingii* | Goodding's Willow | OBL |
| **SOLANACEAE – Nightshade Family** | | |
| *Datura stramonium* | Jimsonweed | |
| *Solanum americanum* | Common Nightshade | FAC |
| **TAMARICACEAE – Tamarisk Family** | | |
| *Tamarix aphylla* | Athel tamarisk | FACW- |
| *Tamarix Sp.* | Tamarisk | - |
| **TYPHACEAE – Cattail Family** | | |
| *Typha latifolia* | Common Cattail | OBL |
| **VISCACEAE – Mistletoe Family** | | |
| *Phoradendron macrophyllum* | Mistletoe | UPL |

## APPENDIX B: TERRESTRIAL VERTEBRATE SPECIES THAT POTENTIALLY OCCUR ON THE WSP PLAN AREA

The species listed below are those that may reasonably be expected to use the habitats of the Plan Area routinely from time to time. The list was not intended to include birds that are vagrants or occasional transients. Terrestrial vertebrate species observed in or adjacent to the Plan Area in 2010-2015 field surveys have been noted with an asterisk.

**CLASS: AMPHIBIA (Amphibians)**
**ORDER: SALIENTIA (Frogs and Toads)**
**FAMILY: BUFONIDAE (True Toads)**
*Western California Toad (*Bufo boreas*)
**FAMILY: HYLIDAE (Treefrogs and relatives)**
*Pacific Chorus Frog (*Pseudacris regilla*)
**FAMILY: RANIDAE (True Frogs)**
*Bullfrog (*Rana catesbeiana*)

**CLASS: REPTILIA (Reptiles)**
**ORDER: TESTUDINES (Turtles)**
**FAMILY: EMYDIDAE (Box and Water Turtles)**
Western Pond Turtle (*Actinemys marmorata*)
**ORDER: SQUAMATA (Lizards and Snakes)**
**SUBORDER: SAURIA (Lizards)**
**FAMILY: PHRYNOSOMATIDAE**
Western Fence Lizard (*Sceloporus occidentalis*)
Side-blotched Lizard (*Uta stansburiana*)
**FAMILY: TEIIDAE (Whiptails and relatives)**
Western Whiptail (*Cnemidophorus tigris*)
**SUBORDER: SERPENTES (Snakes)**
**FAMILY: COLUBRIDAE (Colubrids)**
Coachwhip (*Masticophis flagellum*)
Glossy Snake (*Arizona elegans*)
*Gopher Snake (*Pituophis melanoleucus*)
Common Kingsnake (*Lampropeltis getulus*)
Long-nosed Snake (*Rhinocheilus lecontei*)
Common Garter Snake (*Thamnophis sirtalis*)
**FAMILY: VIPERIDAE (Vipers)**
Western Rattlesnake (*Crotalus viridis*)

**CLASS: AVES (Birds)**
**ORDER: GAVIIFORMES (Loons)**
**FAMILY: PODICIPEDIDAE (Grebes)**
*Pied-Billed Grebe (*Podilymbus podiceps*)
**ORDER: PELECANIFORMES (Tropicbirds, Pelicans and Relatives)**

**FAMILY: PELECANIDAE (Pelicans)**
*American White Pelican (*Pelecanus erythrorhynchos*)
**FAMILY: PHALACROCORACIDAE (Cormorants)**
*Double-Crested Cormorant (*Phalacrocorax auritus*)
**ORDER: CICONIIFORMES (Herons, Storks, Ibises and Relatives)**
**FAMILY: ARDEIDAE (Herons and Bitterns)**
*Great Blue Heron (*Ardea herodias*)
*Great Egret (*Ardea alba*)
*Snowy Egret (*Egretta thula*)
*Green Heron (*Butorides virescens*)
*Black-Crowned Night Heron (*Nycticorax nycticorax*)
*Cattle Egret (*Bubulcus ibis*)
*American Bittern (*Botaurus lentiginosus*)
**FAMILY: CATHARTIDAE (American Vultures)**
*Turkey Vulture (*Cathartes aura*)
**ORDER: FALCONIFORMES (Vultures, Hawks, and Falcons)**
**FAMILY: ACCIPITRIDAE (Hawks, Old World Vultures, and Harriers)**
*Northern Harrier (*Circus cyaneus*)
White-tailed kite (*Elanus leucurus*)
*Red-tailed Hawk (*Buteo jamaicensis*)
Ferruginous Hawk (*Buteo regalis*)
Sharp-Shinned Hawk (*Accipiter striatus*)
Cooper’s hawk (*Accipiter cooperii*)
*Red-Shouldered Hawk (*Buteo lineatus*)
*Swainson's Hawk (*Buteo swainsoni*)
**ORDER: ANSERIFORMES (Screamers, Ducks, and relatives)**
**FAMILY: ANTATIDAE (Swans, Geese, and Ducks)**
Mallard (*Anas platyrhynchos*)
**ORDER: FALCONIFORMES (Caracaras and Falcons)**
**FAMILY: FALCONIDAE (Caracaras and Falcons)**
*American Kestrel (*Falco sparverius*)
Merlin (*Falco columbarius*)
*Peregrine Falcon (*Falco peregrinus*)
*Prairie Falcon (*Falco mexicanus*)
**ORDER: GALLIFORMES (Megapodes, Curassows, Pheasants, and relatives)**
**FAMILY: PHASIANIDAE (Quails, Pheasants, and relatives)**
Ring-necked Pheasant (*Phasianus colchicus*)
**ORDER: GRUIFORMES (Cranes, Rails and Relatives)**
**FAMILY: RALLIDAE (Rails, Gallinules and Coots)**
*Common Moorhen (*Gallinula chloropus*)
*American Coot (*Fulica americana*)
**ORDER: CHARADRIIFORMES (Shorebirds, Gulls, and relatives)**
**FAMILY: CHARADRIIDAE (Plovers and relatives)**
Western Snowy Plover (*Charadrius alexandrines nivosus*)
Mountain Plover (*Charadrius montanus*)

*****Killdeer (*Charadrius vociferus*)

**FAMILY: RECURVIROSTRIDAE (Avocets and Stilts)**

*Black-Necked Stilt (*Himantopus mexicanus*)
*American Avocet (*Recurvirostra americana*)

**FAMILY: COLOPACIDAE (Sandpipers and Relatives)**

*Greater Yellowlegs (*Tringa melanoleuca*)
*Whimbrel (*Numenius phaeopus*)
*Long-Billed Curlew (*Numenius americanus*)
*Least Sandpiper (*Calidris minutilla*)
*Long-Billed Dowitcher (*Limnodromus scolopaceus*)

**FAMILY: LARIDAE (Skuas, Gulls, Terns and Skimmers)**

Ring-billed Gull (*Larus delawarensis*)
California Gull (*Larus californicus*)
*Herring Gull (*Larus argentatus*)
Caspian Tern (*Sterna caspia*)
*Forster's Tern (*Sterna forsteri*)

**ORDER: COLUMBIFORMES (Pigeons and Doves)**

**FAMILY: COLUMBIDAE (Pigeons and Doves)**

*Rock Dove (*Columba livia*)
*Mourning Dove (*Zenaida macroura*)
*Eurasian Collared Dove (*Streptopelia decaocto*)

**ORDER: STRIGIFORMES (Owls)**

**FAMILY: TYTONIDAE (Barn Owls)**

*Common Barn Owl (*Tyto alba*)

**FAMILY: STRIGIDAE (Typical Owls)**

*Burrowing Owl (*Athene cunicularia*)
*Great Horned Owl (*Bubo virginianus*)
Western Screech Owl (*Otus kennicottii*)

**ORDER: CAPRIMULGIFORMES (Goatsuckers and relatives)**

**FAMILY: CAPRIMULGIDAE (Goatsuckers)**

Lesser Nighthawk (*Chordeiles acutipennis*)

**FAMILY: TROCHILIDAE (Hummingbirds)**

Black-chinned Hummingbird (*Archilochus alexandri*)
Anna’s Hummingbird (*Calypte anna*)
Rufous Hummingbird (*Selasphorus rufus*)

**ORDER: CORACIIFORMES (Kingfishers and Relatives)**

**FAMILY: ALCEDINIDAE (Kingfishers)**

*Belted Kingfisher (*Ceryle alcyon*)

**ORDER: PICIFORMES (Woodpeckers and relatives)**

**FAMILY: PICIDAE (Woodpecker and Wrynecks)**

Northern Flicker (*Colaptes chrysoides*)
Downy Woodpecker (*Picoides pubescens*)
Nuttall’s Woodpecker (*Picoides nuttallii*)

**ORDER: PASSERIFORMES (Perching Birds)**

**FAMILY: TYRANNIDAE (Tyrant Flycatchers)**

*Black Phoebe (*Sayornis nigricans*)
*Say's Phoebe (*Sayornis saya*)
*Western Kingbird (*Tyrannus verticalis*)
**FAMILY: LANIIDAE (Shrikes)**
*Loggerhead Shrike (*Lanius ludovicianus*)
**FAMILY: CORVIDAE (Jays, Magpies, and Crows)**
Western Scrub Jay (*Aphelocoma coerulescens*)
Yellow-billed Magpie (*Pica nuttalli*)
*American Crow (*Corvus brachyrhynchos*)
*Common Raven (*Corvus corax*)
**FAMILY: ALAUDIDAE (Larks)**
*****Horned Lark (*Eremophila alpestris*)
**FAMILY: HIRUNDINIDAE (Swallows)**
*Northern Rough-winged Swallow (*Stelgidopteryx serripennis*)
*Cliff Swallow (*Hirundo pyrrhonota*)
*Barn Swallow (*Hirundo rustica*)
**FAMILY: TROGLODYTIDAE (Wrens)**
Marsh Wren (*Cistothorus palustris*)
**FAMILY: TURDIDAE**
Western Bluebird (*Sialia mexicana*)
*American Robin (*Turdus migratorius*)
**FAMILY: MIMIDAE (Mockingbirds and Thrashers)**
*Northern Mockingbird (*Mimus polyglottos*)
**FAMILY: STURNIDAE (Starlings)**
*European Starling (*Sturnus vulgaris*)
**FAMILY: MOTACILLIDAE (Wagtails and Pipits)**
*American Pipit (*Anthus rubescens*)
**FAMILY: BOMBYCILLIDAE (Waxwings)**
Cedar Waxwing (*Bombycilla cedrorum*)
**FAMILY: PARULIDAE (Wood Warblers and Relatives)**
Orange-crowned Warbler (*Vermivora celata*)
*Yellow-rumped Warbler (*Dendroica coronata*)
**FAMILY: EMBERIZIDAE (Wood Warblers, Sparrows, Blackbirds, and relatives)**
*Savannah Sparrow (*Passerculus sandwichensis*)
*Song Sparrow (*Melospiza melodia*)
Golden-crowned Sparrow (*Zonotrichia atricapilla*)
*White-crowned Sparrow (*Zonotrichia leucophrys*)
**FAMILY: CARDINALIDAE (Cardinals, Grosbeaks and Allies)**
*Blue Grosbeak (*Passerina caerulea*)
**FAMILY: ICTERIDAE (Blackbirds, Orioles and Allies)**
*Red-winged Blackbird (*Agelaius phoeniceus*)
Tricolored Black Bird (*Agelaius tricolor*)
*Western Meadowlark (*Sturnella neglecta*)
*Yellow-Headed Blackbird (*Xanthocephalus xanthocephalus*)
*Brewer's Blackbird (*Euphagus cyanocephalus*)

*Great-Tailed Grackle (*Quiscalus mexicanus*)
*Brown-headed Cowbird (*Molothrus ater*)
**FAMILY: FRINGILLIDAE (Finches)**
*House Finch (*Carpodacus mexicanus*)
**FAMILY: PASSERIDAE (Old World Sparrows)**
House Sparrow (*Passer domesticus*)

**CLASS: MAMMALIA (Mammals)**
**ORDER: DIDELPHIMORPHIA (Marsupials)**
**FAMILY: DIDELPHIDAE (Opossums)**
Virginia Opossum (*Didelphis virginiana*)
**ORDER: INSECTIVORA (Insectivores)**
Ornate Shrew (*Sorex ornatus*)
**ORDER: CHIROPTERA (Bats)**
**FAMILY: PHYLLOSTOMIDAE (Leaf-nosed Bats)**
Southern Long-nosed Bat (*Leptonycteris curasoae*)
**FAMILY: VESPERTILIONIDAE (Evening Bats)**
Yuma Myotis (*Myotis yumanensis*)
California Myotis (*Myotis californicus*)
Pale Big-eared Bat (*Corynorhinus townsendii pallescens*)
Townsend's Western Big-eared Bat (*Corynorhinus townsendii townsendii*)
Western Pipistrelle (*Pipistrellus hesperus*)
Big Brown Bat (*Eptesicus fuscus*)
Western Red Bat (*Lasiurus borealis*)
Pallid Bat (*Antrozous pallidus*)
**FAMILY: MOLOSSIDAE (Free-tailed Bat)**
California Mastiff Bat (*Eumops perotis* ssp. *californicus*)
Brazilian Free-tailed Bat (*Tadarida brasiliensis*)
**ORDER: LAGOMORPHA (Rabbits, Hares, and Pikas)**
**FAMILY: LEPORIDAE (Rabbits and Hares)**
*Desert Cottontail (*Sylvilagus audubonii*)
Black-tailed (Hare) Jackrabbit (*Lepus californicus*)
**ORDER: RODENTIA (Rodents)**
**FAMILY: SCIURIDAE (Squirrels, Chipmunks, and Marmots)**
*California Ground Squirrel (*Otospermophilus beecheyi*)
**FAMILY: GEOMYIDAE (Pocket Gophers)**
Botta's Pocket Gopher (*Thomomys bottae*)
**FAMILY: HETEROMYIDAE (Pocket Mice and Kangaroo Rats)**
San Joaquin Pocket Mouse (*Perognathus inornatus*)
Heermann's Kangaroo Rat (*Dipodomys heermani*)
Short-Nosed Kangaroo Rat (*Dipodomys nitratoides brevinasus*)
**FAMILY: MURIDAE (Old World Rats and Mice)**
Western Harvest Mouse (*Reithrodontomys megalotis*)
Deer Mouse (*Peromyscus maniculatus*)
Norway Rat (*Rattus norvegicus*)

House Mouse (*Mus musculus*)
California Vole (*Microtus californicus*)
Southern Grasshopper Mouse (*Onchomys torridus ramona*)

**ORDER: CARNIVORA (Carnivores)**

**FAMILY: CANIDAE (Foxes, Wolves, and relatives)**

*****Coyote (*Canis latrans*)
Gray Fox (*Urocyon cinereoargenteus*)
San Joaquin Kit Fox (*Vulpes macrotis mutica*)

**FAMILY: PROCYONIDAE (Raccoons and relatives)**

*Raccoon (*Procyon lotor*)

**FAMILY: MUSTELIDAE (Weasels, Badgers, and relatives)**

Badger (*Taxidea taxus*)

**FAMILY: MEPHITIDAE (Skunks)**

Striped Skunk (*Mephitis mephitis*)

**FAMILY: FELIDAE (Cats)**

Bobcat (*Lynx rufus*)
Feral Cat (*Felis domesticus*)

**ORDER: ARTIODACTYLA (Even-toes Ungulates)**

**FAMILY: CERVIDAE (Deer, Elk, and relatives)**

Black-tailed Deer (*Odocoileus hemionus columbianus*)

**FAMILY: BOVIDAE (Sheep, Goats, and relatives)**

*****Domestic Sheep (*Ovis aries*)

# APPENDIX C: SELECTED PHOTOS OF WSP PLAN AREA

Picture # 1: Agricultural field, disced.

Picture #2: Agricultural field, disced


Picture #3: Agricultural field, cultivation of garlic.


Picture #4: Agricultural field, orchard.

Picture #5: Irrigation canal (foreground), access road and pasture field (background).

Picture #6: Fallow field.


Picture #7: Agricultural canal, sparse vegetation.


Picture #8: Agricultural canal, moderate vegetation, access road on left.

Picture #9: Off-site tailwater pond, dry with riparian fringe in background.

Picture #10: Off-site tailwater pond, fringed with riparian vegetation.

Picture #11: Burrowing owl perched next to existing burrow and adjacent agricultural canal.

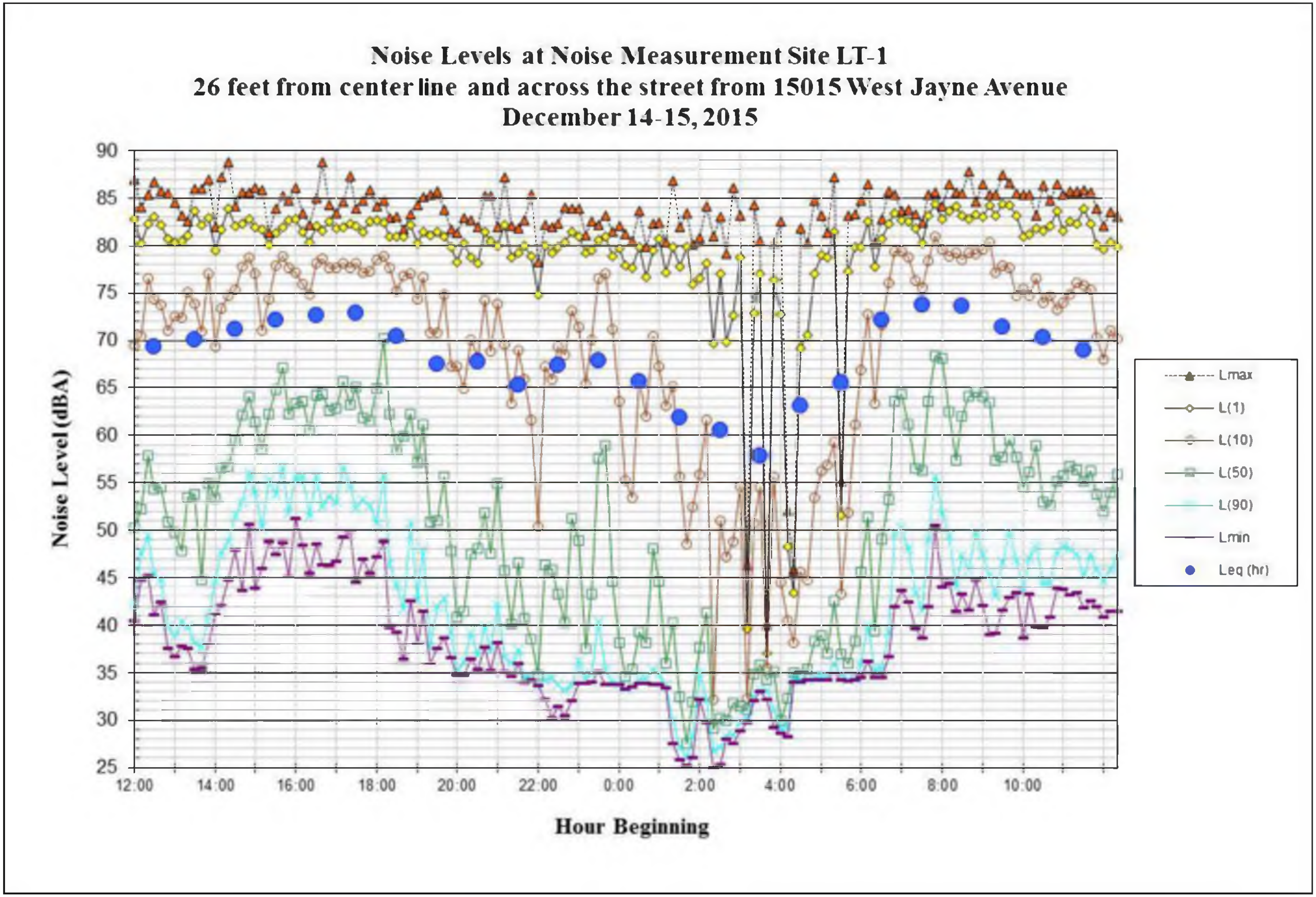
# APPENDIX E

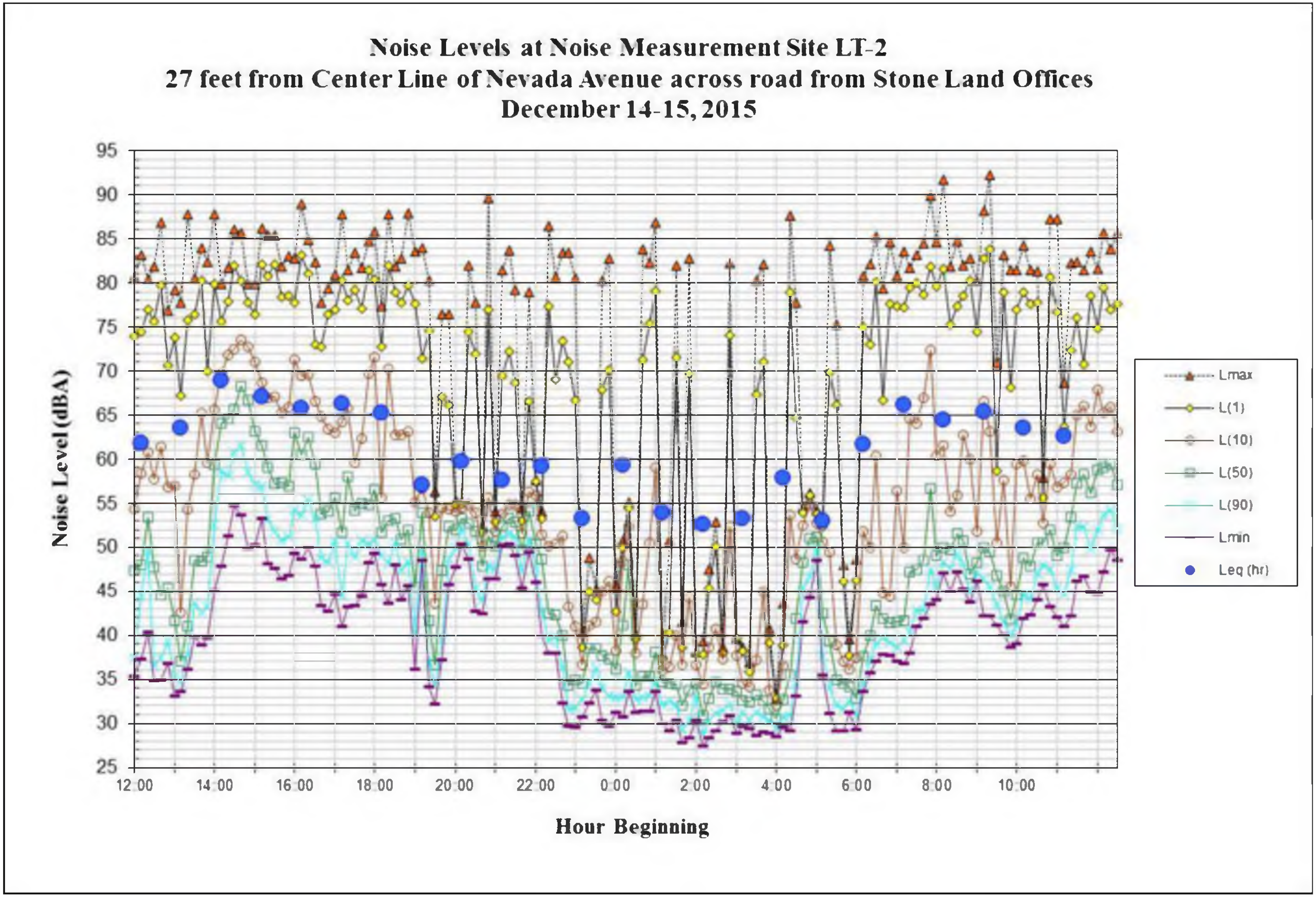
## Noise Technical Appendix

**Prepared by**

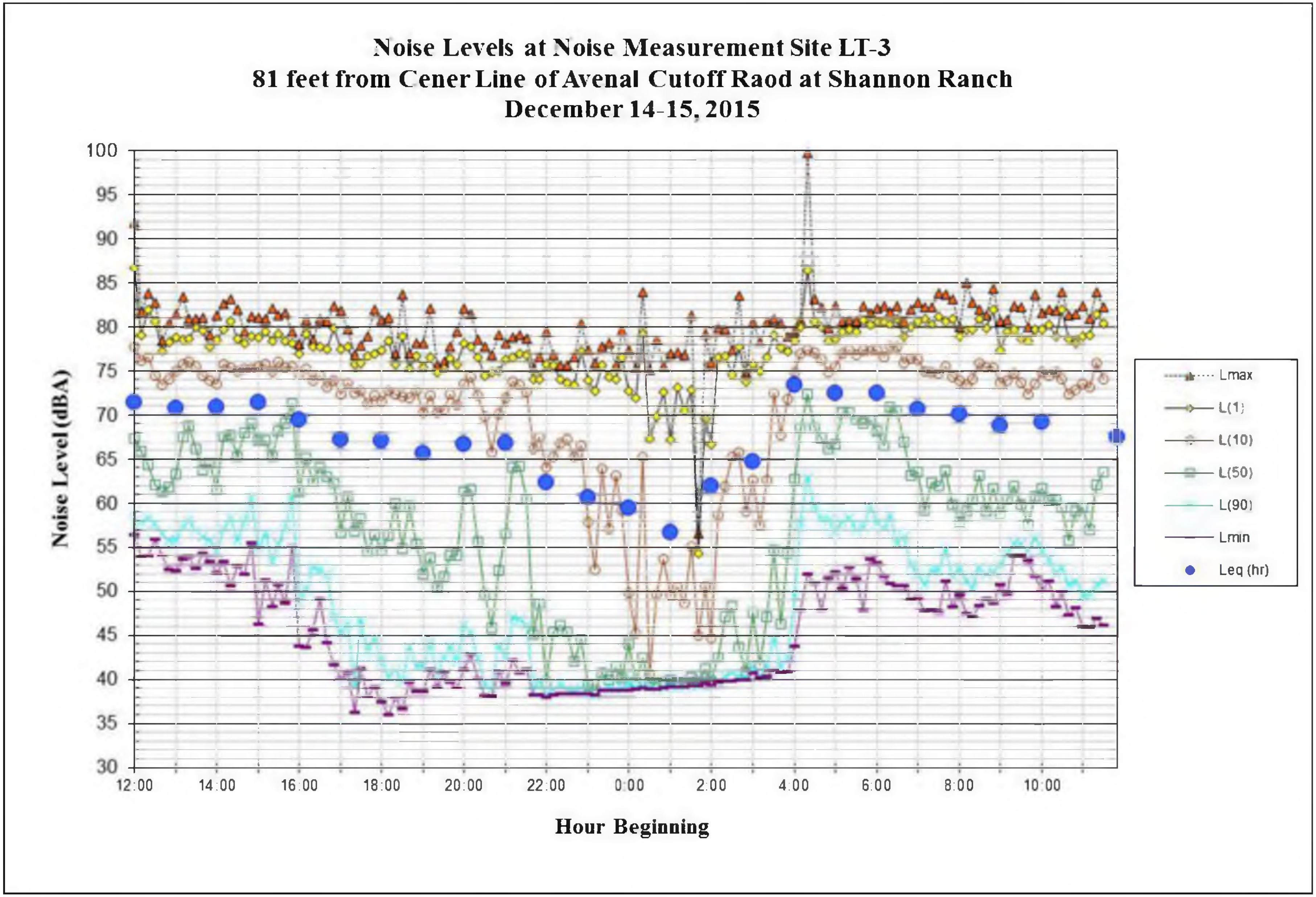
**Illingworth & Rodkin**

**December 2015**


Noise Levels at Noise Measurement Site LT-1
26 feet from center line and across the street from 15015 West Jayne Avenue
December 14-15, 2015
Noise Level (dBA)
90
85
80
75
70
65
60
55
50
45
40
35
30
25
12:00
14:00
16:00
18:00
20:00
22:00
0:00
2:00
4:00
6:00
8:00
10:00
Hour Beginning
Lmax
L(1)
L(10)
L(50)
L(90)
Lmin
Leq (hr)



Noise Levels at Noise Measurement Site LT-2
27 feet from Center Line of Nevada Avenue across road from Stone Land Offices
December 14-15, 2015
Noise Level (dBA)
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
12:00
14:00
16:00
18:00
20:00
22:00
0:00
2:00
4:00
6:00
8:00
10:00
Hour Beginning
Lmax
L(1)
L(10)
L(50)
L(90)
Lmin
Leq (hr)



Noise Levels at Noise Measurement Site LT-3
81 feet from Cener Line of Avenal Cutoff Raod at Shannon Ranch
December 14-15, 2015
Noise Level (dBA)
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
12:00
14:00
16:00
18:00
20:00
22:00
0:00
2:00
4:00
6:00
8:00
10:00
Hour Beginning
Lmax
L(1)
L(10)
L(50)
L(90)
Lmin
Leq (hr)

# APPENDIX F

## Paleontological Report

**Prepared by**

**Applied EarthWorks**

**June 2017**

# Paleontological Resource Assessment for the Westlands Solar Park and Gen-Tie Project, Fresno and Kings Counties, California

Heather L. Clifford and Jessica L. DeBusk

Prepared By

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June 2017

# SUMMARY OF FINDINGS

At the request of Bert Verrips Environmental Consulting Services, Applied EarthWorks, Inc. (Æ) performed a paleontological resource inventory in support of the Westlands Solar Park and Gen-Tie Project (Project) in Fresno and Kings Counties, California. The Project area is south of State Route (SR) 198, west of SR 41 and the Kings River, and east of Interstate 5 (I-5) and the Coast Ranges, within the western San Joaquin Valley. This study consisted of a search of museum collections records maintained by the Natural History Museum of Los Angeles County, the University of California Museum of Paleontology online database, and the Paleobiology Database as well as a comprehensive literature and geologic map review and preparation of this technical report. This report summarizes the methods and results of a paleontological resource assessment and provides Project-specific management recommendations. This study is intended to illustrate compliance with the California Environmental Quality Act (CEQA).

The purpose of the literature review and museum records search was to identify the geologic unit(s) underlying the Project area and to determine whether previously recorded paleontological localities occur either within the Project boundaries or within the same geologic unit elsewhere. Using the results of the literature review and museum records search, the paleontological resource potential of the Project area was determined in accordance with Society of Vertebrate Paleontology guidelines.

Published geologic mapping indicates that the Project area is underlain by Pleistocene to Holocene sedimentary units, including alluvial fan, basin, and lacustrine deposits of the Great Valley. According to the museum records search results, at least six vertebrate localities have been documented from within similar Pleistocene age deposits in Kings County, within the vicinity of the Project. These localities yielded fossilized specimens of terrestrial mammals, reptiles, and fish. One locality in particular, the Witt Site near Kettleman City, yielded over 1,500 vertebrate fossil specimens. No vertebrate fossil localities have been previously recorded directly within the Project boundary.

As a result of this study, portions of the Project area are determined to have a high paleontological sensitivity and the likelihood of impacting scientifically significant vertebrate fossils as a result of Project construction is high. Therefore, it is recommended that a qualified paleontologist be retained to develop and implement a Paleontological Resource Mitigation Plan during Project construction. This plan would include mitigation measures that have been proven to be effective in reducing or eliminating adverse impacts to paleontological resources and would satisfy the requirements of CEQA. The recommended mitigation measures include a field reconnaissance survey; paleontological mitigation monitoring by a qualified paleontologist; and preparation of a Paleontological Mitigation Report, which should be submitted to the approved curation facility, accompanied by all significant fossils found during the course of construction monitoring.

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# 1
# INTRODUCTION

At the request of Bert Verrips Environmental Consulting Services, Applied EarthWorks, Inc. (Æ) performed a paleontological resource inventory in support of the Westlands Solar Park and Gen-Tie Project (Project) in Fresno and Kings Counties, California (Figure 1-1). The assessment consisted of a museum records search; comprehensive literature and geologic map review; and preparation of this technical report, including Project-specific management recommendations. The Westlands Water District (WWD) will serve as the California Environmental Quality Act (CEQA) Lead Agency.

## 1.1 PROJECT LOCATION

The Project area is located south of State Route (SR) 198, west of SR 41 and the Kings River, and east of Interstate 5 (I-5) and the Coast Ranges, within the western San Joaquin Valley. The Project area encompasses approximately 21,000 acres on Westlands Water District land and privately held lands. Specifically, the Project is mapped within portions of Township 19 South, Range 19 East, Sections 31-32; Township 20 South, Range 17 East, Sections 25-26 and 33-36; Township 20 South, Range 18 East, Sections 1, 11-12, 14-16, 19-21, 24-26, and 30-36; Township 20 South, Range 19 East, Sections 3-10, 14-23, 26-28, and 31-35; Township 21 South, Range 18 East, Sections 2-3, and 12; Township 21 South, Range 19 East, Sections 2-10, 15-21, and 29-32; Township 22 South, Range 18 East, Section 1; and Township 22 South, Range 19 East, Section 6 on the Huron, Westhaven, Stratford, Kettleman City CA 7.5-minute U.S. Geological Survey quadrangles.

## 1.2 PROJECT DESCRIPTION

The Westlands Solar Park (WSP) Master Plan is an overall plan of development for solar generating facilities within WSP. The WSP Master Plan is intended to serve as the planning framework for a series of utility-scale photovoltaic (PV) solar energy generating facilities with a combined generating capacity of approximately 2,000 megawatts (MW). It is expected that solar PV projects developed within WSP would have varying generating capacities, with the power output from the solar facilities ranging from about 90 MW to a maximum of 250 MW. The installation of solar generating facilities is planned to occur incrementally over a 15-year build-out period extending from 2016 to 2030 (inclusive), with an average installation rate of about 133 MW per year. For planning purposes, the Master Plan area is divided into 12 subareas and includes planned locations for two large switching stations to provide interconnection to the state's power grid (Bert Verrips, Personal Communication, November 5, 2015).

The Project includes two transmission corridors to convey WSP solar generated power to the statewide electrical grid via the Gates Substation. The description of the generation tie-line (gen-tie) corridors is as follows (Bert Verrips, Personal Communication, November 5, 2015):

a. <u>WSP-North to Gates Gen-Tie Corridor</u> – This planned 230-kilovolt (kV) transmission corridor would run parallel and adjacent to the existing 230-kV Henrietta-Gates transmission line, commencing at a planned switching station in the northern portion of WSP and running southwestward for 11.5 miles to the eastern fenceline of the Gates Substation. This transmission corridor would serve as a gen-tie providing delivery of solar power generated in the northern and central portions of the WSP to the Gates Substation where it would be transferred to the State electrical grid.

b. WSP-South to Gates Gen-Tie Corridor – This planned 230-kV transmission corridor would run parallel and adjacent to the Nevada-Jayne Avenues roadway right-of-way, commencing at a planned switching station on Nevada Avenue in the southern portion of WSP and running westward for 11.5 miles to the eastern fenceline of the Gates Substation. This transmission corridor would serve as a gen-tie line providing delivery of solar power generated in the central and southern portions of the WSP to the Gates Substation where it would be transferred to the State electrical grid.

## 1.3 PURPOSE OF INVESTIGATION

The purpose of this investigation is to: (1) identify the geologic units within the Project area and assess their paleontological resource potential; (2) determine whether the Project has the potential to adversely affect known scientifically significant paleontological resources; and (3) provide Project-specific management recommendations for paleontological resource mitigation, as necessary. The study was conducted in accordance with professional standards and guidelines set forth by the Society of Vertebrate Paleontology (SVP, 2010) and meets the requirements of the laws and regulations described in Chapter 2.

## 1.4 KEY PERSONNEL

This paleontological assessment was prepared under the direction of Æ's Paleontology Program Manager, Jessica DeBusk, who served as Senior Paleontologist and provided a quality assurance review of this report. Associate Paleontologist Heather Clifford requested the museum records searches, conducted the literature and geologic map review, produced all graphics, and served as the primary author of this report. DeBusk has more than 14 years of professional experience as a consulting paleontologist and meets the SVP's definition of a qualified professional paleontologist.

## 1.5 REPORT ORGANIZATION

This report documents the results of Æ's paleontological resource assessment of the Project area. Chapter 1 has introduced the scope of work, identified the Project location, described the Project, defined the purpose of the investigation, and presented key personnel. Chapter 2 outlines the regulatory framework governing the Project. Chapter 3 defines the paleontological significance and sensitivity of the Project. Chapter 4 describes methods, and Chapter 5 provides an overview of the geology and paleontology of the Project area. Chapter 6 presents an analysis and the results of the study. Chapter 7 provides management recommendations, while conclusions are presented in Chapter 8. Lastly, Chapter 9 lists references cited.

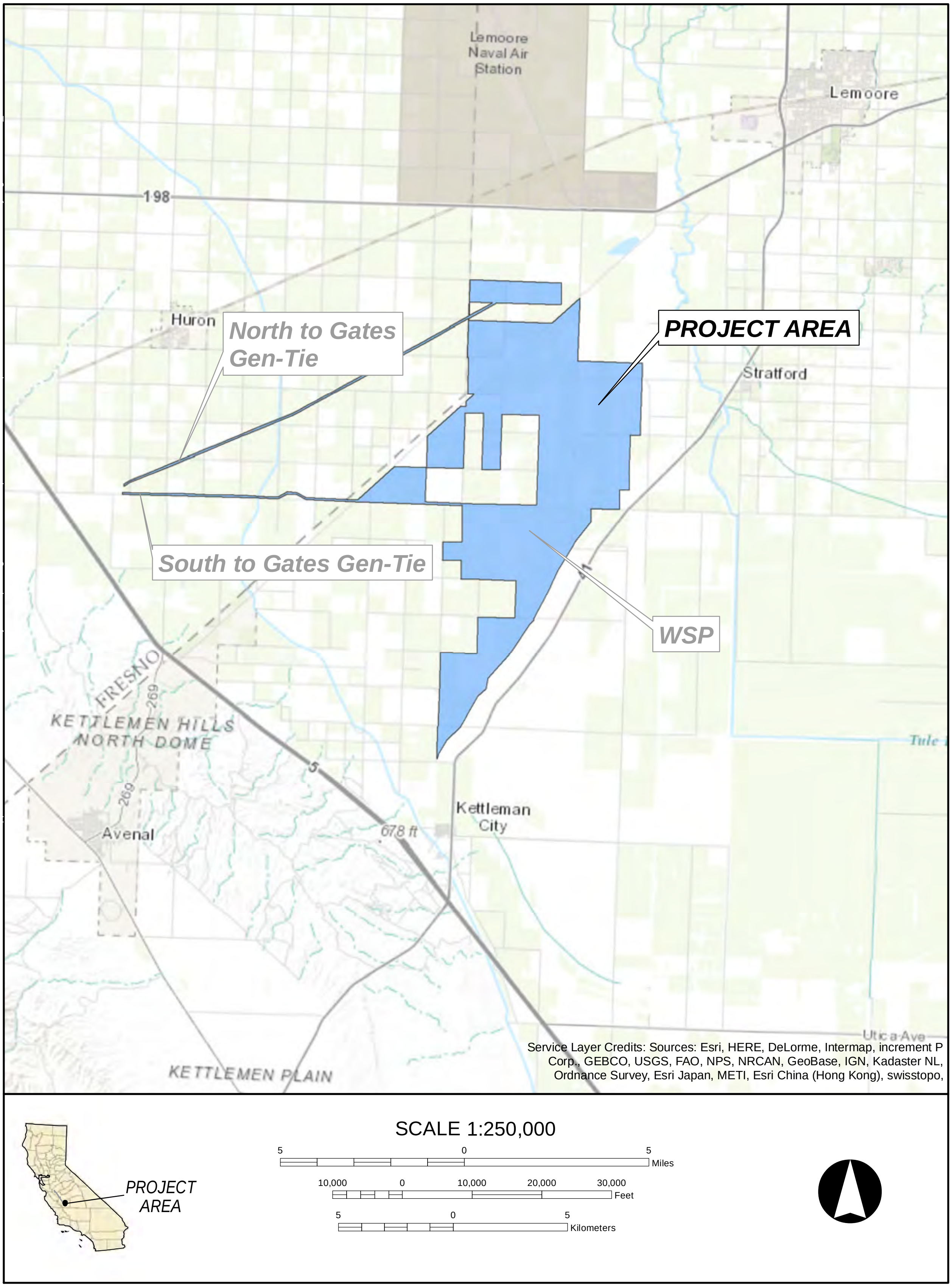


**Figure 1-1 Project vicinity map.**

# 2
# REGULATORY FRAMEWORK

Paleontological resources (i.e., fossils) are considered nonrenewable scientific resources because once destroyed, they cannot be replaced. As such, paleontological resources are afforded protection under various federal, state, and local laws and regulations. Laws pertinent to this project are discussed below.

## 2.1 STATE

### 2.1.1 California Environmental Quality Act (CEQA)

Paleontological resources cannot be replaced once they are destroyed. Therefore, paleontological resources are considered nonrenewable scientific resources and are protected under the CEQA. Specifically, in Section V(c) of Appendix G of the CEQA Guidelines, the “Environmental Checklist Form,” the question is posed: “Will the project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature” (Association of Environmental Professionals, 2015). In order to determine the uniqueness of a given paleontological resource, it must first be identified or recovered (i.e., salvaged). Therefore, mitigation of adverse impacts to paleontological resources is mandated by CEQA.

### 2.1.2 California Public Resources Code

California Public Resources Code (PRC) 5097.5 affirms that no person shall willingly or knowingly excavate, remove, or otherwise destroy a vertebrate paleontological site or paleontological feature without the express permission of the overseeing public land agency. It further states under PRC 30244 that any development that would adversely impact paleontological resources shall require reasonable mitigation. These regulations apply to projects located on land owned by or under the jurisdiction of the state or city, county, district, or other public agency (California Office of Historic Preservation, 2005).

## 2.2 LOCAL

### 2.2.1 County of Fresno

Paleontological resources are addressed in the Open Space and Conservation Element of the Fresno County 2000 General Plan Background Report (County of Fresno, 2013). Open Space and Conservation Element policy OS-J.4 specifically addresses the treatment of paleontological resources for which the following implementation policy is set forth:

> The County shall require that discretionary development projects, as part of any required CEQA review, identify and protect important historical, archeological, paleontological, and cultural sites and their contributing environment from damage, destruction, and abuse to the maximum extent feasible. Project-level mitigation shall include accurate site

surveys, consideration of project alternatives to preserve archeological and historic resources, and provision for resource recovery and preservation when displacement is unavoidable [5-31].

### 2.2.2 County of Kings

Kings County does not have mitigation requirements that specifically address potential adverse impacts to paleontological resources.

# 3
# PALEONTOLOGICAL RESOURCE ASSESSMENT GUIDELINES AND SIGNIFICANCE CRITERIA

## 3.1 DEFINITION OF PALEONTOLOGICAL RESOURCES AND SIGNIFICANCE CRITERIA

Paleontological resources are the evidence of once-living organisms as preserved in the rock record. They include both the fossilized remains of ancient plants and animals and the traces thereof (trackways, imprints, burrows, etc.). In general, fossils are considered to be greater than 5,000 years old (older than Middle Holocene) and are typically preserved in sedimentary rocks. Although rare, fossils can also be preserved in volcanic rocks and low-grade metamorphic rocks formed under certain conditions (SVP, 2010).

Significant paleontological resources are defined as "identifiable" vertebrate fossils, uncommon invertebrate, plant, and trace fossils that provide taphonomic, taxonomic, phylogenetic, paleoecologic, stratigraphic, or biochronological data (SVP, 2010). These data are important because they are used to examine evolutionary relationships, provide insight into the development of and interaction between biological communities, establish time scales for geologic studies, and for many other scientific purposes (Scott and Springer, 2003; SVP, 2010).

## 3.2 PROFESSIONAL STANDARDS AND PALEONTOLOGICAL RESOURCE SENSITIVITY

Absent specific agency guidelines, most professional paleontologists in California adhere to guidelines set forth by SVP in "Standard Procedures for the Assessment and Mitigation of Adverse Impacts to Paleontological Resources" (SVP, 2010). These guidelines establish detailed protocols for the assessment of the paleontological resource potential (i.e., "sensitivity") of a Project area and outline measures to follow in order to mitigate adverse impacts to known or unknown fossil resources during project development. In order to prevent project delays, SVP highly recommends that the owner or developer retain a qualified professional paleontologist in the advance planning phases of a project to conduct an assessment and to implement paleontological mitigation during construction, as necessary.

Using baseline information gathered during a paleontological resource assessment, the paleontological resource potential of the geologic unit(s) (or members thereof) underlying a Project area can be assigned to one of four categories defined by SVP (2010). These categories include high, undetermined, low, and no potential. The criteria for each sensitivity classification and the corresponding mitigation recommendations are summarized in Table 3-1 below.

If a Project area is determined to have high or undetermined potential for paleontological resources following the initial assessment, then SVP recommends that a Paleontological Resource Mitigation Plan (PRMP) be developed and implemented during the construction phase of a project. The mitigation plan describes, in detail, when and where paleontological monitoring will take place and establishes communication protocols to be followed in the event that an unanticipated fossil discovery is made during project development. If significant fossil resources are known to occur within the boundary of the project and have not been collected, then the plan will outline the procedures to be followed prior to any ground-disturbing activities (i.e., preconstruction salvage efforts or avoidance measures, including fencing off a locality). Should microfossils be known to occur in the geologic unit(s) underlying the Project area or suspected to occur, then the plan will describe the methodology for matrix sampling and screening.

**Table 3-1**
**Paleontological Sensitivity Categories**

| Resource Potential* | Criteria | Mitigation Recommendations |
|---|---|---|
| No Potential | Rock units that are formed under or exposed to immense heat and pressure, such as high-grade metamorphic rocks and plutonic igneous rocks. | No mitigation required. |
| Low Potential | Rock units that have yielded few fossils in the past, based upon review of available literature and museum collections records. Geologic units of low potential also include those that yield fossils only on rare occasion and under unusual circumstances. | Mitigation is not typically required. |
| Undetermined Potential | In some cases, available literature on a particular geologic unit will be scarce and a determination of whether or not it is fossiliferous or potentially fossiliferous will be difficult to make. Under these circumstances, further study is needed to determine the unit's paleontological resource potential (i.e., field survey). | A field survey is required to further assess the unit's paleontological potential. |
| High Potential | Geologic units with high potential for paleontological resources are those that have proven to yield vertebrate or significant invertebrate, plant or trace fossils in the past or are likely to contain new vertebrate materials, traces, or trackways. Rock units with high potential also may include those that contain datable organic remains older than late Holocene (e.g., animal nests or middens). | Typically, a field survey (dependent on field conditions) as well as onsite construction monitoring will be required. Any significant specimens discovered will need to be prepared, identified, and curated into a museum. A final report documenting the significance of the finds will also be required. |

*Adapted from SVP (2010).

The PRMP should be prepared by a qualified professional paleontologist and developed using the results of the initial paleontological assessment and survey. Elements of the plan can be adjusted throughout the course of a project as new information is gathered and conditions change, so long as the lead agency is consulted and all parties are in agreement. For example, if after 50 percent of earth-disturbing activities have occurred in a particular unit or area, and no fossils whatsoever have been discovered, then the project paleontologist can reduce or eliminate monitoring efforts in that unit or area.

# 4
# METHODS

Paleontological resources are not found in "soil" but are contained within the consolidated or unconsolidated geologic deposits or bedrock that underlies the soil layer. Therefore, in order to ascertain whether a particular Project area has the potential to contain significant fossil resources at the subsurface, it is necessary to review relevant scientific literature and geologic mapping to determine the underlying geology and stratigraphy of the area. Further, to delineate the boundaries of an area of paleontological sensitivity it is necessary to determine the extent of the entire geologic unit, because paleontological sensitivity is not limited to surface exposures of fossil material.

To determine whether fossil localities have been previously discovered within a Project area or a particular rock unit, a search of pertinent local and regional museum repositories for paleontological localities within and nearby the Project area should be performed. For this Project, a museum records search was conducted at the Natural History Museum of Los Angeles County (LACM). The museum records search was supplemented by a review of the University of California Museum of Paleontology's (UCMP's) online database and the Paleobiology Database (PDBD), which contain additional paleontological records for Fresno and Kings Counties.

# 5
# GEOLOGY AND PALEONTOLOGY

## 5.1 REGIONAL GEOLOGY

The Project area is located in the San Joaquin Valley within the Great Valley (also referred to as the Central Valley) geomorphic province of California. A geomorphic province is a region of unique topography and geology that is readily distinguished from other regions based on its landforms and diastrophic history (Norris and Webb, 1976). The Great Valley is a north-northwest–trending asymmetric structural trough bisected by the Stockton Arch, a structural feature that subdivides the region into the Sacramento Valley in the north and the San Joaquin Valley to the south. The Great Valley is roughly 400 miles long and 50 miles wide and was covered by marine waters as far back as the Jurassic and into the Paleogene. Deposition into the Great Valley began during the Late Jurassic as the paleo-Sierra Nevada began to rise and deliver eroded sediments to the lowlands. Forearc (i.e., the deep marine region between a volcanic arc and the associated subduction zone) marine and nonmarine shale, sandstone, and conglomerate of the Cretaceous Central Valley Sequence were deposited during this time unconformably on top of the Franciscan Complex of the Coast Ranges and the Sierran Batholith (Bartow and Nilsen, 1990). During the late Mesozoic and much of the Cenozoic, the actively subsiding region persisted as a submerged lowland basin known as the Great Valley Sea (Harden, 1998). By the Pliocene, most of the marine waters in the Great Valley were drained (brackish and freshwater lakes remained) coincident with an orogenic (i.e., mountain-building) episode near the present-day Coast Ranges, resulting in their uplift above sea level (Weissmann et al., 2005). Subsequently, during the Quaternary period, extensive deposits of terrestrial material, including alluvial fan, fluvial, basin, and lacustrine sediments, were deposited in the Great Valley (Norris and Webb, 1976) during continued uplift and erosion of the Sierra Nevada and Temblor and Diablo Ranges within the Coast Ranges.

The present surface of the valley floor is dominated by well-developed soils formed from alluvial parent rock, including unconsolidated Pleistocene age arkosic alluvial sediments derived from the drainage of the glaciated Sierra Nevada; alluvial fan deposits originating from the metamorphic-rich Coast Ranges; and Holocene alluvial sediments deposited within the flood and delta plains of the Sacramento and San Joaquin River watersheds (Bartow, 1991; Matthews and Burnett, 1965; Norris and Webb, 1976; Weissmann et al., 2005). In general, the western side of the San Joaquin Valley, which encompasses the Project area, is characterized by steeply to gently sloping alluvial fans derived from erosion of the Coast Ranges (Bull, 1964; Jennings and Strand, 1958). These Quaternary age alluvial fan sediments interfinger with the Pleistocene to Holocene Sierran detritus along roughly the central margin of the valley floor, east of the Project area (Bartow, 1991). In the vicinity of the Project area, the geomorphology is relatively flat but also consists of minor topographic relief derived from flooding and fluvial processes, including terraces and sloughs. In general, the soils are sandy, permeable, and fertile but may consist of hardpan in some areas (Croft and Gordon, 1968).

## 5.2 GEOLOGY AND PALEONTOLOGY OF THE PROJECT AREA

The Project area is mapped at a scale of 1:250,000 by Matthews and Burnett (1965) and is underlain by Quaternary age deposits, including unnamed alluvial fan (Qf), basin (Qc), fluvial (Qb), and lacustrine deposits (Ql). The lithology, stratigraphy, and paleontology of these units are described in the following sections and depicted in Appendix A. An overview of the geology and paleontological sensitivity of the Project area is shown on Figure 5-1.

### 5.2.1 Quaternary Older Alluvium (Qc)

Quaternary alluvial fan and fluvial deposits of Middle to Late Pleistocene age (Qc) are exposed in a very small area (less than 5 acres) at the southern tip of the Project area (Lettis, 1982; Matthews and Burnett, 1965). The Pleistocene deposits consist of unconsolidated coarse to fine sand and silt with abundant pebbles and cobbles, which drained from the Coast Ranges during the Quaternary period. The Pleistocene age sediments typically display well-developed soil and dissection by channels that are partially filled with Holocene age alluvium (Helley and Graymer, 1997). The total thickness of the Pleistocene deposits varies locally, but is up to 150 feet thick in the vicinity of the proposed Project area (Barlock, 1988). Quaternary alluvial deposits of Pleistocene age have yielded significant vertebrate fossil localities throughout Kings County, especially within the fine-grained lacustrine sediments of the Tulare Lake deposits (UCMP, 2015). Pleistocene age alluvial sediments in Kings County have preserved a characteristic Ice Age vertebrate fauna of large land mammals, including specimens of bison, camel, mammoth, horse, wolf, sloth, and gopher. Further north, during excavations near Tranquility, California, 149 vertebrate localities were recorded, which yielded over 100 specimens of mammal, bird, reptile, and fish (UCMP, 2015). The depth of fossil recovery is unreported.

### 5.2.2 Tulare Lake Lacustrine Deposits (Ql)

Quaternary lacustrine deposits (Ql) of Pleistocene to Holocene age (with age increasing with depth), attributed to former Tulare Lake, are mapped along the southeastern to eastern margin of the Project area (Matthews and Burnett, 1965; McLeod, 2015). The Tulare Lake deposits underlie a large shallow depression in southeastern Kings County, which extends into neighboring Tulare and Kern Counties (Page, 1983). Former Tulare Lake formed in response to climatic changes during Pleistocene glaciation, and later evolved into a seasonal playa during the warmer Holocene. During this time, according to Page (1983), the accumulation of Tulare Lake deposits exceeded several thousand feet below ground surface (bgs). The Tulare Lake deposits, as mapped by Matthews and Burnett (1965), consist of flood-plain, lake, and marsh deposits derived from both Sierran and Coast Ranges sources, which are composed of mostly clay and silt, with subordinate sand (Page, 1983). These fine-grained sediments intercalate with the fluvio-lacustrine Late Pliocene to Early Pleistocene Tulare Formation and unconformably overlie the Pliocene San Joaquin Formation.

Pleistocene age sedimentary deposits have yielded significant vertebrate fossil localities throughout the Central Valley. Fine-grained lacustrine sediments, such as the Tulare Lake deposits, have an especially high potential for the preservation of fossilized remains (SVP, 2010; UCMP, 2015). According to Page (1983), the fine-grained deposits in the Tulare Lake bed

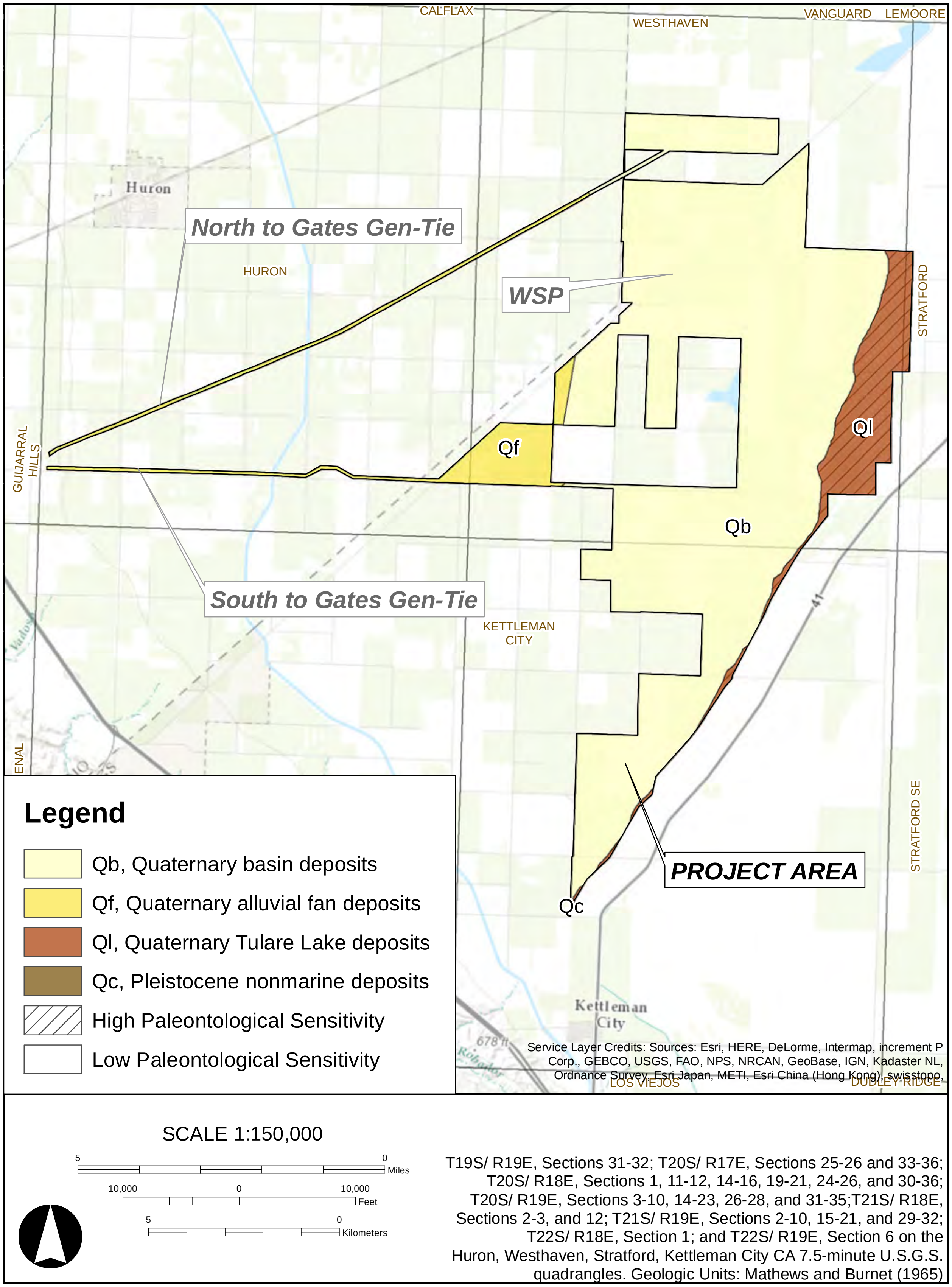


**Figure 5-1 Overview of the Geologic Units and Paleontological Sensitivity in the Project Area.**

"were laid down seemingly without interruption throughout the late Pliocene, the entire Pleistocene, and the Holocene. Beneath Tulare Lake bed these deposits would probably yield excellent (geologic) data in the form of fossils (11)." The UCMP online database maintains records for at least two vertebrate localities identified within Pleistocene Tulare Lake deposits from Kings County, which yielded specimens of mammoth, bison, ground sloth, turtle, and other unspecified mammals. Another UCMP locality, the Witt Site (V82055) near Kettleman City, within the boundary of former Tulare Lake, yielded over 1,500 Pleistocene age vertebrate fossil specimens, including taxa of bison, horse, mammoth, ground sloth, wolf, badger, rodent, turtle, and fish. The depth of fossil recovery is unreported.

#### 5.2.3 Quaternary Alluvium (Qf, Qb)

Quaternary alluvial fan (Qf) and basin deposits (Qb) of Holocene to latest Pleistocene age underlie the majority of the Project area (Matthews and Burnett, 1965). These Quaternary alluvial fan deposits are poorly documented relative to other late Cenozoic sedimentary deposits in the region, especially with respect to the well-known Pleistocene Modesto and Riverbank Formations on the eastern side of the Central Valley. The alluvial fans of the western San Joaquin Valley are composed of coarse- to fine-grained alluvial sediments primarily derived from erosion of volcanic, plutonic, and metamorphic rocks of the Coast Ranges (i.e., Coast Ranges alluvium). The Quaternary basin deposits are widespread along the center and west-central margin of the San Joaquin Valley and are derived from reworked Coast Ranges alluvium, with input from Sierran-derived alluvium transported from the eastern side of the valley (Bull, 1964). The Coast Ranges alluvium was deposited as a system of coalescing alluvial fans and terrace deposits consisting of locally variable compositions of silt, sand, gravel, and larger clasts, which grade from coarse gravel in the foothills of the Temblor and Diablo ranges to finer-grained sediments toward the interior of the San Joaquin Valley (Laudon and Belitz, 1989). Deposition of the Coast Ranges alluvium occurred by both alluvial (water-transported) and mudflow processes; as a result, the Coast Ranges alluvium includes both fine- to medium-grained, well to moderately sorted deposits and very coarse, poorly sorted sediments (Bull, 1964). Holocene deposits are generally considered too young to contain fossilized remains, but may shallowly overlie older Pleistocene deposits that have the potential to yield paleontological resources.

# 6
# ANALYSIS AND RESULTS

## 6.1 MUSEUM RECORDS SEARCH RESULTS

A museum records search of the Project area was conducted by the LACM on December 3, 2015 (McLeod, 2015). The LACM reports that although there are no previously recorded vertebrate fossil localities directly within the Project boundaries, at least three have been identified nearby from within similar Pleistocene age sedimentary deposits. East-southeast of the Project area, just north of city of Delano, locality LACM 1156 has yielded a fossil specimen of horse from younger Quaternary lacustrine deposits. Additionally, locality LACM 6701, located southeast of the Project area near White River, and LACM 4087, located southeast of the Project area east of Highway 65 near Terra Bella, have both yielded fossil specimens of mammoth.

A supplemental review of online museum collections records maintained by the UCMP online database and the PBDB was conducted in order to determine if any previously recorded paleontological resources occur within the Project area or vicinity. Records retrieved from the UCMP database do not provide the exact location of recovered fossil specimens; only a rough description of their general area of their recovery is given. The UCMP online database contains records for three vertebrate localities identified within Pleistocene alluvial deposits in western Kings County, which yielded fossil specimens of horse, bison, ground sloth, wolf, mammoth, camel, rodent, reptile, and fish. The UCMP localities include the Witt Site near Kettleman City (UCMP V82055), which has yielded at least 1,630 vertebrate specimens from similar Pleistocene deposits and is located approximately five miles southeast of the Project area on the southwest margin of the Tulare Lake Bed. The UCMP contained no vertebrate localities for Pleistocene alluvial deposits in western Fresno County. Further, PBDB contained no vertebrate fossil records for the Project area or vicinity. The results of the museum records search are summarized in Table 6-1.

**Table 6-1**
**Vertebrate Localities Reported in the Vicinity of the Project Area**

| Locality No. | Geologic Unit | Age | Taxa |
|---|---|---|---|
| LACM 1156 | Unnamed Pleistocene deposits | Pleistocene | *Equus* sp. (horse) |
| LACM 6701 | Unnamed Pleistocene deposits | Pleistocene | *Mammuthus* sp. (mammoth) |
| LACM 4087 | Unnamed Pleistocene deposits | Pleistocene | *Mammuthus* sp. |
| UCMP V69205 (Tulare Lake) | Unnamed Pleistocene deposits | Pleistocene | *Equus* sp., *Bison* sp. (bison), *Glossotherium* sp. (extinct ground sloth), Eutheria (placental mammal), *Clemmys marmorata* (turtle), Mammalia |

**Table 6-1**
**Vertebrate Localities Reported in the Vicinity of the Project Area in Kings County**

| Locality No. | Geologic Unit | Age | Taxa |
|---|---|---|---|
| UCMP V75041 (Tulare Lake W) | Unnamed Pleistocene deposits | Pleistocene | *Mammuthus* sp. |
| UCMP V82055 and PBDB 93249 (Witt Site) | Unnamed Pleistocene deposits | Pleistocene | *Clemmys marmorata*, *Chelonia*sp., (turtle), *Bison* sp., *Equus* sp., *Mammuthus* sp., Proboscidea (order that includes mammoths, mastodons, and elephants), *Glossotherium* sp., *Paramylodon* sp. (extinct ground sloth), Camelops sp. (camel), *Canis* sp. (genus of wolf), *Canisdirus* (extinct dire wolf), *Taxidea* sp. (badger), *Thomomys* sp. (pocket gopher), *Mylopharodon* sp. (fish), Osteichthyes (order of fish), Ungulata (clade of hooved mammals) |

Sources: UCMP, 2015, and PBDB, 2015.

## 6.2 PALEONTOLOGICAL RESOURCE POTENTIAL FOR GEOLOGIC UNITS WITHIN THE PROJECT AREA

Based on the literature review and museum records search results, the geologic units underlying the proposed Project area have a paleontological resource potential ranging from low to high in accordance with the SVP (2010) guidelines. The Quaternary older alluvial (Qc) and former Tulare Lake deposits (Ql) are considered to have a high paleontological resource potential in accordance to the SVP sensitivity scale because they have proven to yield vertebrate fossils near the proposed Project area and throughout California. Holocene-age alluvial and basin deposits (Qf, Qb) are determined to have a low paleontological resource potential, increasing with depth, because they are generally too young or too coarse to preserve significant fossilized; however, younger alluvium may overlie the older sensitive geologic deposits at depth. The paleontological sensitivity ratings of the geologic units underlying the Project area are listed below in Table 6-2 and depicted in Appendix B. Refer to Figure 5-1 for an overview of the paleontological sensitivity of the Project area.

**Table 6-2**
**Geologic Units in the Project Area and Their Recommended Paleontological Sensitivity**

| Geologic Unit* | Map Abbreviation | Age | Typical Fossils | Paleontological Resource Potential (SVP, 2010) |
|---|---|---|---|---|
| Quaternary alluvial fan and basin deposits of the Coast Ranges alluvium | Qf, Qb | Holocene (to latest Pleistocene at depth) | None | Low |
| Tulare Lake lacustrine deposits | Ql | Late Pleistocene to Holocene | Vertebrates | High |
| Quaternary older alluvium, fluvial and lacustrine lithologies | Qc | Middle to Late Pleistocene | Vertebrates | High |

*Geology taken from Matthews and Burnett (1965).

# 7
# MANAGEMENT RECOMMENDATIONS

The following management recommendations have been developed in accordance with SVP guidelines and, if implemented, will satisfy the requirements of CEQA. These measures have been used by professional paleontologists for many years and have proven to be effective in reducing or eliminating adverse impacts to paleontological resources as a result of private and public development projects throughout California and elsewhere.

## 7.1 WORKER'S ENVIRONMENTAL AWARENESS TRAINING

Prior to any ground-disturbing activities, all field personnel should receive a worker's environmental awareness training module on paleontological resources. The training should provide a description of the fossil resources that may be encountered in the Project area, outline steps to follow in the event that a fossil discovery is made, and provide contact information for the Project Paleontologist and on-site monitor(s). The training should be developed by the Project Paleontologist and may be conducted concurrent with other environmental training (e.g., cultural and natural resources awareness training, safety training, etc.).

## 7.2 PALEONTOLOGICAL RESOURCE MITIGATION PLAN (PRMP)

Prior to the commencement of ground-disturbing activities, a qualified and professional paleontologist should be retained to prepare and implement a PRMP for the Project. The PRMP should describe mitigation recommendations in detail, including field reconnaissance methodology; paleontological monitoring procedures; communication protocols to be followed in the event that an unanticipated fossil discovery is made during project development; and preparation, curation, and reporting requirements. The PRMP should include the following mitigation strategies described below.

### 7.2.1 Paleontological Reconnaissance Survey

A qualified paleontologist should be retained to conduct a field reconnaissance survey of the Project area prior to any ground-disturbing activities. The purpose of the field survey will be to inspect the ground surface visually for exposed fossils or traces thereof and to further evaluate geologic exposures for their potential to contain preserved fossil material at the subsurface. The field survey should be conducted in Project areas underlain by geologic units with a high paleontological sensitivity (e.g., Quaternary older alluvium and lacustrine deposits [Qc, Ql]); Project areas underlain by geologic units with low sensitivity should not be subject to the survey. Particular attention will be paid to rock outcrops, both inside and in the vicinity of the Project area, and any areas where geologic sediments are well exposed. Areas determined to be heavily disturbed or otherwise obscured by heavy vegetation, agriculture, or buildings, etc., may be subject to a windshield survey.

All fossil occurrences observed during the course of fieldwork, significant or not, should be adequately documented and recorded at the time of discovery. The data collected for each fossil occurrence should include, at minimum, the following information: Universal Transverse Mercator (UTM) coordinates, approximate elevation, description of taxa, lithologic description, and stratigraphic context (if known). In addition, each locality should be photographically documented with a digital camera. If feasible, with prior consent of the landowner(s), all significant or potentially significant fossils should be collected at the time they are observed in the field. If left exposed to the elements, fossil materials are subject to erosion and weathering. If the fossil discovery is too large to collect during the survey (e.g., a mammoth skeleton or bone bed) and requires a large-scale salvage effort, then it will be documented and a recovery strategy will be devised pursuant to SVP (2010) guidelines.

### 7.2.2 Paleontological Mitigation Monitoring

Prior to the commencement of ground-disturbing activities, a qualified and professional paleontologist should be retained to prepare and implement a PRMP for the Project. Initially, full-time monitoring may be required in the Project area during all ground-disturbing activities within the previously undisturbed geologic units with a high paleontological sensitivity (e.g., Quaternary older alluvium and lacustrine deposits [Qc, Ql]). Using the results of the field reconnaissance, together with Natural Resources Conservation Service soil data for the Project area obtained from the Web Soil Survey (The Soil Survey Staff, 2003), the depth of required monitoring may be adjusted based on the depth of soil development on sensitive geologic units. This is because paleontological resources are not found in “soil” but are contained within the consolidated or unconsolidated geologic deposits or bedrock that underlies the soil layer. In addition, spot-checking may also occur at the discretion of the Project Paleontologist in Project areas underlain by Quaternary alluvial deposits in order to determine if underlying sensitive geologic units are being impacted by construction, and at what depth.

Monitoring entails the visual inspection of excavated or graded areas and trench sidewalls. In the event that a paleontological resource is discovered, the monitor should have the authority to divert the construction equipment around the find temporarily until it is assessed for scientific significance and collected. Monitoring efforts can be reduced or eliminated at the discretion of the Project Paleontologist if no fossil resources are encountered after 50 percent of the excavations are completed.

Monitoring should include matrix screening for the presence of microfossils, the frequency of which will be determined by the Project Paleontologist. Monitoring is largely a visual inspection of sediments; therefore, the most likely fossils to be observed will be macrofossils of vertebrates (bones, teeth, tusk) or invertebrates (shells). At the discretion of the Project Paleontologist, the monitor should periodically screen sediments to check for the presence of microfossils that can be seen with the aid of a hand lens (i.e., microvertebrates). Should microvertebrate fossils be encountered during the screening process, then bulk matrix samples will be taken for processing off site. For each fossiliferous horizon or paleosol, a standard sample (4.0 cubic yards or 6,000 pounds) will be collected for subsequent wet screening per SVP (2010) guidelines.

### 7.2.3 Fossil Preparation, Curation, and Reporting

Upon completion of fieldwork, all significant fossils collected should be prepared in a properly equipped paleontology laboratory to a point ready for curation. Preparation should include the careful removal of excess matrix from fossil materials and stabilizing and repairing specimens, as necessary. Following laboratory work, all fossil specimens should be identified to the lowest taxonomic level possible, cataloged, analyzed, and delivered to an accredited museum repository for permanent curation and storage. The cost of curation is assessed by the repository and is the responsibility of the Project owner.

At the conclusion of laboratory work and museum curation, a final report should be prepared describing the results of the paleontological mitigation monitoring efforts associated with the Project. The report should include a summary of the field and laboratory methods, an overview of the Project area geology and paleontology, a list of taxa recovered (if any), an analysis of fossils recovered (if any) and their scientific significance, and recommendations. If the monitoring efforts produced fossils, then a copy of the report should also be submitted to the designated museum repository.

# 8
# CONCLUSIONS

This assessment is based on the results of a museum records search and review of available geologic and paleontologic literature. Therefore, only fossils that have already been inventoried or collected are available for this analysis. In addition to unrecorded surface fossils, there is the potential for an unknown number of paleontological resources buried within those geologic units underlying the Project area. These nonrenewable scientific resources may be at risk of being adversely impacted by ground-disturbing activities during construction of the Project. By implementing the management recommendations presented in Chapter 7, adverse impacts to paleontological resources can be reduced to a less than significant level pursuant to the requirements of CEQA.

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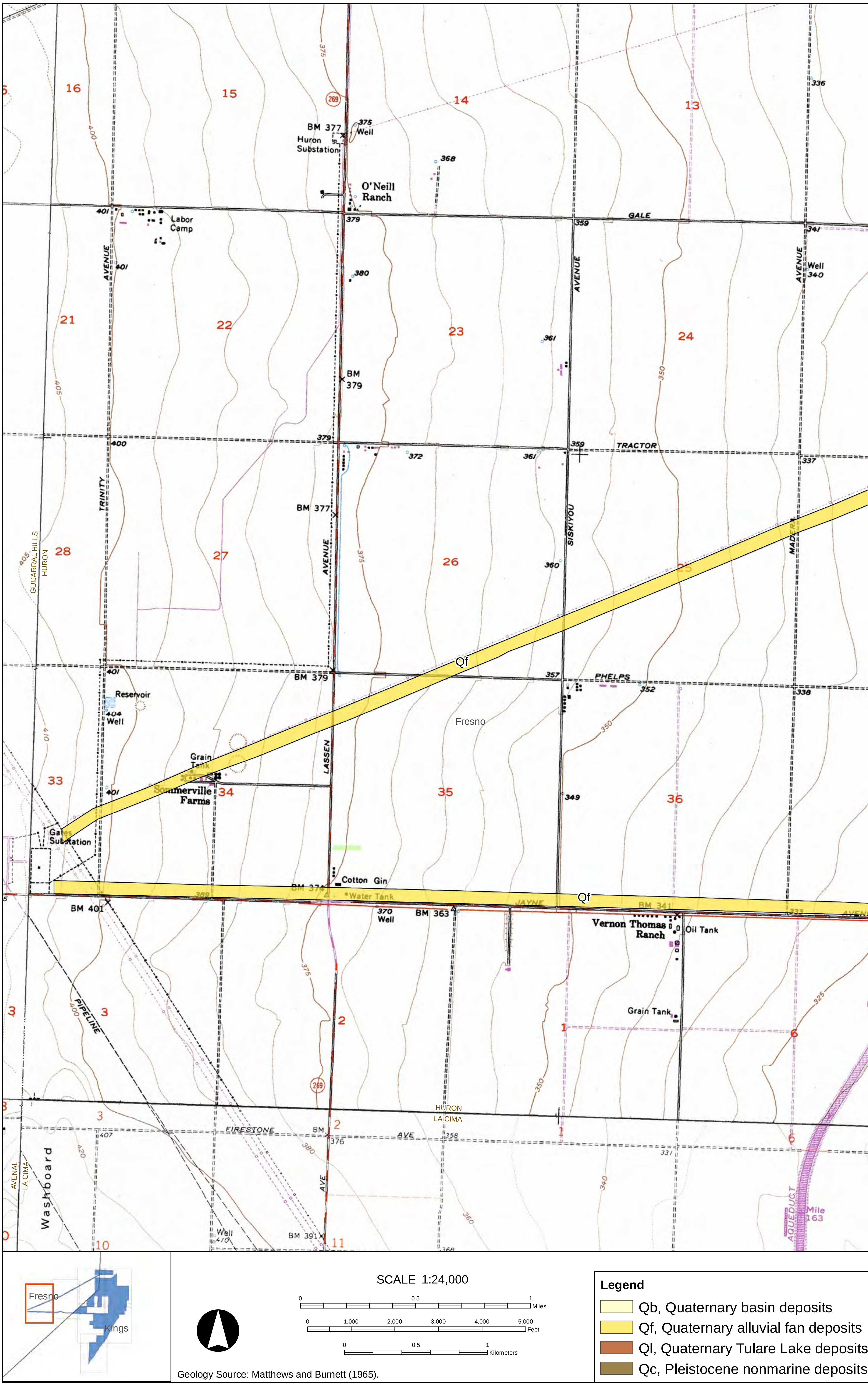
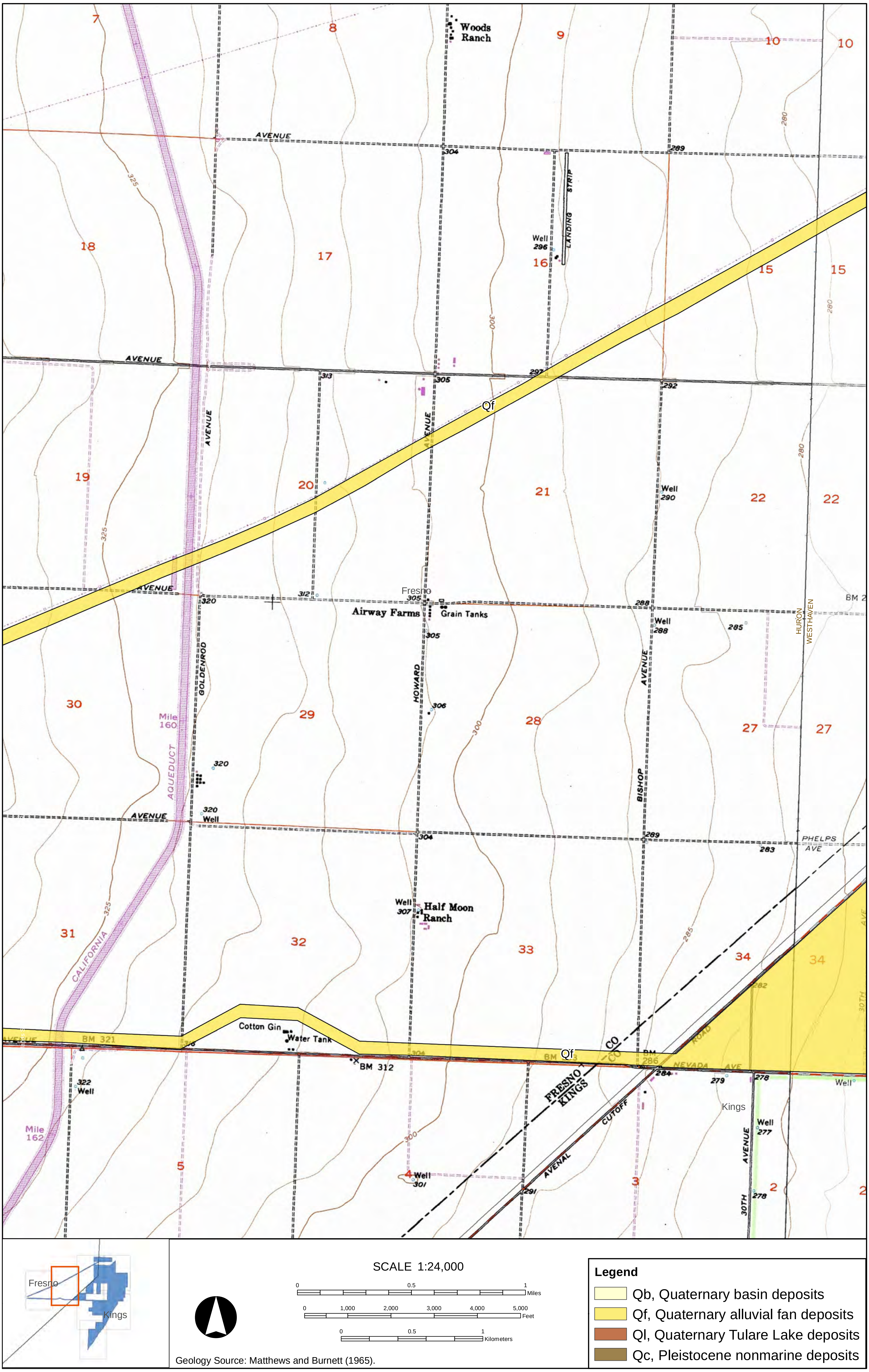
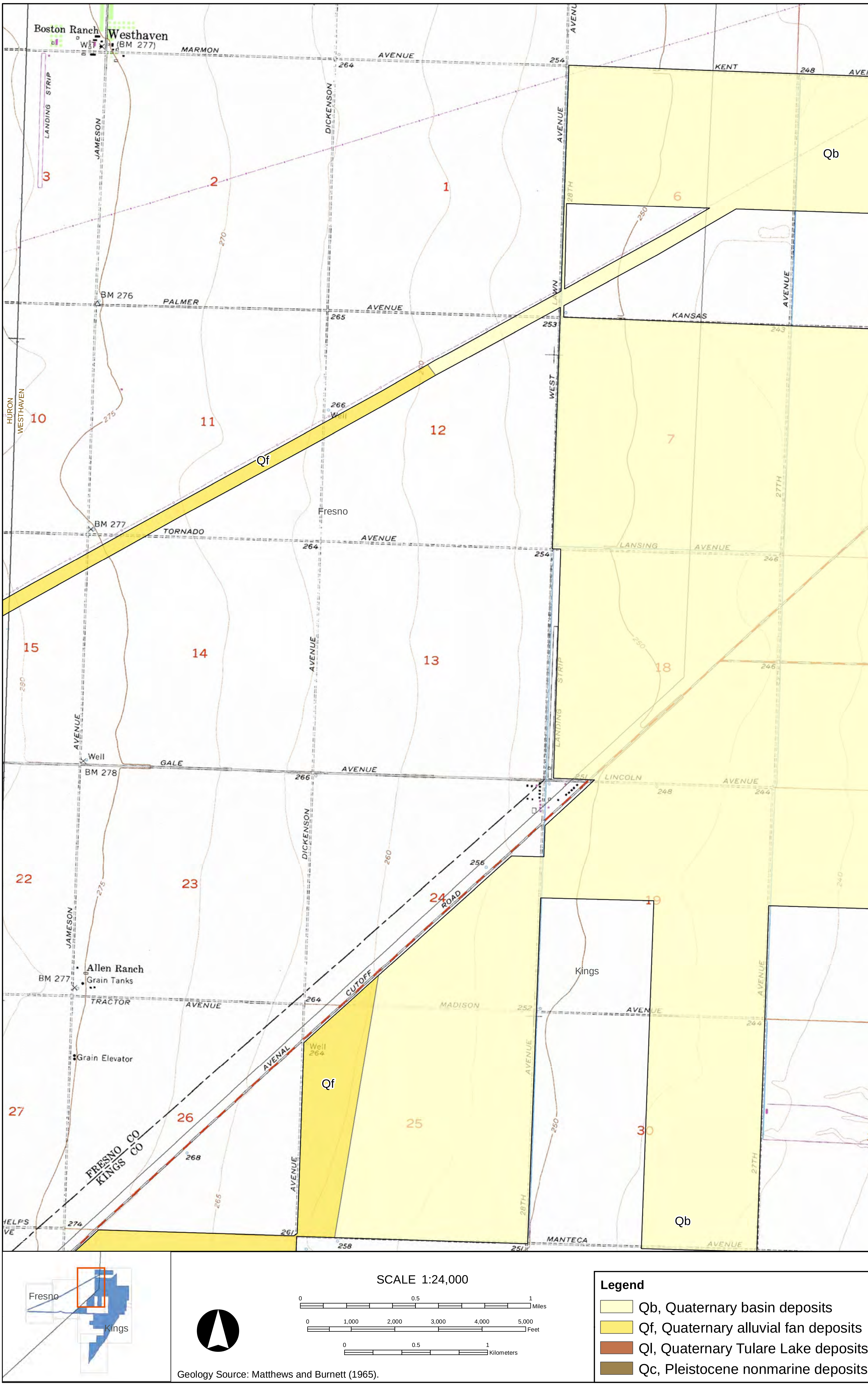



**Appendix A-1 Geologic Units in the Project area.**




**Appendix A-2 Geologic Units in the Project area.**

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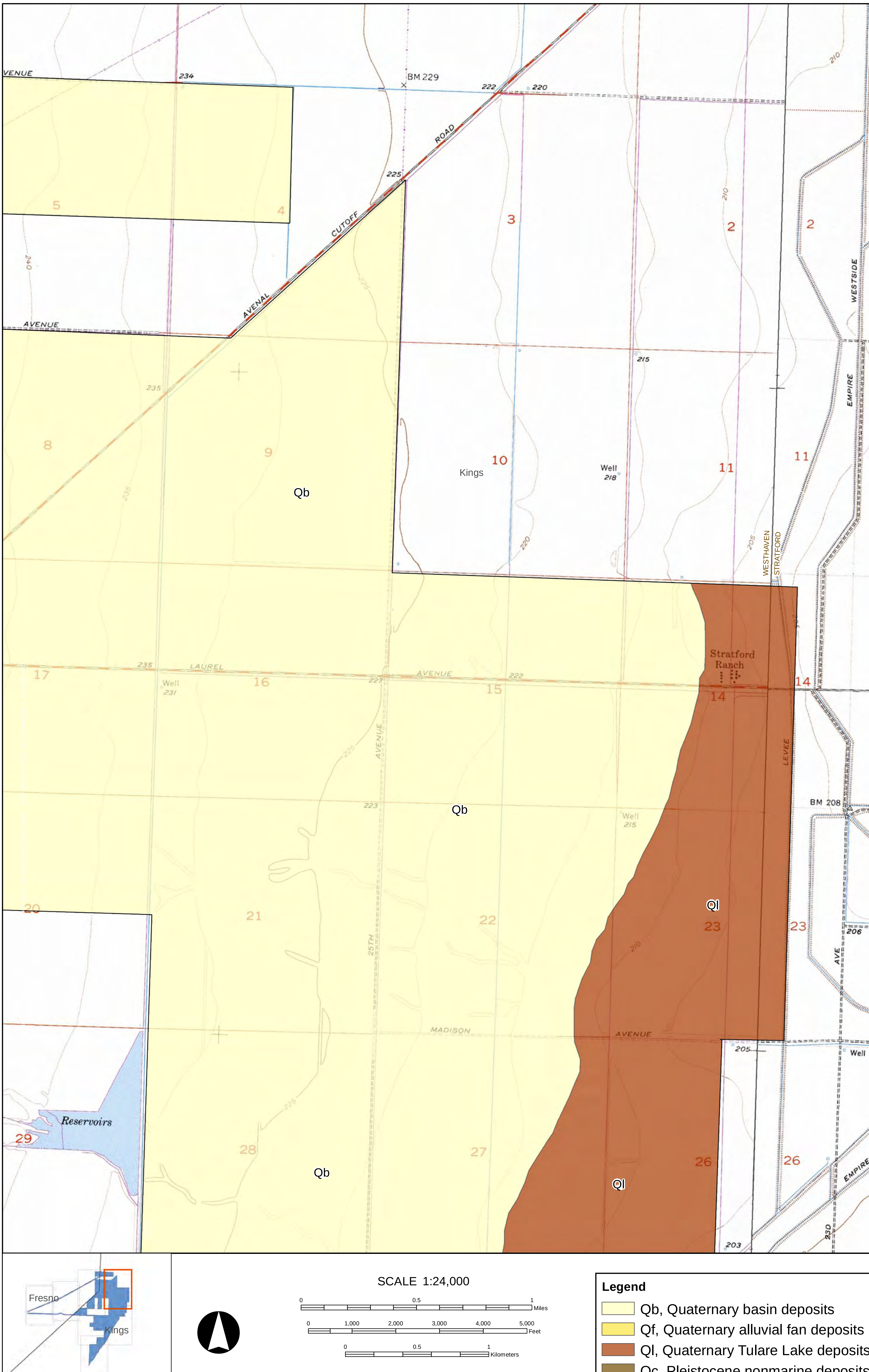
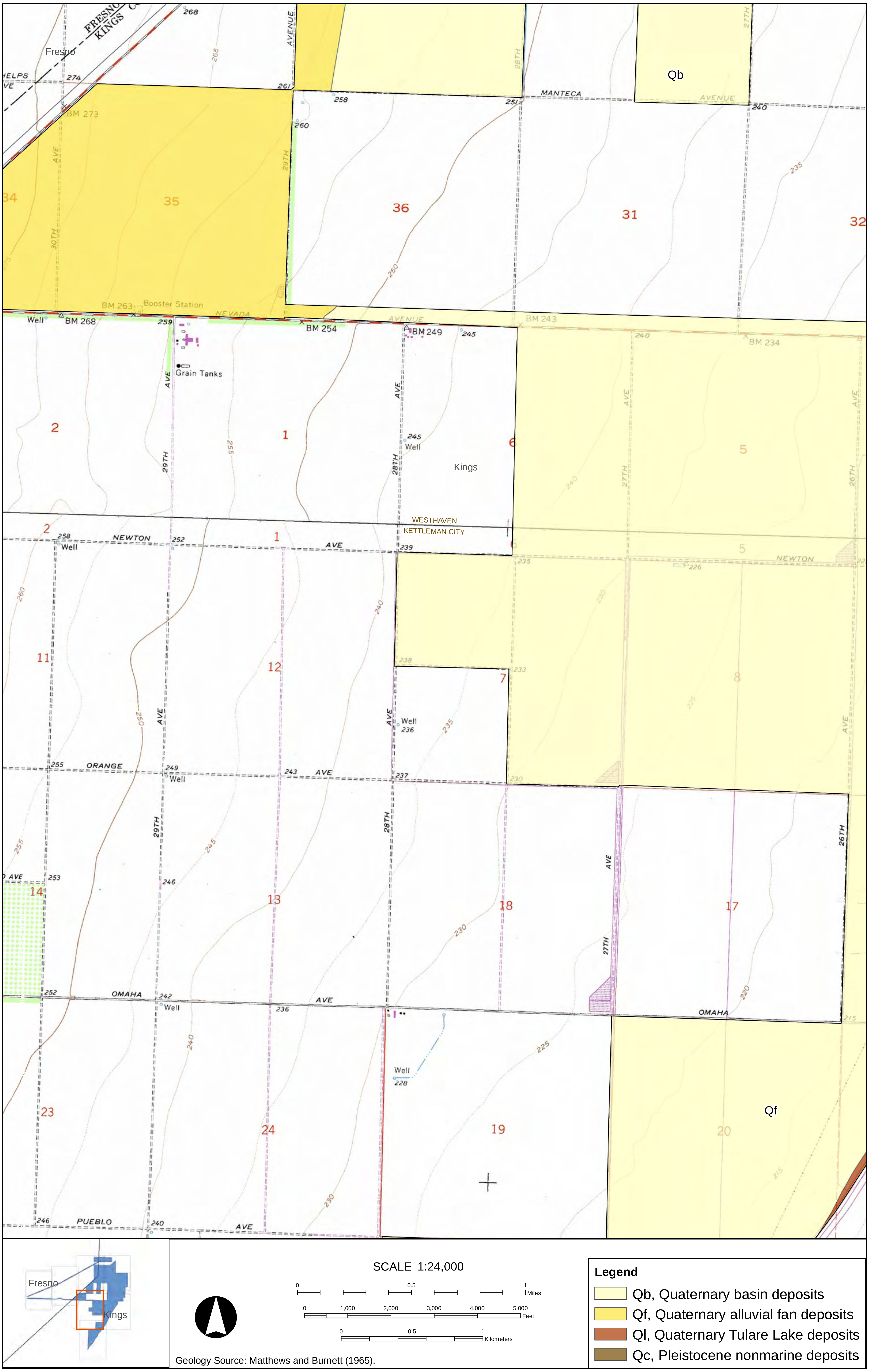
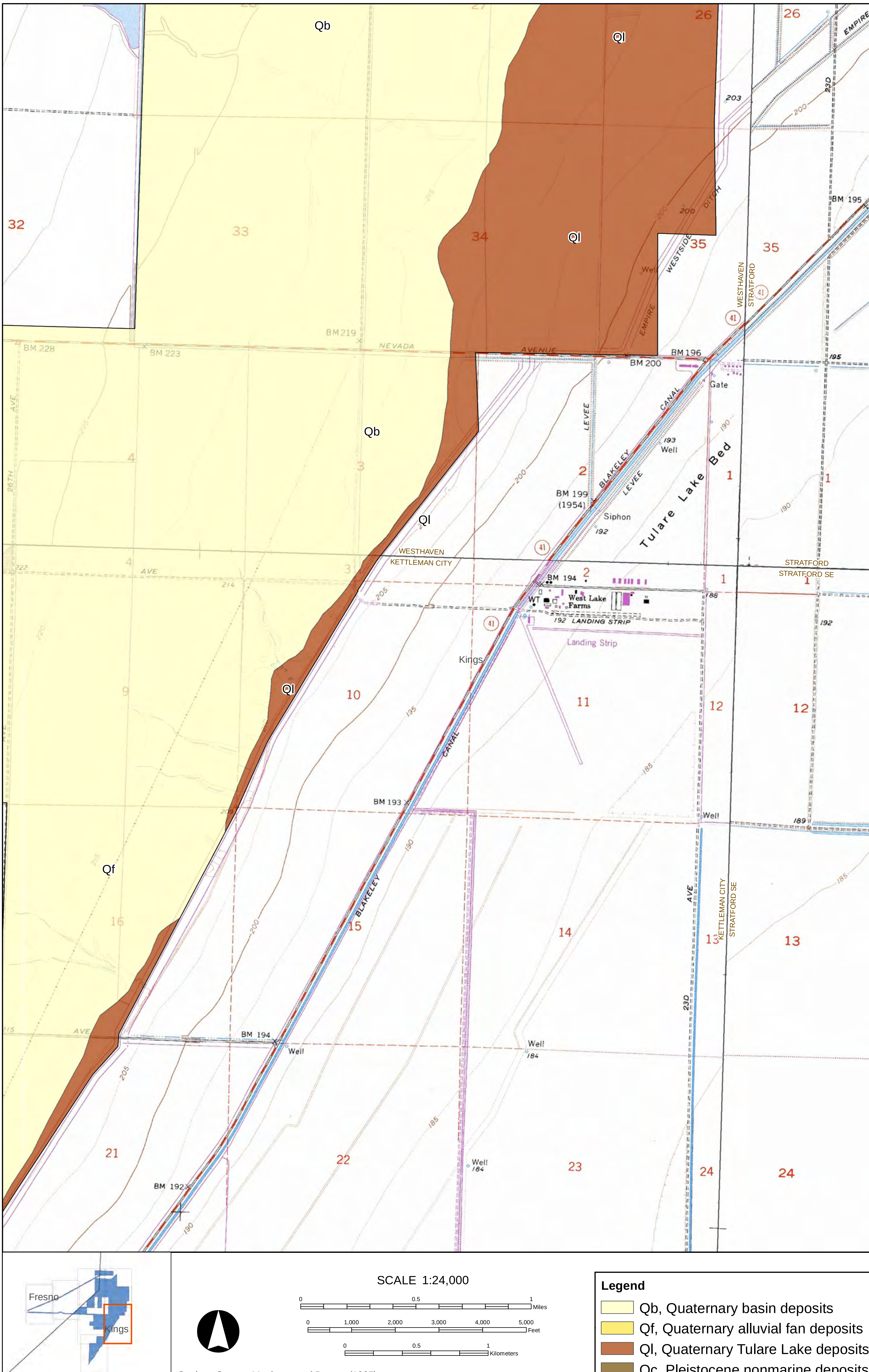


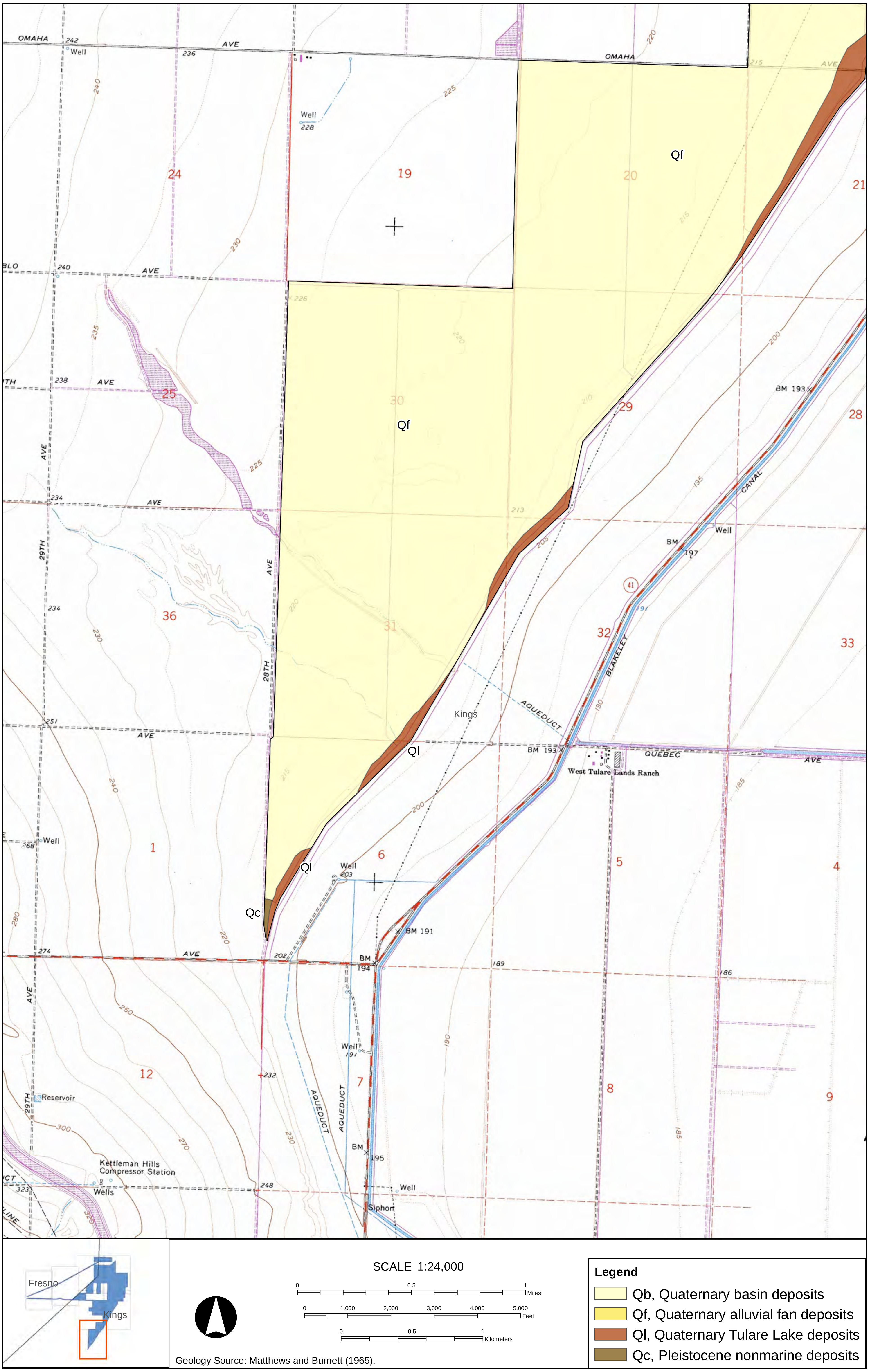

**Appendix A-4 Geologic Units in the Project area.**




**Appendix A-5 Geologic Units in the Project area.**

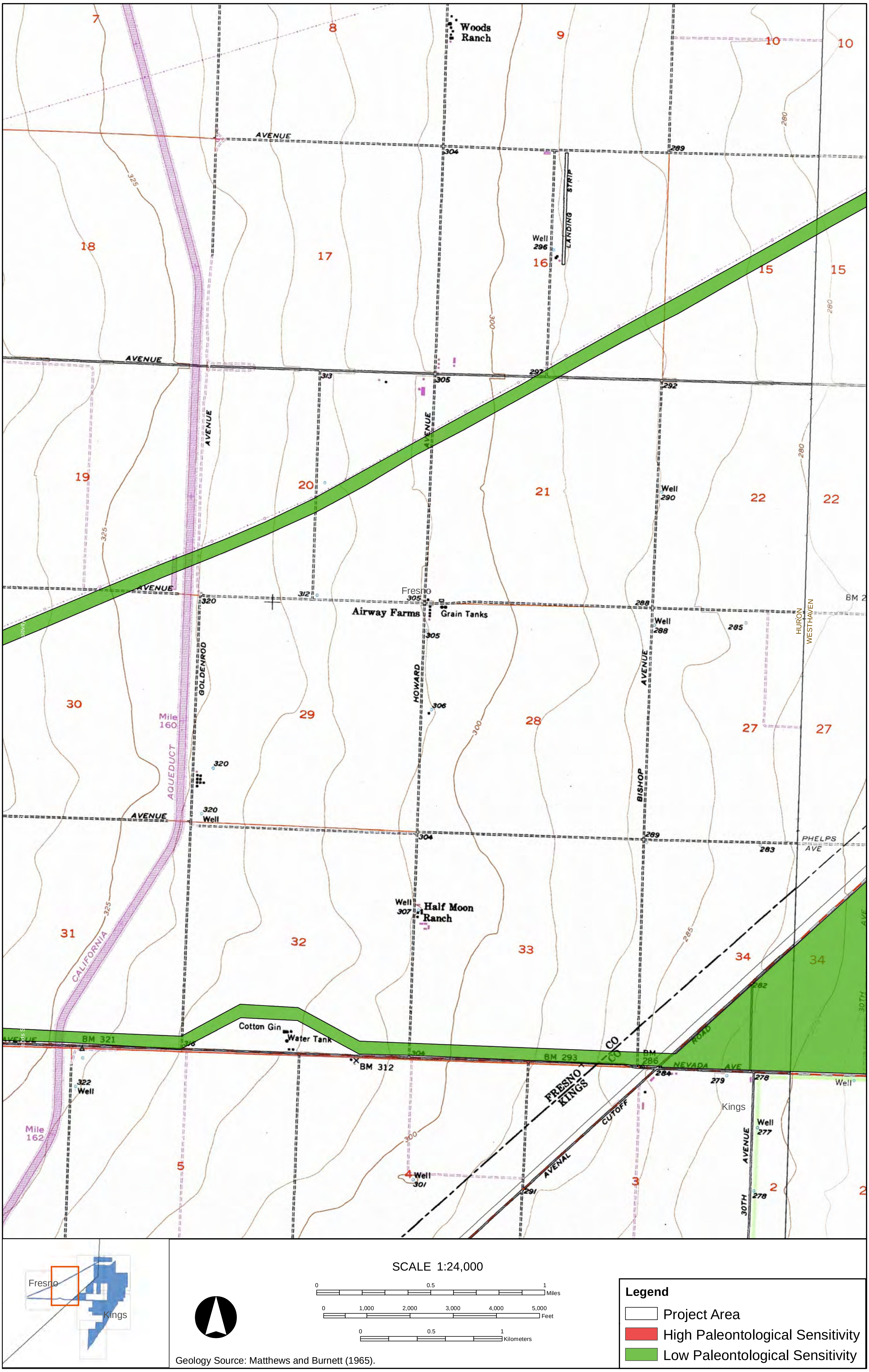



**Appendix A-6 Geologic Units in the Project area.**



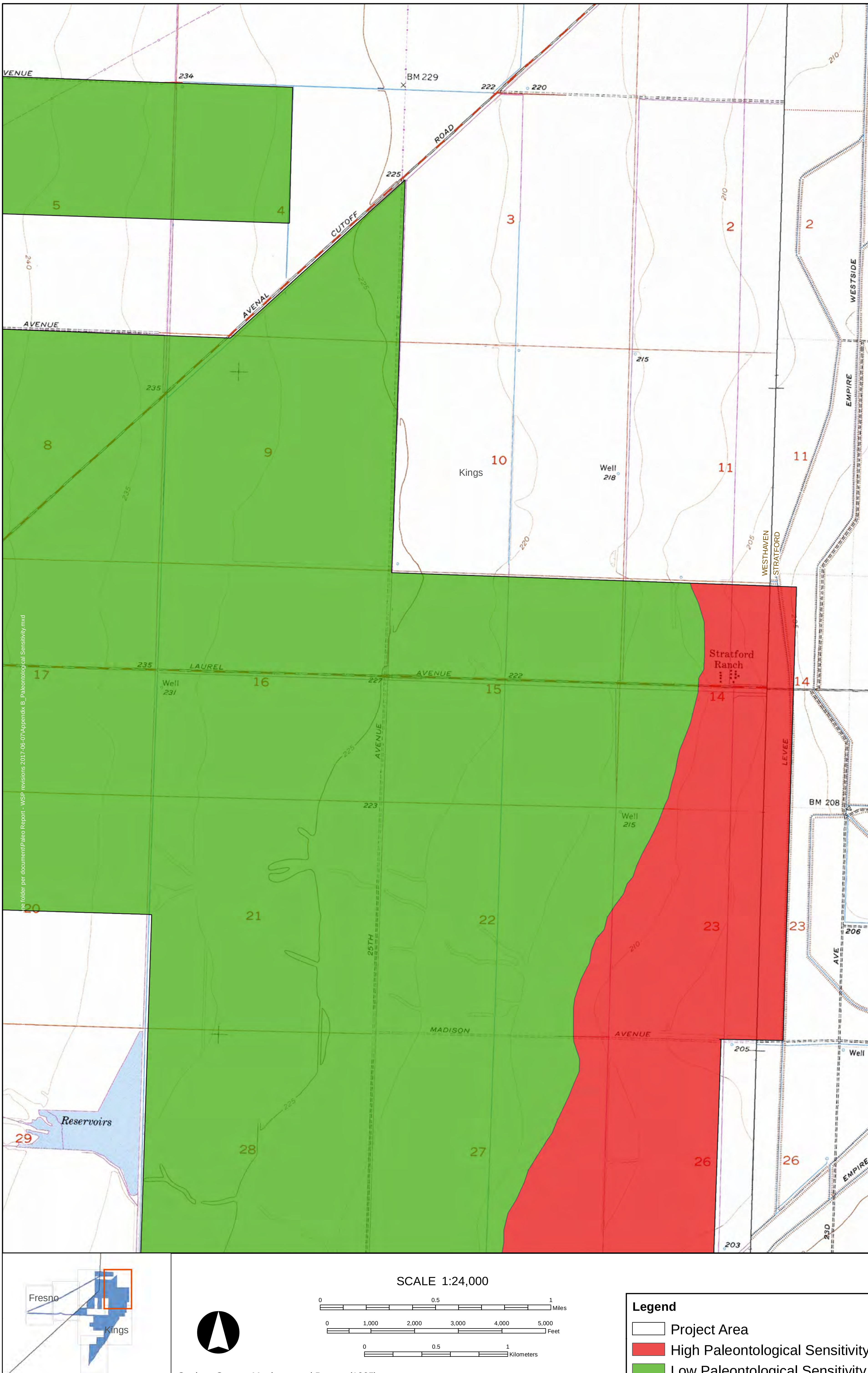

**Appendix A-7 Geologic Units in the Project area.**


**Appendix B-1 Paleontological Sensitivity in the Project area.**



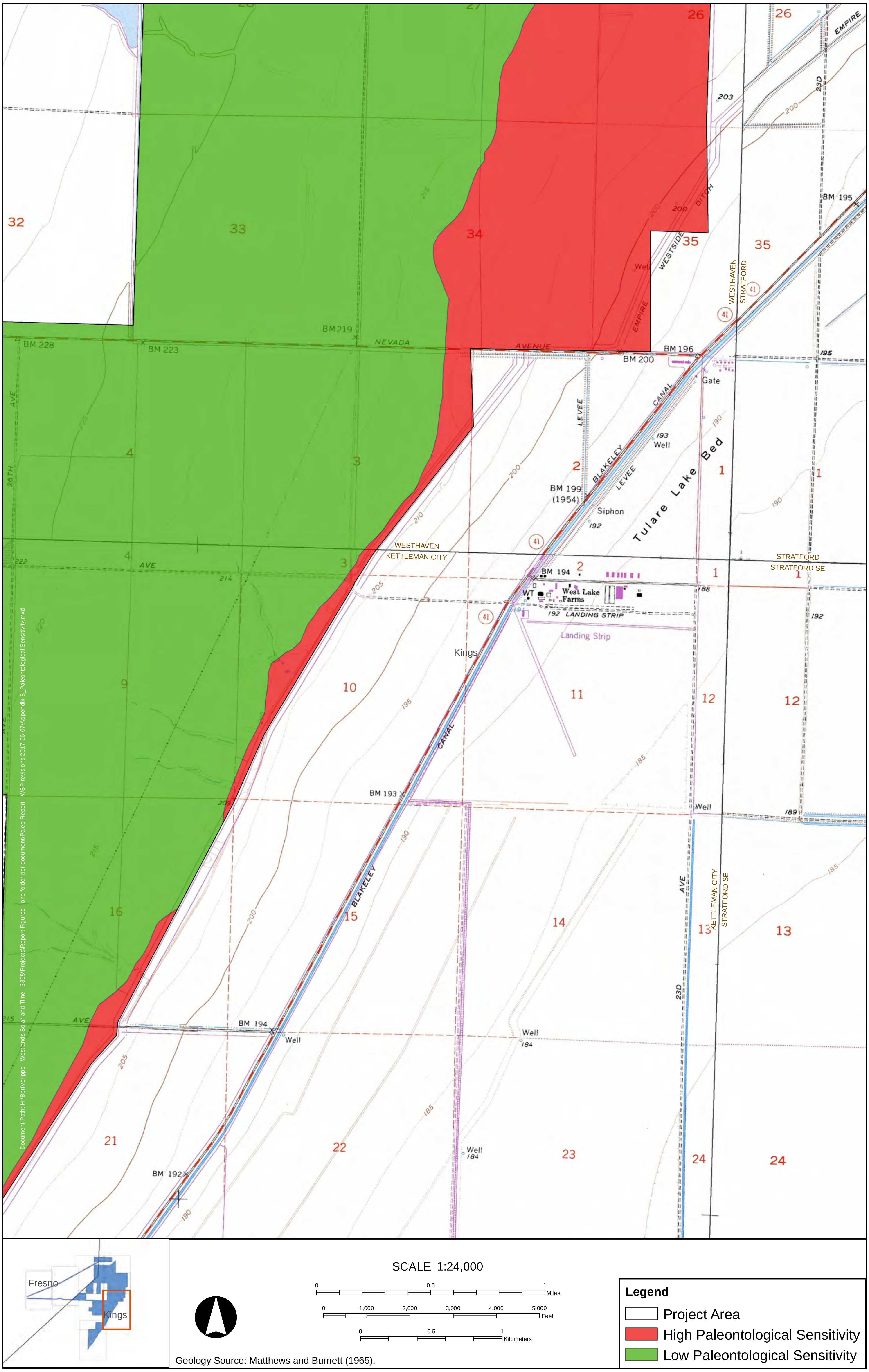

**Appendix B-2 Paleontological Sensitivity in the Project area.**


**Appendix B-3 Paleontological Sensitivity in the Project area.**

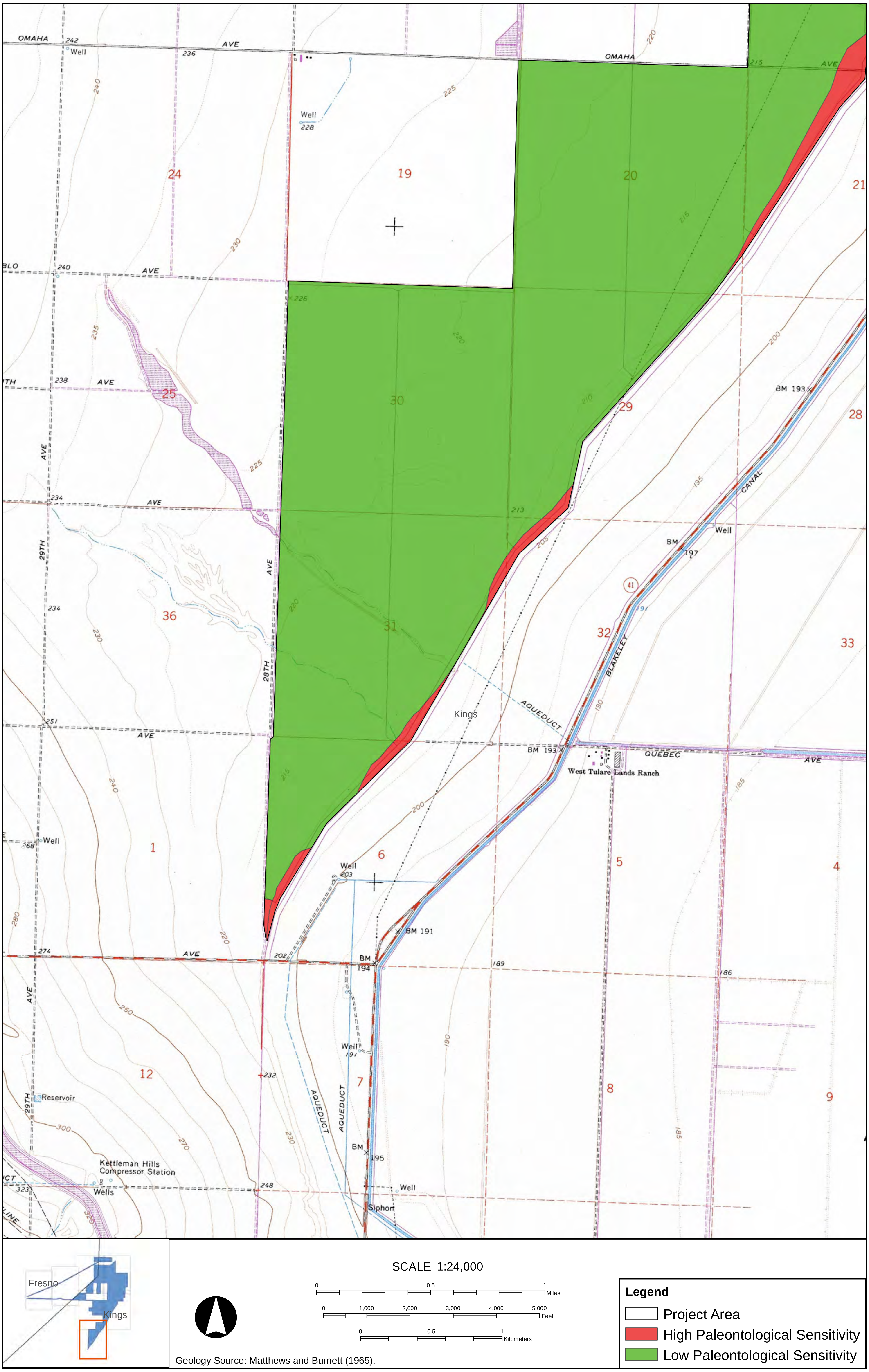



**Appendix B-4 Paleontological Sensitivity in the Project area.**


**Appendix B-5 Paleontological Sensitivity in the Project area.**




**Appendix B-6 Paleontological Sensitivity in the Project area.**




**Appendix B-7 Paleontological Sensitivity in the Project area.**

# APPENDIX G

## Water Supply Assessment

**Prepared by**

**Karen E. Johnson, Water Resources Planning**

**October 2017**

# Water Supply Assessment

# Westlands Solar Park Master Plan
# and
# WSP Gen-Tie Corridors Plan

**Kings and Fresno Counties, California**

**Prepared for:**

**Bert Verrips, AICP, Environmental Consulting**

**October 2017**

Karen E. Johnson
Water Resources Planning

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# CHAPTER 1 – INTRODUCTION

## BACKGROUND AND PURPOSE

This Water Supply Assessment (WSA) was prepared for Bert Verrips, AICP, Environmental Consulting, the firm preparing the programmatic Environmental Impact Report (EIR) for the Westlands Solar Park Master Plan (project) on behalf of Westlands Water District (District or WWD). The District has been identified as the water purveyor that would supply operational water to the project and it is the lead agency conducting the environmental review.

The primary purpose of the WSA is to determine if there is sufficient water supply to meet the demands of the project and future water demands under normal and dry water years over the next 20 years. The WSA will be included in the EIR prepared for the project pursuant to the California Environmental Quality Act (CEQA). This forms the basis for an assessment of water supply sufficiency in accordance with the requirements of California Water Code §10910, *et seq.* The WSA was prepared in conformance with the requirements of Senate Bill 610 (Chapter 643, Statutes of 2001) (referred to here as SB 610). SB 610 was adopted, along with a companion measure Senate Bill 221 effective January 1, 2002, to improve the nexus between land use planning and water supply availability. Information regarding water supply availability is to be provided to local public agency decision makers prior to approval of development projects that meet or exceed specific criteria.

- A proposed residential development of more than 500 dwelling units.
- A proposed shopping center or business establishment employing more than 1,000 persons or having more than 500,000 square feet of floor space.
- A proposed commercial office building employing more than 1,000 persons or having more than 250,000 square feet of floor space.
- A proposed hotel or motel, or both, having more than 500 rooms.
- A proposed industrial, manufacturing, or processing plant, or industrial park planned to house more than 1,000 persons, occupying more than 40 acres of land, or having more than 650,000 square feet of floor area.
- A mixed-use project that includes one or more of the projects defined above.
- A project that would demand an amount of water equivalent to, or greater than, the amount of water required by a 500 dwelling unit project

SB 610 was not originally clear on whether renewable energy projects are subject to SB 610 and require a WSA. However, SB 267 was signed into law on October 8, 2011, amending California's Water Law to revise the definition of "project" specified in SB 610. Under SB 267, wind and photovoltaic projects which consume less than 75 acre-feet per year (afy) of water are not considered to be a "project" under SB 610. As discussed in Chapter 2, a peak project water demand of 729 afy may be needed for construction and operations, with an ongoing annual operational demand of 270 afy after construction is completed.

There is no public potable water system available or needed to serve the project. The project site is located within the boundaries of the District which provides irrigation water to users within its jurisdiction. The District does not deliver treated water for human consumption and is not considered a public water system. Water required during construction and operation of the project does not need to be treated for human consumption and will be obtained from groundwater wells and/or from the District. There is no Urban Water Management Plan (UWMP) that accounts for the project water demands because UWMPs are prepared by urban water suppliers. The District is not considered an urban water supplier and is not required to prepare an UWMP.

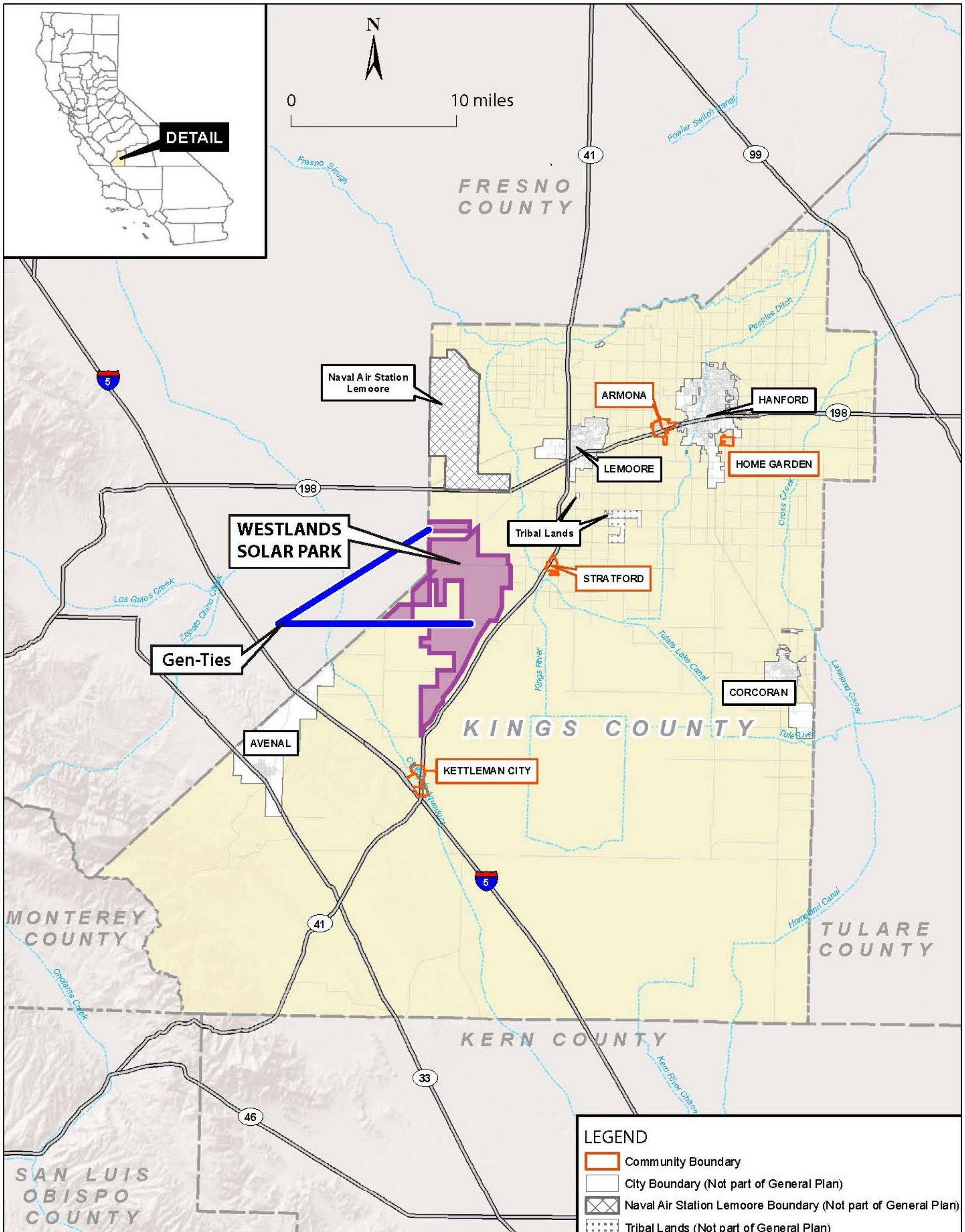
**DESCRIPTION OF THE PROPOSED PROJECT**

The Westlands Solar Park is planned as a series of large utility-scale photovoltaic (PV) solar energy generating facilities on a total area of approximately 20,900 acres. The Master Plan area is in unincorporated west-central Kings County, south of Naval Air Station Lemoore, as shown on Figure 1. The site is within the Westlands Competitive Renewable Energy Zone (WWD CREZ) as identified through the Renewable Energy Transmission Initiative (RETI). As shown in Figure 1, the plan area is generally located south of SR-198, west of SR-41, and east of the Fresno County line. Almost half (9,800 acres) of the project site has been retired from irrigated agricultural uses while the remaining irrigated lands (11,100 acres) purchase water from WWD and/or pump groundwater.

Also included in the Master Plan are two 230-kV generation-interconnection tie-lines (gen-ties) which will deliver solar generated power to the California grid at Gates Substation located approximately 11.5 miles west of Westlands Solar Park (see Figure 1). The 11.5-mile northern gen-tie line will connect the northern portion of the WSP plan area to the Gates Substation alongside an existing Pacific Gas and Electric (PG&E) 230-kV transmission line, and the 11.5-mile southern gen-tie will connect the southern and central portions of the WSP plan area along a corridor running alongside Nevada/Jayne Avenues.

The Westlands Solar Park Master Plan provides a planning framework for the comprehensive and orderly development of renewable solar energy resources within the WWD CREZ. The total peak generating capacity of the project is estimated to be approximately 2,000 megawatts (MW) based on current solar PV technology and collection systems.

The development of Westlands Solar Park is planned to occur through the incremental installation of individual solar projects privately developed over a 13 year period from 2018 through 2030, inclusive. The solar modules will be installed at an average rate of about 154 MW per year with up to 250 MW to be constructed during the peak years. Individual solar projects are anticipated to vary from 20 MW to 250 MW. The location and timing of individual solar projects with the Westlands Solar Park plan area will depend on market conditions as well as institutional and technical factors that will determine the time and place of interconnection to the electrical grid and the construction of internal and external transmission facilities.




*Source: Kings County Community Development Agency*

**Westlands Solar Park**

**Figure 1. Regional Location**

For master planning purposes, it is expected that the average density of solar generation throughout the project will be about one MW per 10 acres. While land requirements for solar arrays themselves will be less, this factor recognizes additional land requirements for supporting infrastructure such as operation and maintenance facilities, substations and switching stations, internal power collection and transmission corridors, and maintenance access roads, as well as existing physical features to be accommodated such as natural gas pipeline easements, irrigation canals and ditches, and irregular site boundaries. (In addition, there are a number of scattered parcels within the Westlands Solar Park plan area that will not be developed for solar facilities, such that the total developable acreage within the plan area will be approximately 20,000 acres.)

Under current technology, it is anticipated that the solar modules will be mounted on a series of horizontal single-axis trackers to be oriented in north-south rows which will rotate the solar arrays in an east-west direction. The solar modules generate direct current (DC) power and the electricity travels via underground cables to inverters to be converted to alternating current (AC) power. Since the solar facilities will not have permanent on-site staff, wastewater generated by workers visiting the solar facilities for maintenance activities will be held in septic tanks that will be regularly serviced by a private septic pumping contractor, with the collected wastewater disposed of at an approved wastewater treatment facility in the area.

Chapter 2 of this WSA provides a discussion of future project water demands and historical site demands. Water supply information is provided in Chapter 3. The comparison of water demands with supplies and the reliability of supplies is provided in Chapter 4 followed by sufficiency findings in Chapter 5.

# CHAPTER 2 – WATER DEMANDS

The regional climatic characteristics are summarized along with projected project water demands and current water production requirements for the site.

## CLIMATIC CONDITIONS

The project area is in the semi-arid San Joaquin Valley. Temperatures during the summer are hot, frequently exceeding 100 degrees Fahrenheit. Cool winters occasionally fall below freezing. Average maximum and minimum temperatures are presented in Table 1 for the closest station which is near Kettleman City. The growing season is long with most rainfall occurring between November and April. As presented in Table 1, the average annual precipitation is 6.6 inches. With climate change, the State Department of Water Resources (DWR) expects a reduced snowpack, spring runoff shifting to earlier in the year, more frequent and extreme dry periods, and shorter winters.

**Table 1. Climate Data**[1]

| Month | Average Maximum Temperature (F) | Average Minimum Temperature (F) | Average Precipitation (inches) |
|---|---|---|---|
| January | 55.2 | 35.2 | 1.38 |
| February | 62.1 | 39.7 | 1.18 |
| March | 68.1 | 42.9 | 0.82 |
| April | 74.3 | 47.2 | 0.69 |
| May | 84.4 | 54.5 | 0.31 |
| June | 93.0 | 61.7 | 0.06 |
| July | 100.1 | 68.0 | 0.01 |
| August | 98.6 | 66.5 | 0.03 |
| September | 92.1 | 60.7 | 0.09 |
| October | 80.6 | 52.0 | 0.27 |
| November | 67.1 | 41.8 | 0.72 |
| December | 56.1 | 35.7 | 1.08 |
| **Annual** | **77.6** | **50.5** | **6.64** |

Source: Temperature and precipitation from Kettleman City, Ca #044534, Western Regional Climate Center for period of record February 1955 through January 2015. (WRCC, 2015)

**PROJECT WATER DEMANDS**

Water demands for the Westlands Solar Park plan area consist of temporary construction demands over a 13 year period and long term operational demands for rinsing the solar modules and controlling site vegetation.

**Construction Water Use**

The highest water demands are associated with construction in preparing the site for the solar arrays and trenching for conduit. During this earthwork phase of construction, non-potable water will be used for dust control. Because the timing of the various solar projects within Westlands Solar Park cannot be predicted with certainty over the 13 year period, the water requirements may vary greatly on a year to year basis. Project proponents estimate the maximum rate of development to be approximately 250 MW per year with the average annual rate of development being approximately 154 MW.

The simplest and most effective way to calculate water demands for solar projects is to base the estimates on each MW of power generated. Based on past experience with similar solar projects, each MW will require 2.0 acre-feet of water during construction (equivalent to 0.2 af/acre), as presented in Table 2. The total construction water demands are 4,000 acre-feet spread over 13 years. Assuming a peak development year of 250 MW, the peak year construction demands could be 500 afy. Construction demands are presented in Table 3. The construction of both gen-tie lines would involve a total ground disturbance area of 150 acres (at the transmission tower sites). At a water application rate of 0.2 af/acre, the total water required for dust control during gen-tie line construction would be 30 acre-feet.

**Table 2. Water Demand Factors**

| Activity | Water Use | Unit |
|---|---|---|
| **Construction – Dust Control** | | |
| WSP Plan Area | 2.0 | afy/MW |
| WSP Gen-Tie Corridors | 0.2 | afy/acre |
| **Operations** | | |
| Panel Washing | 40,000 | gal/MW/yr |
| Sheep Grazing | 2,039 | gal/MW/yr |
| General Operations | 2,000 | gal/MW/yr |
| **Total Operational Demands** | 44,039 | gal/MW/yr |

Source: Bert Verrips, AICP, Environmental Consulting, 2017.

**Table 3. Project Water Demands**

| Activity | Water Use[1] | Unit |
|---|---|---|
| **Construction** | | |
| Westlands Solar Park | | |
| Total Demands over 13 years | 4,000 | acre-feet |
| Peak Construction Demands (250 MW/yr) | 500 | afy |
| | | |
| Westlands Solar Park Gen-Ties | | |
| Construction Demands (150 acres @ 0.2 af/ac) | 30 | acre-feet |
| | | |
| **Operations** | | |
| 2030 Buildout Demands@2,000 MW | 88,078,000 | gallons per yr |
| | 270 | afy |
| | 0.0135 | af/ac/yr |

[1] Based on unit factors from Table 2.

The water supply for construction needs will be obtained from existing agricultural wells on or near the project site. Supplies are described in the next chapter.

**Operational Water Use**

As the project develops, maintenance will primarily consist of washing the PV modules about four times each year to remove accumulated dust from panel surfaces to maintain efficiency. Light duty trucks with tow-behind trailers with small water tanks will transport the water; workers spray to wet the panel surfaces then squeegee the panels dry. In addition to panel washing, sheep will be grazing the site for approximately five months during the first half of each year to keep site vegetation under control. An additional demand for general operations and maintenance (e.g., equipment washing, hand washing, and other non-sanitary uses) is estimated to be 2,000 gallons per MW per year.

Water demand unit factors associated with operations are presented in Table 2. The panel washing unit factor is based on 1/8 of a gallon per square foot of panel or module with an average of 20 square feet per module, which equals 2.5 gallons per module. With four washing per year, the 10 gallons per module per year applied to approximately 4,000 modules per MW, equals 40,000 gallons per MW per year.

Sheep grazing within the plan area is based on 0.5 sheep per acre, on 18,000 net acres (20,000 acres minus 10 percent unvegetated area within each solar facility), grazing five months (151 days), at 3 gallons per day per sheep, equals 453 gallons per sheep per year. This totals 4,077,000 gallons per year or 2,039 gallons per MW per year, as presented in Table 2. Applying these factors to the total 2,000 MW capacity at buildout, total operational water demands will be 88 million gallons per year or 270 afy, as presented in Table 3. Overall, annual water demands are not anticipated to vary based on climatic conditions.

The water supply for ongoing operations will be provided by the District. The District has a distribution system of laterals that convey surface water directly from the San Luis Canal/California Aqueduct. District water supplies are from several sources, as discussed in the following chapter.

**Maximum Water Demands During Construction**

Table 4 presents the maximum Westlands Solar Park water demand over the 13 year construction period. It is anticipated that 2018 will be the first year of construction. Although the first peak year of 250 MW capacity constructed is anticipated to occur in Year 4, at that time the operational demands will be approximately 80 afy, with a total Year 4 demand of 580 afy. During Year 12, construction of 250 MW is anticipated (500 afy), along with a greater operational demand at that time of 229 afy. Therefore, the maximum annual water demand associated with Westlands Solar Park solar development is 729 afy in Year 12 for combined construction needs and operational requirements.

**HISTORICAL WATER PRODUCTION**

Under current conditions, approximately 11,119 acres within the Westlands Solar Park plan area is irrigated with District water and groundwater, while 9,819 acres of District-owned lands is not irrigated. The District-owned lands are not irrigated due to poor drainage and water quality issues, resulting in lands left fallowed or used for non-irrigated low-yield agricultural production (tilled, seeded, and harvested for winter wheat and oats) utilizing precipitation only. There are a number of agricultural wells and irrigation canals within the Westlands Solar Park plan area; however, historical and current groundwater pumping quantities on project lands are not available. Assuming a typical application rate for croplands of 2.5 acre-feet per acre per year (af/ac/yr) applied to the approximately 11,120 acres of private lands being irrigated, existing water demands on the project site are approximately 27,800 afy. This demand is met with District water and groundwater pumping; the quantities of each vary annually depending on surface water availability.

**Table 4. Maximum Water Demands During Construction**

| Year[1] | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Megawatts (MW)** | 90 | 125 | 125 | 250 | 75 | 175 | 160 | 110 | 110 | 180 | 230 | 250 | 120 | 2,000 |
| **Construction Demands (afy)[2]** | 180 | 250 | 265[3] | 500 | 150 | 350 | 320 | 235[3] | 220 | 360 | 460 | 500 | 240 | 4,030 |
| **Operational Demands (afy)[4]** | 12 | 29 | 46 | 80 | 90 | 114 | 136 | 151 | 166 | 190 | 221 | 229 | 270 | |
| **Total Annual Demands (afy)** | **192** | **279** | **311** | **580** | **240** | **464** | **456** | **386** | **386** | **550** | **681** | **729** | **510** | |

[1] Year 1 assumed to be 2018; Year 13 is 2030. (Note: The number of MWs to be installed in a given year are based on preliminary estimates and are subject to change.)

[2] Construction demands to be met with groundwater.

[3] Includes 15 acre-feet of construction water demand for gen-tie construction in Years 3 and 8.

[4] Operational demands to be met with WWD supplies.

# CHAPTER 3 – WATER SUPPLIES

Water for project construction needs will be provided by wells proximate to each Westlands Solar Park solar facility. Upon completion, water for ongoing operational water supplies will be provided by the District through its water pipeline system from imported surface water sources. This section discusses water supplies currently used on project lands, surface water and groundwater available to the project, District supply conditions, water management activities, and reliability of project supplies.

## CURRENT WATER USE

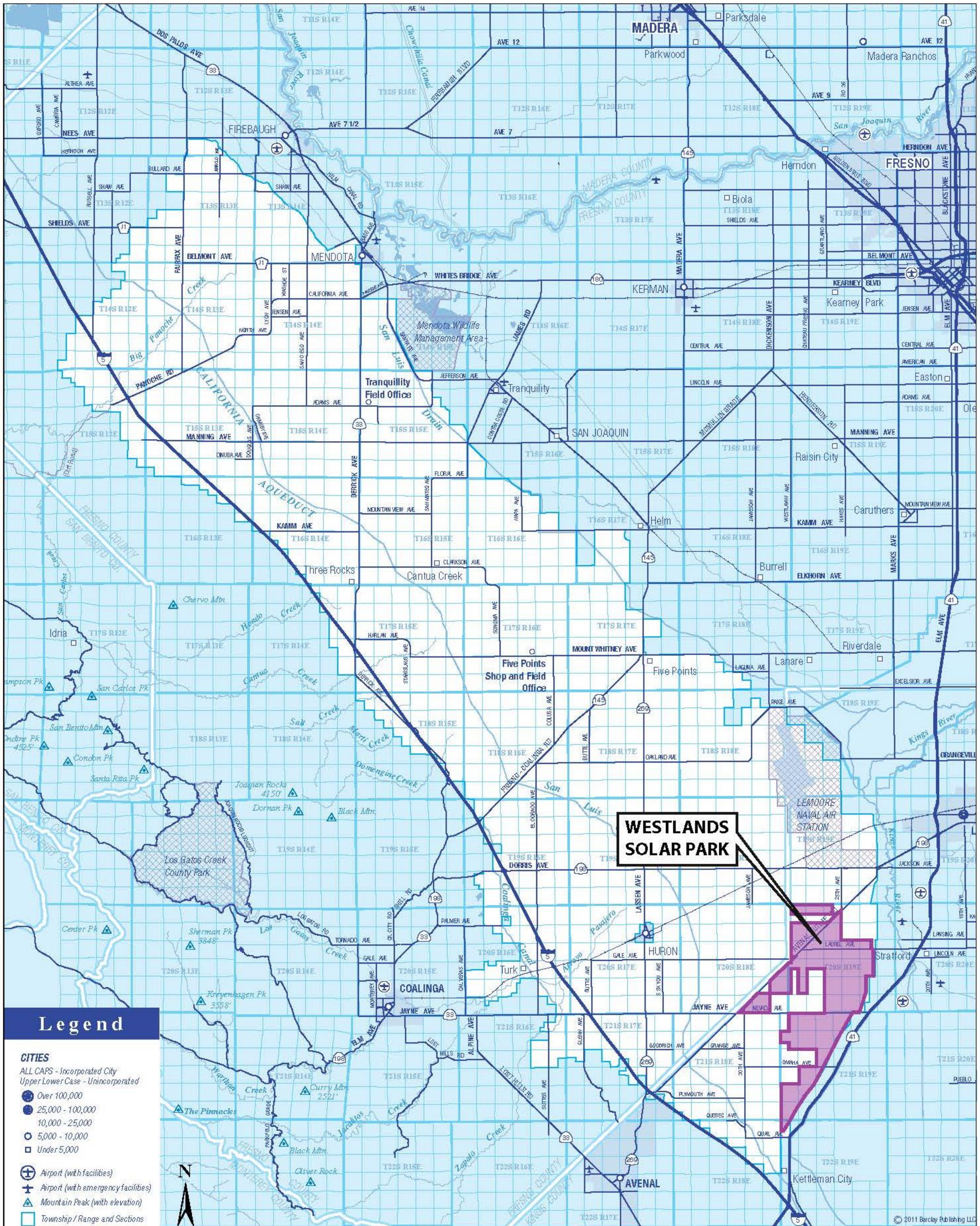
As discussed in Chapter 2, existing agricultural water demands within the Westlands Solar Park plan area are estimated to be approximately 27,800 afy. Agricultural water supplies for irrigated lands within the project site (approximately 11,100 acres) are currently provided by the District and groundwater pumping from on-site wells. The groundwater supply is untreated non-potable water for crop irrigation; there are no sources of potable domestic water within the master plan area. The remaining approximately 9,800 acres within the plan area is not irrigated.

## SURFACE WATER SUPPLIES

The Westlands Solar Park plan area lies entirely within the boundaries of the District, as presented on Figure 2. The WWD was formed in 1952 to serve agricultural water users on the west side of the San Joaquin Valley, and has a service area of 610,000 acres of which 44,000 acres is retired, non-irrigated farmland. The total volume of water required for WWD's entire irrigable area of 568,000 acres is about 1.5 million afy (WWD 2016). Upon completion of the San Luis Canal by the U.S. Bureau of Reclamation (USBR) in 1968, WWD began receiving deliveries of Central Valley Project (CVP) water from the Delta. Water is delivered from the Sacramento River-San Joaquin River Delta during winter months and is stored in the San Luis Reservoir. Water is then delivered to District growers through the San Luis Canal and the Coalinga Canal. Once it leaves the federal project canals, water is delivered through approximately 1,030 miles of pipeline.

Westlands' annual water entitlement from the USBR's Central Valley Project is 1,197,000 acre-feet, or 303,000 acre-feet less than irrigation needs. Thus Westlands' surface water supply entitlement of CVP water is 20 percent short even when 100 percent of the contract water is available. Some of the difference is made up by groundwater from the lower aquifer and water transfers (the latter averaging 150,000 acre-feet per year). Under the terms of the 2015 settlement agreement between WWD and the U. S. Department of Justice, WWD's water deliveries will be capped at 895,000 afy, as discussed above. Thus the annual shortfalls of water supply will be approximately 500,000 afy, assuming full delivery of surface water, and annual transfers of 150,000 afy.

The west side of the San Joaquin Valley was among the last areas in the Central Valley to receive imported water from the Delta and thus have a lower priority to receive contract water from the federal




*Source: Westlands Water District, 2016*

**Westlands Solar Park**

**Figure 2. Westlands Water District Boundary**

CVP. The south of Delta contractors suffer disproportionately during drought conditions when water deliveries are curtailed. For example, as presented in Table 5, between 2006 and 2015, WWD received its full 100 percent contract entitlement in only one year - 2006. In eight of those 10 years, WWD received water allocations that were 50 percent or less than its contract entitlement. The average annual water allocation received during that 10 year period was about 460,000 acre-feet, or 38.5 percent of the contract entitlement. This represents 31 percent of the total irrigation water demands within the District, which are 1.5 million afy. As of this date, the District will receive its full 100 percent contract entitlement in 2017, the first time since 2006.

**Table 5. Westlands Water District Water Supplies**

**District Water Supply**

| Water Year | CVP Allocation % | Net CVP (AF) | Groundwater (AF) | Water User Acquired (AF) | Additional District Supply (AF) | Total Supply (AF) | Fallowed Acres |
|---|---|---|---|---|---|---|---|
| 1988 | 100% | 1,150,000 | 160,000 | 7,657 | 97,712 | 1,415,369 | 45,632 |
| 1989 | 100% | 1,035,369 | 175,000 | 20,530 | 99,549 | 1,330,448 | 64,579 |
| 1990 | 50% | 625,196 | 300,000 | 18,502 | (2,223) | 941,475 | 52,544 |
| 1991 | 27% | 229,666 | 600,000 | 22,943 | 77,399 | 930,008 | 125,082 |
| 1992 | 27% | 208,668 | 600,000 | 42,623 | 100,861 | 952,152 | 112,718 |
| 1993 | 54% | 682,833 | 225,000 | 152,520 | 82,511 | 1,142,864 | 90,413 |
| 1994 | 43% | 458,281 | 325,000 | 56,541 | 108,083 | 947,905 | 75,732 |
| 1995 | 100% | 1,021,719 | 150,000 | 57,840 | 121,747 | 1,351,306 | 43,528 |
| 1996 | 95% | 994,935 | 50,000 | 92,953 | 172,609 | 1,310,497 | 26,754 |
| 1997 | 90% | 968,408 | 30,000 | 94,908 | 261,085 | 1,354,401 | 35,554 |
| 1998 | 100% | 945,115 | 15,000 | 54,205 | 162,684 | 1,177,004 | 33,481 |
| 1999 | 70% | 806,040 | 60,000 | 178,632 | 111,144 | 1,155,816 | 37,206 |
| 2000 | 65% | 695,693 | 225,000 | 198,294 | 133,314 | 1,252,301 | 46,748 |
| 2001 | 49% | 611,267 | 215,000 | 75,592 | 135,039 | 1,036,898 | 73,802 |
| 2002 | 70% | 776,526 | 205,000 | 106,043 | 64,040 | 1,151,609 | 94,557 |
| 2003 | 75% | 863,150 | 160,000 | 107,958 | 32,518 | 1,163,626 | 76,654 |
| 2004 | 70% | 800,704 | 210,000 | 96,872 | 44,407 | 1,151,983 | 70,367 |
| 2005 | 85% | 996,147 | 75,000 | 20,776 | 98,347 | 1,190,270 | 66,804 |
| 2006 | 100% | 1,076,461 | 25,000 | 45,936 | 38,079 | 1,185,476 | 54,944 |
| 2007 | 50% | 647,864 | 310,000 | 87,554 | 61,466 | 1,106,884 | 96,409 |
| 2008 | 40% | 347,222 | 460,000 | 85,421 | 102,862 | 995,505 | 99,663 |
| 2009 | 10% | 202,991 | 480,000 | 68,070 | 70,149 | 821,210 | 156,239 |
| 2010 | 45% | 590,059 | 140,000 | 71,296 | 79,242 | 880,597 | 131,339 |
| 2011 | 80% | 876,910 | 45,000 | 60,380 | 191,686 | 1,173,976 | 59,514 |
| 2012 | 40% | 405,451 | 355,000 | 111,154 | 123,636 | 995,241 | 112,755 |
| 2013 | 20% | 188,448 | 638,000 | 101,413 | 143,962 | 1,071,823 | 131,848 |
| 2014 | 0% | 98,573 | 655,000 | 59,714 | 26,382 | 839,669 | 220,053 |
| 2015 | 0% | 82,429 | 660,000 | 51,134 | 34,600 | 828,163 | 218,112 |
| 2016 | 5% | 9,204 | 612,000 | 72,154 | 174,374 | 867,732 | 179,784 |
| 2017* | 100% | 957,763 | 32,000 | 30,000 | 164,220 | 1,183,983 | 130,000 |

**Definitions:** *Estimated

Water Year - March 1 to February 28

CVP Allocation - Final CVP water supply allocation for the year ( 100% = 1,150,000 AF)+(Reassignment = 46,948 AF)

Net CVP - CVP Allocation adjusted for carry over and rescheduled losses

Groundwater - Total groundwater pumped (see District's Deep Groundwater Report)

Water User Aquired - Private Landowner water transfers

Additional District Supply - Surplus water, supplemental supplies, and other adjustments.

Fallowed Acres - Agricultural land out of production

Source: WWD, 2017

The curtailment of surface water deliveries is experienced equally by all of the District's contractors, including the growers within the project master plan site. Under the terms of a 2015 settlement agreement with the U.S. Department of Justice, the CVP surface water deliveries to Westlands will be capped at 895,000 afy)(USBR 2015).

The District augments CVP contract water with other supplies such as flood flows from the San Joaquin and Kings rivers when available; these seasonal supplies are made available to the District as they flow into the Mendota Pool. Water was last taken from this source in the above average water year of 2011-12. Water transfers have become an important component in the District supply portfolio. Transfers and other purchases are included in Table 5 as Additional District Supply. Transfers from other water districts are pursued each year to supplement contract deliveries. For example, water year 2011-12 saw a total of 115,615 acre-feet transferred into the District with 1,440 acre-feet transferred out. The amount of groundwater pumped from the basin in any given year is typically inversely proportional to the availability of surface water supplies; this is evident for dry water years 2013 through 2015, as shown in Table 5.

**REGIONAL GROUNDWATER SUPPLY**

The District does not supply groundwater to District growers nor does it regulate the use of groundwater. Growers within the District service area augment District deliveries with pumped groundwater to meet irrigation needs. The Westlands Solar Park plan area overlies the Westside Subbasin (5-22.09) of the San Joaquin Valley Basin within the Tulare Lake Hydrologic Region. Although the District collects some pumping data, the lack of a complete database of extraction data and replenishment rates within the subbasin makes it difficult to estimate baseline conditions regarding water supply availability. This is a common problem in the San Joaquin Valley as the majority of water usage is associated with individual agricultural water users with a lack of consistent groundwater monitoring and reporting programs. Where data are not available to make quantitative estimates of water availability and reliability, reasonable assumptions are made here based on information and data that are available.

**Subbasin Characteristics**

The Tulare Lake Hydrologic Region covers approximately 17,000 square miles including all of Kings and Tulare counties, and most of Fresno and Kern counties. Significant geographic features include the Temblor Range to the west, the Tehachapi Mountains to the south and the southern Sierra Nevada to the east. The Kings, Kaweah, Tule, and Kern Rivers drain the southern portion of the valley internally towards the Tulare drainage basin.

The Westside Subbasin is primarily located in Fresno County; a portion – including the entire Westlands Solar Park plan area – is in Kings County. The subbasin encompasses a surface area of approximately 640,000 acres within the San Joaquin Valley. The Westside Subbasin is located between the Coast Range foothills on the west and the San Joaquin River drainage and Fresno Slough to the east. To the southwest is the Pleasant Valley Groundwater Subbasin, and to the west are Tertiary marine sediments of the Coast Ranges. To the north and northeast is the Delta-Mendota Groundwater Subbasin, and to the east and southeast are the Kings and Tulare Lake Groundwater subbasins, also subbasins of the San Joaquin Valley Basin.

The aquifer system comprising the Westside Subbasin consists of unconsolidated continental deposits of Tertiary and Quaternary age. These deposits form an unconfined to semi-confined upper aquifer and a confined lower aquifer. These aquifers are separated by an aquitard named the Corcoran Clay member of the Tulare Formation. The unconfined to semi-confined aquifer (upper zone) above the Corcoran Clay includes younger alluvium, older alluvium, and part of the Tulare Formation. These deposits consist of highly lenticular, poorly sorted clay, silt, and sand intercalated with occasional beds of well-sorted fine to medium grained sand. This clay layer ranges in thickness from 20 to 200 feet, underlies most of the District, and has extensive wells penetrating the clay which allows partial interaction between the zones (DWR, 2006). The depth to the top of the Corcoran Clay varies from approximately 500 feet to 850 feet (WWD, 2014). The confined aquifer (lower zone) consists of the lower part of the Tulare Formation and possibly the uppermost part of the San Joaquin Formation. This unit is composed of lenticular beds of silty clay, clay, silt, and sand interbedded with occasional strata of well-sorted sand. Brackish or saline water underlies the usable groundwater in the lower zone (DWR, 2006). Well yields are good with an average of 1,100 gallons per minute (gpm) and a maximum of 2,000 gpm (DWR, 2003a).

Flood basin deposits along the eastern subbasin have caused near surface soils to drain poorly thus restricting the downward movement of percolating water. This causes agriculturally applied water to build up as shallow water in the near surface zone. Areas prone to this buildup are often referred to as drainage problem areas (DWR, 2006).

Water quality in the lower water bearing zone varies. Typically, water quality varies with depth with poorer quality existing at the upper and lower limits of the aquifer and the optimum quality somewhere between. The upper limit of the aquifer is the base of the Corcoran Clay with the USGS identifying the lower limit as the base of the fresh groundwater. The quality of the groundwater below the base of fresh water can exceed 2,000 milligrams per liter (mg/L) total dissolved solids (TDS) which is too high for irrigating crops; the subbasin averages 520 mg/L TDS. In addition to high TDS, this subbasin can also contain selenium and boron that may affect usability as irrigation water.

**Groundwater Level Trends**

As shown in Table 6, groundwater levels were generally at their lowest levels in the late 1960's prior to the importation of surface water. The CVP began delivering surface water to the San Luis Unit in 1967-68. Water levels gradually increased to a maximum in about 1987-88, falling briefly during the 1976-77 drought and again during the 1987-92 drought. 1998 water levels recovered nearly to the 1987-88 levels after a series of wet years. Recharge is primarily from seepage of Coast Range streams along the west side of the subbasin (approximately 30,000 to 40,000 afy) and deep percolation of surface irrigation. Secondary recharge to the upper aquifer (approximately 20,000 to 30,000 afy) and lower aquifer (150,000 to 200,000 afy) occurred from areas to the east and northeast as subsurface flows. WWD

**Table 6. Groundwater Use and Elevation Change in Westlands Water District**

| Crop[1] Year | Pumped AF | Elevation FT | Elevation Change FT | Crop Year | Pumped AF | Elevation FT | Elevation Change FT |
|---|---|---|---|---|---|---|---|
| 1956 | 964,000 | -65 | -13 | 1986 | 145,000 | 71 | 8 |
| 1957 | 928,000 | -56 | 9 | 1987 | 159,000 | 89 | 18 |
| 1958 | 884,000 | -29 | 27 | 1988 | 160,000 | 64 | -25 |
| 1959 | 912,000 | -77 | -48 | 1989 | 175,000 | 63 | -1 |
| 1960 | 872,000 | -81 | -4 | 1990 | 300,000 | 9 | -54 |
| 1961 | 824,000 | -96 | -15 | 1991 | 600,000 | -32 | -41 |
| 1962 | 920,000 | | | 1992 | 600,000 | -62 | -30 |
| 1963 | 883,000 | | | 1993 | 225,000 | 1 | 63 |
| 1964 | 913,000 | | | 1994 | 325,000 | -51 | -52 |
| 1965 | 822,000 | | | 1995 | 150,000 | 27 | 78 |
| 1966 | 924,000 | -134 | | 1996 | 50,000 | 49 | 22 |
| 1967 | 875,000 | -156 | -22 | 1997 | 30,000 | 63 | 14 |
| 1968 | 596,000 | -135 | 21 | 1998 | 15,000 | 63 | 0 |
| 1969 | 592,000 | -120 | 15 | 1999 | 20,000 | 65 | 2 |
| 1970 | 460,000 | -100 | 20 | 2000 | 225,000 | 43 | -22 |
| 1971 | 377,000 | -93 | 7 | 2001 | 215,000 | 25 | -18 |
| 1972 | | -54 | 39 | 2002 | 205,000 | 22 | -3 |
| 1973 | | -37 | 17 | 2003 | 160,000 | 30 | 8 |
| 1974 | 96,000 | -22 | 15 | 2004 | 210,000 | 24 | -6 |
| 1975 | 111,000 | -11 | 11 | 2005 | 75,000 | 56 | 32 |
| 1976 | 97,000 | -2 | 9 | 2006 | 15,000 | 77 | 21 |
| 1977 | 472,000 | -99 | -97 | 2007 | 310,000 | 35 | -42 |
| 1978 | 159,000 | -4 | 95 | 2008 | 460,000 | -11 | -46 |
| 1979 | 140,000 | -13 | -9 | 2009 | 480,000 | -31 | -20 |
| 1980 | 106,000 | 4 | 17 | 2010 | 140,000 | 9 | 40 |
| 1981 | 99,000 | 11 | 7 | 2011 | 45,000 | 49 | 40 |
| 1982 | 105,000 | 32 | 21 | 2012[2] | 355,000 | 1 | -48 |
| 1983 | 31,000 | 56 | 24 | 2013 | 638,000 | -58 | -59 |
| 1984 | 73,000 | 61 | 5 | 2014 | 655,000 | -76 | -18 |
| 1985 | 228,000 | 63 | 2 | 2015 | 660,000 | -120 | -44 |

Source: WWD, 2016.

[1] Crop year is from October 1 of previous year to September 30 of current year.

[2] Starting with 2012, groundwater pumped is for Water Year (March 1 through February 28)

estimated the average deep percolation between 1978 and 1996 was 244,000 afy and applied groundwater between 1978 and 1997 was 193,000 afy (DWR, 2006; WWD, 2015).

According to DWR's draft designation, the Westside Subbasin is considered a critically overdrafted basin. This designation was recently identified as a part of the Sustainable Groundwater Management Act of 2014 (SGMA) and Groundwater Sustainability Plan (GSP) process and was based on significant, on-going, and irreversible subsidence which was about 0.4 feet per year between 2007 and 2011 (DWR, 2015b). Basins in critical overdraft must develop a GSP by 2020. As the primary water purveyor in the Westside Subbasin, Westlands Water District is the designated Groundwater Management Agency for the subbasin, and is currently in the process of developing the GSP for the subbasin. The plans and progress toward meeting the sustainability goal of achieving sustainable groundwater management within 20 years of implementation of the GSP, will be evaluated every five years. Other actions to manage the subbasin are described later in this chapter.

**Aquifer's Ability to Recover**

The reduction of CVP water and other surface supplies to the District over time has resulted in the construction of many new wells by farmers to obtain water to make up for the shortfall. There were 605 wells constructed within the District between 2000 and 2015. The total number of operational wells within the District in 2014 was 792 and 124 non-operational wells. Most of the information provided here on District groundwater conditions was obtained from the District's 2015 Deep Groundwater Report (WWD, 2016b) and 2012 Water Management Plan (WWD, 2013a).

As presented in Table 6, prior to the delivery of CVP water into the District, the annual groundwater pumping ranged from 822,000 to 964,000 acre-feet during the period of 1953 to 1968. The majority of this pumping was from the aquifer below the Corcoran Clay causing the sub-Corcoran piezometric groundwater surface (groundwater surface) to reach the lowest recorded average elevation of 156 feet below mean sea level in 1967. The U.S. Geological Survey concluded that extraction of large quantities of groundwater prior to CVP deliveries resulted in compaction of water bearing sediments and caused land subsidence ranging from 1 to 24 feet between 1926 and 1972.

After CVP water deliveries began in 1968, the groundwater surface rose steadily until reaching 89 feet above mean sea level in 1987, the highest average elevation on record dating back to the early 1940's. The only exception during this period was in 1977 when a drought and drastic reduction of CVP deliveries resulted in groundwater pumping of approximately 472,000 acre-feet and an accompanying drop in the groundwater surface elevation of approximately 97 feet.

During the early 1990's, groundwater pumping increased due to reduced CVP water supplies due to drought and regulatory actions. Groundwater pumping reached an estimated 600,000 acre-feet annually during 1991 and 1992 when the District received only 25 percent of its contractual entitlement of CVP water. This increased pumping caused the groundwater surface to decline to 62 feet below mean sea level, the lowest elevation since 1977. DWR estimated the amount of subsidence since 1983 to be almost two feet in some areas of the District, with most of that subsidence occurring since 1989.

Based on data presented in Table 5 and Table 6, during 2011 to 2015, CVP allocations averaged 28 percent (320,771 acre-feet), total groundwater pumped was 2,353,000 acre-feet, and the groundwater surface elevation decreased 129 feet. The CVP allocations for 2014 and 2015 water year were 0 percent for both years and with the accompanying increase in groundwater pumped (655,000 acre-feet and 660,000 acre-feet, respectively), the groundwater surface decreased 62 feet over the two-year period to an average elevation of 120 feet below mean sea level.

In the project vicinity, the depth to the top of the Corcoran Clay in the project vicinity is approximately 650 to 700 feet. The elevation of the base of fresh groundwater is approximately -2200 feet mean sea level (WWD, 2015b).

**Sustainable Yield**

Estimates of annual sustainable yield or perennial yield of the subbasin (i.e., the annual amount of groundwater that can be extracted without lowering groundwater levels over the long term) are currently being developed by WWD through its development of a Groundwater Sustainability Plan under the Sustainable Groundwater Management Act. Once the sustainable yield number is determined, the yield per acre will vary somewhat throughout WWD depending on localized hydrogeology. However, as indicated in Tables 5 and 6 for 2013 through 2015, under drought conditions, WWD groundwater withdrawals (data tables only include WWD data as growers who rely solely on groundwater are not included here) results in progressive lowering of the groundwater table, indicating exceedance of the sustainable yield of the groundwater resource.

**WESTLANDS WATER DISTRICT SUPPLY CONDITIONS**

The District has stated it will provide PV solar projects an operational water supply of up to 5.0 afy per quarter section (160 acres) (which equals 0.03 af/ac/yr or 600 afy for the Westlands Solar Park plan area). Total operational demands of 270 afy from Table 3 equates to 2.16 afy per ¼ section (0.0.0135 af/ac/yr), well within WWD's maximum annual allowance.

Because of recurring dry years and the possibility of a drought during the construction period, pumping in excess of the sustainable yield may continue in the Westside Subbasin. However, such conditions would occur regardless of the proposed project and water levels in the Westside Subbasin have historically generally recovered from periods of heavy pumping during drought years, indicating that overdraft conditions do not persist when the import of surface water returns to non-drought quantities. However, DWR designated the subbasin as critically overdrafted primarily because of the related subsidence effects of overpumping. Although the District has been able to meet its municipal and industrial untreated water demands in the past, in the event that the District cannot provide the project water supply, water can be obtained from the same local wells that were used for construction water demands.

**WATER MANAGEMENT AGENCIES AND ACTIVITIES**

The majority of the Westside Subbasin is in Fresno County, extending south into Kings County. The Westside Subbasin is almost entirely within the District service area.

**Westlands Water District**

With the a total irrigation requirement of 1.5 million afy, and with WWD's CVP contract water amount recently reduced to a maximum 895,000 afy (with actual surface water deliveries recently averaging far less), the District must allocate water to its growers, even in the wettest years. To adapt to ongoing supply shortages and shallow groundwater drainage issues which are detrimental to regional groundwater quality, the District funds education and technology, enabling growers to effectively utilize water allotments through efficiencies. The District surveys the static water levels in the wells and the water quality and quantity of pumped groundwater as part of its Water Management Plan.

A key component of the District's Water Management Plan is water conservation. This program consists of the following elements.

- Irrigation Guide for water requirements per crop
- Water Conservation and Management Handbook
- Workshops and meeting on water management information
- Technical assistance and conservation computer programs
- Meter repair and updated program
- Groundwater monitoring
- Pump efficiency tests
- Conjunctive use of supplies
- Irrigation System Improvement Program
- Satellite imagery purchased about once every two weeks

As mentioned above, the SGMA requires that all medium to critically overdrafted subbasins identified by DWR be managed by a groundwater sustainability agency (GSA). The GSA is responsible for locally managing the groundwater subbasin through the development and implementation a GSP. As the primary water purveyor in the DWR-designated critically overdrafted Westside Subbasin, WWD is serving as the GSA for the subbasin, effective November 1, 2016.. Under SGMA, WWD is required to submit a Groundwater Sustainability Plan by January 31, 2020 to demonstrate how the groundwater resources will be sustainably managed. As mentioned, the WWD is currently in the process of developing the GSP for the Westside Subbasin.

**Fresno Area Regional Groundwater Management Plan**

The Fresno County Groundwater Management Plan was updated in 2006. Although the study area is primarily within the Kings Subbasin which does not extend to the WSP site, its activities will improve the management of the Westside Subbasin and it demonstrates active efforts towards increased supply reliability in the region. The regional groundwater management group of nine agencies and one private water company that prepared the plan is implementing activities to improve water resources management and reporting annually. Activities include: groundwater level monitoring, groundwater quality monitoring, land surface subsidence monitoring, and surface water monitoring on an ongoing basis. These agencies are constantly making improvements to improve groundwater recharge, increase water conservation and education savings, pursue groundwater banking, increase recycled water usage to reduce potable consumption, and other activities.

**WATER SUPPLY RELIABILITY**

SB 610 requires the consideration of supply availability under varying climatic conditions including normal water years and dry years. Reasonable assumptions can be made regarding availability and reliability under normal year and dry year scenarios based on available data and information for the project.

**Groundwater Supply Reliability**

During single and multiple dry years when less CVP contract water is available, the District relies more on local groundwater resources, resulting in a temporary drawdown of the aquifer. As demonstrated, historically the basin generally recovers from these times of increased pumping when surface water availability is restored; however, there is some concern regarding subsidence reducing the overall capacity of the aquifer, particularly on the west side of the subbasin.

In addition, reducing the current amount of groundwater pumping within the Westlands Solar Park plan area will increase availability of Westside Subbasin groundwater supplies and not exacerbate subsidence. Groundwater management efforts described in this WSA would contribute to additional supply and improved quality of waters in the Westside Subbasin. For the construction of the Westlands Solar Park solar projects, groundwater in this unadjudicated basin is considered available and reliable under normal water years, a single dry water year, and multiple dry years, as shown in Table 7.

Westlands Solar Park's temporary peak demands of 729 afy (during the 13-year construction period) and 270 afy (operational use after Westlands Solar Park buildout) would introduce a less intensive water demand on 11,120 acres of the site which is currently pumping some portion of the overall 27,800 afy irrigation demand. Of the 9,820 acres of fallowed (or dry farmed) District-owned land, the Westlands Solar Park solar projects would temporarily represent a more intensive use of the land by applying water for dust control during construction (whereas no water is applied to this area currently). The net result for the entire 20,900 acre plan area is a reduction in water demands from 27,800 afy to a maximum of 729 afy during peak construction and 270 afy for operations after buildout. Based on the information provided in this WSA, the maximum year demand during construction of 729 afy is not expected to result in adverse water supply reliability impacts; in fact, the change in land use will result in a beneficial impact to the Westside Subbasin by significantly reducing the amount of groundwater pumped.

**Westlands Water District Supply Reliability**

The amount of CVP contract water received by the District during any given year varies depending on climatic and hydrologic conditions, Delta constraints, and other factors. The District augments the contract water with transfers and other purchased supplies, and growers augment surface supplies through increased groundwater pumpage. During operation of the project, the long term water demand of 270 afy for operational uses such as panel cleaning and vegetation management by sheep grazing would be met using water provided by WWD.

The District does not have a municipal and industrial (M&I) supply contract with USBR, but it does exercise provisions in its agricultural water service contract for supplying water for incidental agricultural water. These purposes include M&I water use for industrial and commercial operations, single family dwellings, and farm housing. Thus, WWD delivers untreated water to communities of Coalinga, Heron, and other M&I users. The WWD rules and regulations recognize solar facilities as an

**Table 7. Westlands Solar Park Supplies and Demands (afy)**

| | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 |
|---|---|---|---|---|---|---|
| **Normal Year Construction** | | | | | | |
| Groundwater Supply [1] | 2,669 | 2,669 | 2,669 | 2,669 | 2,669 | 2,669 |
| WWD Supply | 0 | 0 | 0 | 0 | 0 | 0 |
| *Construction Demand [2]* | *0* | *265* | *235* | *240* | *0* | *0* |
| **Normal Year Operations** | | | | | | |
| Groundwater Supply | 0 | 0 | 0 | 0 | 0 | 0 |
| WWD Supply [3] | 625 | 625 | 625 | 625 | 625 | 625 |
| *Operations Demand [2]* | *0* | *46* | *151* | *270* | *270* | *270* |
| **Single Dry Year Construction** | | | | | | |
| Groundwater Supply [1] | 2,669 | 2,669 | 2,669 | 2, 669 | 2, 669 | 2, 669 |
| WWD Supply | 0 | 0 | 0 | 0 | 0 | 0 |
| *Construction Demand [2]* | *0* | *265* | *235* | *240* | *0* | *0* |
| **Single Dry Year Operations** | | | | | | |
| Groundwater Supply | 0 | 0 | 0 | 0 | 0 | 0 |
| WWD Supply [3] | 625 | 625 | 625 | 625 | 625 | 625 |
| *Operations Demand [2]* | *0* | *46* | *151* | *270* | *270* | *270* |
| **Multiple Dry Year Construction (Year 1, 2, 3)** | | | | | | |
| Groundwater Supply [1] | 2,669 | 2,669 | 2,669 | 2,669 | 2,669 | 2,669 |
| WWD Supply | 0 | 0 | 0 | 0 | 0 | 0 |
| *Construction Demand [2]* | *0* | *265* | *235* | *240* | *0* | *0* |
| **Multiple Dry Year Operations (Year 1, 2, 3)** | | | | | | |
| Groundwater Supply | 0 | 0 | 0 | 0 | 0 | 0 |
| WWD Supply [3] | 625 | 625 | 625 | 625 | 625 | 625 |
| *Operations Demand [2]* | *0* | *46* | *151* | *270* | *270* | *270* |

[1] Pending WWD's development of sustainable yield estimates through its ongoing Groundwater Sustainability Plan efforts, this analysis presumes a sustainable yield of 0.24 af/ac/yr (based on a conservatively low estimate of 135,000 afy sustainable yield for the 568,000 irrigable acres within Westlands Water District) applied to 11,120 currently irrigated acres within the Westlands Solar Park plan area. This low-side estimate of sustainable yield provides a reasonable worst-case baseline for purposes of this WSA.
[2] From Table 4.
[3] WWD can provide up to 5.0 afy per 160 acres from its CVP allocation augmented with other purchases and groundwater. Assumes total WSP plan area of 20,000 acres.

M&I use and therefore has a higher priority for CVP allocations. During dry years for example, a higher percentage is allocated to M&I than to agricultural uses (e.g., during 2014 the CVP had a 25 percent allocation for M&I versus 0 percent for agriculture).

WWD manages its supplies for long term supply reliability. It augments CVP contract water with local and purchased surface waters, which are supplemented by groundwater pumping by growers, as presented in Table 5, and WWD encourages the fallowing of lands during shortages. Based on the information provided in this WSA, WWD water supplies to meet the operational demand of 270 afy under normal water years, a single dry water year, and multiple dry years, are considered available and reliable, as shown in Table 7. If for some reason District surface water supplies are not available when needed, groundwater would be pumped from local agricultural wells and trucked to the site for panel washing and sheep grazing.

In summary, sufficient water supply is available to meet Westlands Solar Park construction and operational demands under normal, dry, and multiple dry year climatic conditions. Westlands Solar Park would result in significantly less groundwater pumping of the Westside Subbasin during construction, and no groundwater pumping during solar facility operations after full buildout.

**OTHER PLANNED USES**

Other planned uses in the Westside Subbasin consist almost entirely of other solar PV generation facilities. Currently, there are 15 completed or partially completed solar projects in the Fresno County and Kings County portions of the subbasin, plus an additional 13 solar projects with pending or approved conditional use permit (CUP) applications at the counties. The total land area covered by these other projects is approximately 22,599acres, with a total generating capacity of 2,478MW. Based on an average construction water demand rate of 2.0 acre-feet/MW (or 0.2 acre-feet/acre, on average, based on land requirements of approximately 10 acres per MW), these other projects would consume a total of 4,956acre-feet during construction. It is assumed that all construction water would be obtained from local groundwater sources within the subbasin, and it is expected that construction of each acre of solar project would take less than one year. The consumption rate of 0.2 af/ac/yr would not exceed the presumed groundwater sustainable yield of 0.24 af/ac/yr of the groundwater basin. Upon completion, operational water demands would be approximately 0.0135 af/ac/yr. It is assumed that operational water for the other solar projects would be obtained from groundwater sources within the subbasin. These operational water demands would be well below the presumed sustainable yield for the groundwater basin. In summary, neither the short-term construction of the other planned projects within the subbasin, nor the long-term operational water demands from each project, would be likely to exceed the sustainable yield of the groundwater basin. Therefore, the construction and operational water demands for the other planned projects in the subbasin could be met from existing groundwater sources without contributing to overdraft of the subbasin.

# CHAPTER 4 – CONCLUSIONS

## SUFFICIENCY FINDINGS

A lack of specific data for project site groundwater usage and replenishment rates (e.g., a water budget) makes it difficult to quantify baseline conditions regarding groundwater supply availability. However, an analysis of the ability of the groundwater basin (based on District subbasin data) to meet projected temporary construction water demands of Westlands Solar Project was based on other factors. One consideration is that the solar projects have rights to a reasonable use of groundwater supply from the groundwater basin they overlie and that the peak construction demands are substantially less than the presumed sustainable groundwater yield on a per acre basis. Another consideration is that the projected peak combine construction and operational buildout demands for the Westlands Solar Park (729 afy) will be significantly lower than current total agricultural water demands within the WSP plan area (27,800 afy).

The WWD CVP allocation is only about 50 percent reliable on average, but this supply is augmented with other sources, particularly during dry years. The groundwater basin available to individual landowners within WWD is in critical overdraft. However a reduction in agricultural water demands due to the solar project will result in increased water supply reliability for other agricultural users within the District.

With consideration of these variables and conditions, it is concluded that groundwater supplies from the Westside Subbasin will meet construction demands for the WSP during the 13 year construction period, in addition to the demand of existing and other planned future uses. District water supplies will meet projected operational water demands for the WSP over a 20 year planning horizon, in addition to the demand of existing and other planned future uses. No supply deficiencies are expected in normal, dry, and multiple dry years for the proposed project. This WSA was prepared in compliance with the California Water Code, as amended by SB 610.

# REFERENCES

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