APPENDIX C

Air Quality Report

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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 4th 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 98th 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 99th 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 98th 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.

Ozone

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.

[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.

SJVAPCD Indirect Source Review Rule

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.

Regulation VIII – Fugitive PM_{10}

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) Construction Emissions of PM. 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) Criteria Air Pollutant Emissions. 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) Ambient Air Quality. 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) Local CO Concentrations. 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*.

Consistency with GHG Reduction Plans and Policies

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		Mean annual wind speed, mph: (8)		8.03
Total tons of soil handled:	0.0		Avg. Soil moisture, %: (9)		5
Total days soil handled:	213		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	**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

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:	**994085**	**per Applicant**
Total Daily VMT-Diesel	0	
Total Daily VMT-Gasoline	0	
Total Period VMT-Diesel	944380.75	
Total Period VMT-Gasoline	49704.25	

Emissions Factors (lbs/vmt)

NOx	CO	VOC	SOx	PM10	CO2	
0.00774877	0.00056881	0.00013224	0.000026	5.2881E-05	3.17439316	HDDT
0.000569	0.00393159	9.5515E-05	0.000013	3.8032E-06	1.0634582	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

3.659	0.269	0.062	0.012	0.025	1498.9	0.021	HDDT
0.014	0.098	0.002	0.000	0.000	26.4	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**
0.00053213	0.00473183	0.00010839	0.000008	5.9144E-06	0.68648682	lbs/vmt*	LDT gasoline	
0.1596	1.4195	0.0325	0.0024	0.0018	205.9460	lbs/day	gasoline	0.0012

Tons per Const Period

0.0202	0.1796	0.0041	0.0003	0.0002	26.1	**tons/period**	**gasoline**	0.0001

Ref: EMFAC 2014, SJVAPCD Year 2016
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
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: 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: 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		98	2	7	245	14	3430	336140
Front End Loaders	(single category)	98	1	7	83	7	581	56938
Backhoes		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

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:	**1588347**	**per Applicant**
Total Daily VMT-Diesel	0	
Total Daily VMT-Gasoline	0	
Total Period VMT-Diesel	1508929.33	
Total Period VMT-Gasoline	79417.3333	

Emissions Factors (lbs/vmt)

NOx	CO	VOC	SOx	PM10	CO2	
0.00625339	0.00051535	0.00011377	0.000026	3.9844E-05	3.10646173	HDDT
0.00046982	0.00340025	7.8173E-05	0.000013	2.9202E-06	1.02361637	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

4.718	0.389	0.086	0.020	0.030	2343.7	0.025	HDDT
0.019	0.135	0.003	0.001	0.000	40.6	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
0.00040762	0.00359256	6.9991E-05	0.000008	5.0718E-06	0.6541839	lbs/vmt*	LDT gasoline	
0.1223	1.0778	0.0210	0.0024	0.0015	196.2552	lbs/day	gasoline	0.0010

Tons per Const Period

0.0155	0.1363	0.0027	0.0003	0.0002	24.8	**tons/period**	**gasoline**	0.0001

Ref: EMFAC 2014, SJVAPCD Year 2016
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.

SGF 3 2020-2021

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
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: 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		98	2	7	245	14	3430	336140
Front End Loaders	(single category)	98	1	7	83	7	581	56938
Backhoes		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

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:	**894677**	**per Applicant**
Total Daily VMT-Diesel	0	
Total Daily VMT-Gasoline	0	
Total Period VMT-Diesel	849942.675	
Total Period VMT-Gasoline	44733.825	

Emissions Factors (lbs/vmt)

NOx	CO	VOC	SOx	PM10	CO2	
0.00625339	0.00051535	0.00011377	0.000026	3.9844E-05	3.10646173	HDDT
0.00046982	0.00340025	7.8173E-05	0.000013	2.9202E-06	1.02361637	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

2.658	0.219	0.048	0.011	0.017	1320.2	0.014	HDDT
0.011	0.076	0.002	0.000	0.000	22.9	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**
0.00040762	0.00359256	6.9991E-05	0.000008	5.0718E-06	0.6541839	lbs/vmt*	LDT gasoline	
0.1223	1.0778	0.0210	0.0024	0.0015	196.2552	lbs/day	gasoline	0.0010

Tons per Const Period

0.0155	0.1363	0.0027	0.0003	0.0002	24.8	**tons/period**	**gasoline**	0.0001

Ref: EMFAC 2014, SJVAPCD Year 2016
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		98	1	7	50	7	350	34300
Backhoes		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		Mean annual wind speed, mph: (8)		8.03
Total tons of soil handled:	0.0		Avg. Soil moisture, %: (9)		5
Total days soil handled:	342		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	**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

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:	**2183909**	**per Applicant**
Total Daily VMT-Diesel	0	
Total Daily VMT-Gasoline	0	
Total Period VMT-Diesel	2074713.74	
Total Period VMT-Gasoline	109195.46	

Emissions Factors (lbs/vmt)

NOx	CO	VOC	SOx	PM10	CO2	
0.00625339	0.00051535	0.00011377	0.000026	3.9844E-05	3.10646173	HDDT
0.00046982	0.00340025	7.8173E-05	0.000013	2.9202E-06	1.02361637	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

6.487	0.535	0.118	0.027	0.041	3222.5	0.034	HDDT
0.026	0.186	0.004	0.001	0.000	55.9	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
0.00040762	0.00359256	6.9991E-05	0.000008	5.0718E-06	0.6541839	lbs/vmt*	LDT gasoline	
0.1223	1.0778	0.0210	0.0024	0.0015	196.2552	lbs/day	gasoline	0.0010

Tons per Const Period

0.0155	0.1363	0.0027	0.0003	0.0002	24.8	**tons/period**	**gasoline**	0.0001

Ref: EMFAC 2014, SJVAPCD Year 2016
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
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: 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		98	2	7	98	14	1372	134456
Front End Loaders	(single category)	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 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	**	
			calculated per Applicant dat	
Number of construction work days per month:		22	**VMT/period:**	**9654.24**
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		

	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

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:	**1786890**	**per Applicant**
Total Daily VMT-Diesel	0	
Total Daily VMT-Gasoline	0	
Total Period VMT-Diesel	1697545.5	
Total Period VMT-Gasoline	89344.5	

Emissions Factors (lbs/vmt)

NOx	CO	VOC	SOx	PM10	CO2	
0.00625339	0.00051535	0.00011377	0.000026	3.9844E-05	3.10646173	HDDT
0.00046982	0.00340025	7.8173E-05	0.000013	2.9202E-06	1.02361637	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

5.308	0.437	0.097	0.022	0.034	2636.7	0.028	HDDT
0.021	0.152	0.003	0.001	0.000	45.7	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
0.00040762	0.00359256	6.9991E-05	0.000008	5.0718E-06	0.6541839	lbs/vmt*	LDT gasoline	
0.1223	1.0778	0.0210	0.0024	0.0015	196.2552	lbs/day	gasoline	0.0010

Tons per Const Period

0.0155	0.1363	0.0027	0.0003	0.0002	24.8	**tons/period**	**gasoline**	0.0001

Ref: EMFAC 2014, SJVAPCD Year 2016
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; 8 hrs/day; 1.71 years

Construction Totals: 164 hrs/month; 3360 hrs/const period; 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		98	1	7	50	7	350	34300
Backhoes		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.

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)		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

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:	**1687618**	**per Applicant**
Total Daily VMT-Diesel	0	
Total Daily VMT-Gasoline	0	
Total Period VMT-Diesel	1603237.42	
Total Period VMT-Gasoline	84380.9167	

Emissions Factors (lbs/vmt)

NOx	CO	VOC	SOx	PM10	CO2	
0.00625339	0.00051535	0.00011377	0.000026	3.9844E-05	3.10646173	HDDT
0.00046982	0.00340025	7.8173E-05	0.000013	2.9202E-06	1.02361637	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

5.013	0.413	0.091	0.021	0.032	2490.2	0.027	HDDT
0.020	0.143	0.003	0.001	0.000	43.2	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**
0.00040762	0.00359256	6.9991E-05	0.000008	5.0718E-06	0.6541839	lbs/vmt*	LDT gasoline	
0.1223	1.0778	0.0210	0.0024	0.0015	196.2552	lbs/day	gasoline	0.0010

Tons per Const Period

0.0155	0.1363	0.0027	0.0003	0.0002	24.8	**tons/period**	**gasoline**	0.0001

Ref: EMFAC 2014, SJVAPCD Year 2016
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
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: 21.5 months — Construction Totals: 217.67442 hrs/month
8 hrs/day — 4680 hrs/const period
1.79 years — 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		98	2	7	245	14	3430	336140
Front End Loaders	(single category)	98	1	7	83	7	581	56938
Backhoes		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)
			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: 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

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:	**1093494**	**per Applicant**
Total Daily VMT-Diesel	0	
Total Daily VMT-Gasoline	0	
Total Period VMT-Diesel	1038818.83	
Total Period VMT-Gasoline	54674.675	

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

0.693	0.192	0.033	0.013	0.006	1514.7	0.005	HDDT
0.007	0.055	0.001	0.000	0.000	23.9	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:	**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; 8 hrs/day; 0.75 years

Construction Totals: 422 hrs/month; 3800 hrs/const period; 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		98	2	7	147	14	2058	201684
Front End Loaders	(single category)	98	1	7	50	7	350	34300
Backhoes		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		Mean annual wind speed, mph: (8)		8.03
Total tons of soil handled:	0.0		Avg. Soil moisture, %: (9)		5
Total days soil handled:	383		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	**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

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:	**2481715**	**per Applicant**
Total Daily VMT-Diesel	0	
Total Daily VMT-Gasoline	0	
Total Period VMT-Diesel	2357629.25	
Total Period VMT-Gasoline	124085.75	

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

1.573	0.436	0.074	0.029	0.013	3437.6	0.011	HDDT
0.016	0.125	0.002	0.001	0.000	54.3	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

Ref: EMFAC 2014, SJVAPCD Year 2023 LDT1-gas, MDV-gas, HDDT-dsl	0.0085	0.0775	0.0014	0.0003	0.0001	20.9	**tons/period**	**gasoline**	0.0001

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		98	2	7	147	14	2058	201684
Front End Loaders	(single category)	98	1	7	50	7	350	34300
Backhoes		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)
			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

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:	**2481715**	**per Applicant**
Total Daily VMT-Diesel	0	
Total Daily VMT-Gasoline	0	
Total Period VMT-Diesel	2357629.25	
Total Period VMT-Gasoline	124085.75	

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

1.573	0.436	0.074	0.029	0.013	3437.6	0.011	HDDT
0.016	0.125	0.002	0.001	0.000	54.3	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

Ref: EMFAC 2014, SJVAPCD Year 2023 LDT1-gas, MDV-gas, HDDT-dsl	0.0085	0.0775	0.0014	0.0003	0.0001	20.9	**tons/period**	**gasoline**	0.0001

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		*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	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		98	2	7	98	14	1372	134456
Front End Loaders	(single category)	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 =	4.7	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

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

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	Bus Round Trips/Day:	0 max	Ref: SJVAPCD EMFAC 2014, Year 2025
Avg Bus VMT/Const Day:	0	Bus Occupancy/Trip:	0	All other buses-DSL
Max Bus VMT/Const Day:	0			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.

SGF 11 2029

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; 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: 17 months; 8 hrs/day; 1.42 years
Construction Totals: 249.41176 hrs/month; 4240 hrs/const period; 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		98	1	7	83	7	581	56938
Backhoes		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		Mean annual wind speed, mph: (8)		8.03
Total tons of soil handled:	0.0		Avg. Soil moisture, %: (9)		5
Total days soil handled:	252		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	**3.470**	**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	
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

Ref: EMFAC 2014, SJVAPCD Year 2023 LDT1-gas, MDV-gas, HDDT-dsl	0.0085	0.0775	0.0014	0.0003	0.0001	20.9	**tons/period**	**gasoline**	0.0001

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	Bus Round Trips/Day:	0 max	Ref: SJVAPCD EMFAC 2014, Year 2025
Avg Bus VMT/Const Day:	0	Bus Occupancy/Trip:	0	All other buses-DSL
Max Bus VMT/Const Day:	0			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.

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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; 8 hrs/day; 1.17 years
Construction Totals: 180 hrs/month; 2520 hrs/const period; 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		98	2	7	98	14	1372	134456
Front End Loaders	(single category)	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			Calc 3	int		0.513
tons/period 0.000 0.000			Calc 4	PM10	lb/ton	0.0006
tons/month 0.000 0.000			PM2.5 fraction of PM10:			0.210
max lbs/day 0.000 0.000						

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

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:	**987625**	**per Applicant**
Total Daily VMT-Diesel	0	
Total Daily VMT-Gasoline	0	
Total Period VMT-Diesel	938243.75	
Total Period VMT-Gasoline	49381.25	

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

0.626	0.174	0.029	0.012	0.005	1368.0	0.004	HDDT
0.006	0.050	0.001	0.000	0.000	21.6	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:	**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		98	0	0	0	0	0	0
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

** 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
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		98	0	0	0	0	0	0
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

** 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
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: 3 months; 8 hrs/day; 0.25 years

Construction Totals: 240 hrs/month; 720 hrs/const period; 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	(single category)	98	1	7	30	7	210	20580
Backhoes	(single category)	98	0	0	0	0	0	0
Trenchers	(single category)	81	0	0	0	0	0	0
Welders	(single category)	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 = 863511
Const Period Gasoline Hp-Hrs = 0
Const Period Diesel Fuel Use = 51811 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	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
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: 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.

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)
			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			
Calc 1	0.733	0.733	**Emissions**	**PM10**	**PM2.5**
Calc 2	1.151	1.151	**lbs/period**	**2957.93**	**296.52**
Calc 3	1.266	0.127	**tons/period**	**1.479**	**0.148**
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)											
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

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
Total Const Period Worker VMT: **123260**	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
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: 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		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, 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
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

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
Total Const Period Worker VMT: **123260**	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	% Overlap 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

Subarea	MW
1	100
2	160
3	90
4	220
5	180
6	170
7	110
8	250
9	250
10	150
11	200
12	120

Totals Scaled to Project Size

Worker trips	Truck Trips	Total Trips	Worker VMT	Truck VMT	Total VMT	Truck percentage
49300	4661	53961	4,437,000	994,085	5,431,085	9%
78400	7415	85815	7056000	1,588,347	8,644,347	9%
44370	4195	48565	3993300	894,677	4,887,977	9%
108064	10204	118268	9725760	2,183,909	11,909,669	9%
88200	8342	96542	7938000	1,786,890	9,724,890	9%
83300	7879	91179	7497000	1,687,618	9,184,618	9%
54230	5127	59357	4880700	1,093,494	5,974,194	9%
122800	11596	134396	11,052,000	2,481,715	13,533,715	9%
122800	11596	134396	11,052,000	2,481,715	13,533,715	9%
73500	6952	80452	6,615,000	1,489,075	8,104,075	9%
98240	9277	107517	8841600	1,985,372	10,826,972	9%
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)
			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
			Inputs from Exhaust Calcs
Number of vehicles per day:		51	*
Number of work days per month:		30	**VMT/period:** **171740**
	Total vehicles per month:	1530	
Number of work months per year:		10.67	adjusted for precip events
	Total vehicles per OPs period:	16325.1	

	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

# of Identical Engines: 2

Engine Service: Portable Generator

Mfg:	Cummins or equivalent		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 lbs/mmbtu		0.0159	0.02	7.62	0.00381	*0.03*	*0.03*	*15.24*	*0.00762*
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

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.