C.5 - HEALTH AND SAFETY

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C.5.1 SUMMARY OF CONCLUSIONS

U.S. Bureau of Land Management and Energy Commission staff (hereafter jointly referred to as staff) have analyzed potential public health and safety risks associated with construction and operation of the Genesis Solar Energy Project (GSEP) and does not expect there would be any significant adverse cancer, or short - or long-term noncancer health effects from project toxic emissions. Staff's analysis of potential health impacts from the proposed GSEP project was based on a conservative health protective methodology that accounts for impacts to the most sensitive individuals in a given population, including newborns and infants. According to the results of staff's health risk assessment, emissions from GSEP would not contribute significantly to morbidity or mortality in any age or ethnic group residing in the project area.

C.5.2 INTRODUCTION

The purpose of this Preliminary Staff Assessment/Plan Amendment/Draft Environmental Impact Statement (PSA/DPA/DEIS) is to determine if emissions of toxic air contaminants (TACs) from the proposed GSEP project would have the potential to cause significant adverse public health impacts or to violate standards for public health protection. If potentially significant health impacts are identified, staff will evaluate mitigation measures to reduce such impacts to insignificant levels.

In addition to the analysis contained in this Public Health and Safety Section that focuses on potential effects to the public from emissions of toxic air contaminants, other related aspects to the assessment of potential public health and safety impacts from GSEP are considered elsewhere in this document as listed and briefly described below:

- Air Quality - evaluates the expected air quality impacts from the emissions of criteria air pollutants from both the construction and operation of the GSEP Project; Criteria air pollutants are defined as air contaminants for which the state and/or federal governments have established an ambient air quality standard to protect public health;
- Hazardous Materials Management - evaluates the potential impacts on public and worker health from accidental releases of hazardous materials;
- Socioeconomics and Environmental Justice - evaluates project-induced changes on community services including law enforcement and hospitals;
- Soil and Water Resources – evaluates the potential for GSEP to cause contamination of soil and water resources, to exacerbate flooding, and to cause adverse effects to water supply in consideration of other existing users and projected needs;
- Transmission Line Safety and Nuisance – evaluates potential effects associated with proposed transmission lines accounting for both the physical presence of the lines and the physical interactions of their electric and magnetic fields; The potential effects include aviation safety, interference with radio-frequency communication,

audible noise, fire hazards, hazardous shocks, nuisance shocks, and electric and magnetic field (EMF) exposure.

- Worker Safety and Fire Protection - assess the worker safety and fire protection measures proposed by the applicant including determining whether the project would have any adverse impacts on fire protection and emergency medical services that are also relied upon by the public;
- Waste Management - evaluates issues associated with wastes generated from the proposed project construction and operation including ensuring that wastes would be managed in an environmentally safe manner.

C.5.3 METHODOLOGY AND THRESHOLDS FOR DETERMINING ENVIRONMENTAL CONSEQUENCES

The analysis of proposed project effects must comply with both CEQA and NEPA requirements given the respective power plant licensing and land jurisdictions of the California Energy Commission and U.S. Bureau of Land Management (BLM). CEQA requires that the significance of individual effects be determined by the Lead Agency; however, the use of specific significance criteria is not required by NEPA.

Because this document is intended to meet the requirements of both NEPA and CEQA, the methodology used for determining environmental impacts of the proposed project includes a consideration of guidance provided by both laws.

CEQA requires a list of criteria that are used to determine the significance of identified impacts. A significant impact is defined by CEQA as “a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project” (State CEQA Guidelines Section 15382).

In comparison, the Council on Environmental Quality Regulations for Implementing the Procedural Provisions of the NEPA (CEQ NEPA Regulations) states that “‘Significantly’ as used in NEPA requires considerations of both context and intensity…” (40 CFR 1508.27). Therefore, thresholds serve as a benchmark for determining if a project action will result in a significant adverse environmental impact when evaluated against the baseline. CEQ NEPA Regulations requires that an Environmental Impact Statement (EIS) be prepared when a proposed major federal action (project) as a whole has the potential to “significantly affect the quality of the human environment.”

Thresholds for determining significance in this section are based on Appendix G of the CEQA Guidelines (CCR 2006) and performance standards or thresholds identified by the Energy Commission staff. In addition, staff’s evaluation of the environmental effects of the proposed project on land uses (i.e., those listed below) includes an assessment of the context and intensity of the impacts, as defined in the NEPA implementing regulations 40 CFR Part 1508.27.

Effects of the proposed project on the land use environment (and in compliance with both CEQA and NEPA) have been determined using the thresholds listed below.

The **PUBLIC HEALTH** section of this staff assessment discusses toxic emissions to which the public could be exposed during project construction and routine operation. Following the release of toxic contaminants into the air or water, people may come into contact with them through inhalation, dermal contact, or ingestion via contaminated food or water.

Air pollutants for which no ambient air quality standards have been established are called noncriteria pollutants. Unlike criteria pollutants such as ozone, carbon monoxide, sulfur dioxide, or nitrogen dioxide, noncriteria pollutants have no ambient (outdoor) air quality standards that specify levels considered safe for everyone.

Since noncriteria pollutants do not have such standards, a health risk assessment is used to determine if people might be exposed to those types of pollutants at unhealthy levels. The risk assessment consists of the following steps:

- identify the types and amounts of hazardous substances that GSEP could emit to the environment;
- estimate worst-case concentrations of project emissions in the environment using dispersion modeling;
- estimate amounts of pollutants that people could be exposed to through inhalation, ingestion, and dermal contact; and
- characterize potential health risks by comparing worst-case exposure to safe standards based on known health effects.

Staff relies upon the expertise of the California Environmental Protection Agency (Cal/EPA) Office of Environmental Health Hazard Assessment (OEHHA) to identify contaminants that are known to the state to cause cancer or other noncancer toxicological endpoints and to calculate the toxicity and cancer potency factors of these contaminants. Staff also relies upon the expertise of the California Air Resources Board and the local air districts to conduct ambient air monitoring of toxic air contaminants and the state Department of Public Health to conduct epidemiological investigations into the impacts of pollutants on communities. It is not within the purview or the expertise of the Energy Commission staff to duplicate the expertise and statutory responsibility of these agencies.

Initially, a screening level risk assessment is performed using simplified assumptions that are intentionally biased toward protection of public health. That is, an analysis is designed that overestimates public health impacts from exposure to project emissions. In reality, it is likely that the actual risks from the power plant will be much lower than the risks as estimated by the screening level assessment. The risks for screening purposes are based on examining conditions that would lead to the highest, or worst-case, risks and then using those conditions in the study. Such conditions include:

- using the highest levels of pollutants that could be emitted from the plant;
- assuming weather conditions that would lead to the maximum ambient concentration of pollutants;

- using the type of air quality computer model which predicts the greatest plausible impacts;
- calculating health risks at the location where the pollutant concentrations are estimated to be the highest;
- assuming that an individual's exposure to cancer-causing agents occurs continuously for 70 years; and
- using health-based standards designed to protect the most sensitive members of the population (i.e., the young, elderly, and those with respiratory illnesses).

A screening level risk assessment will, at a minimum, include the potential health effects from inhaling hazardous substances. Some facilities may also emit certain substances that could present a health hazard from noninhalation pathways of exposure (OEHHA 2003, Tables 5.1, 6.3, 7.1). When these substances are present in facility emissions, the screening level analysis includes the following additional exposure pathways: soil ingestion, dermal exposure, and mother's milk (OEHHA 2003, p. 5-3).

The risk assessment process for this project addresses two categories of health impacts: chronic (long-term) noncancer effects, and cancer risk (also long-term). Since the only TAC emitted from this project would be diesel particulate from emergency diesel-fueled engines, and since only long-term health effects have been established for diesel particulate, no acute (short-term) health effects are calculated for this project.

Chronic health effects are those that arise as a result of long-term exposure to lower concentrations of pollutants. The exposure period is considered to be approximately from 12 percent to 100 percent of a lifetime, or from 8 to 70 years (OEHHA 2003, p. 6-5). Chronic health effects include diseases such as reduced lung function and heart disease.

The analysis for noncancer health effects compares the maximum project contaminant levels to safe levels called *Reference Exposure Levels*, or RELs. These are amounts of toxic substances to which even sensitive people can be exposed and suffer no adverse health effects (OEHHA 2003, p. 6-2). These exposure levels are designed to protect the most sensitive individuals in the population, such as infants, the aged, and people suffering from illness or disease which makes them more sensitive to the effects of toxic substance exposure. The Reference Exposure Levels are based on the most sensitive adverse health effect reported in the medical and toxicological literature and include margins of safety. The margin of safety addresses uncertainties associated with inconclusive scientific and technical information available at the time of standard setting and is meant to provide a reasonable degree of protection against hazards that research has not yet identified. The margin of safety is designed to prevent pollution levels that have been demonstrated to be harmful, as well as to prevent lower pollutant levels that may pose an unacceptable risk of harm, even if the risk is not precisely identified as to nature or degree. Health protection is achieved if the estimated worst-case exposure is below the relevant reference exposure level. In such a case, an adequate margin of safety exists between the predicted exposure and the estimated threshold dose for toxicity.

Exposure to multiple toxic substances may result in health effects that are equal to, less than, or greater than effects resulting from exposure to the individual chemicals. Only a small fraction of the thousands of potential combinations of chemicals have been tested for the health effects of combined exposures. In conformity with the California Air Pollution Control Officers Association (CAPCOA 1993) guidelines, the health risk assessment assumes that the effects of each substance are additive for a given organ system (OEHHA 2003, pp. 1-5, 8-12). Other possible mechanisms due to multiple exposures include those cases where the actions may be synergistic or antagonistic (where the effects are greater or less than the sum, respectively). For these types of substances, the health risk assessment could underestimate or overestimate the risks.

For carcinogenic substances, the health assessment considers the risk of developing cancer and assumes that continuous exposure to the cancer-causing substance occurs over a 70-year lifetime. The risk that is calculated is not meant to project the actual expected incidence of cancer, but rather a theoretical upper-bound number based on worst-case assumptions.

Cancer risk is expressed in chances per million and is a function of the maximum expected pollutant concentration, the probability that a particular pollutant will cause cancer (called *potency factors* and established by OEHHA), and the length of the exposure period. Cancer risks for each carcinogen are added to yield total cancer risk. The conservative nature of the screening assumptions used means that actual cancer risks due to project emissions are likely to be considerably lower than those estimated.

The screening analysis is performed to assess worst-case risks to public health associated with the proposed project. If the screening analysis predicts no significant risks, then no further analysis is required. However, if risks are above the significance level, then further analysis, using more realistic site-specific assumptions, would be performed to obtain a more accurate assessment of potential public health risks.

Significance Criteria

Energy Commission staff determines the health effects of exposure to toxic emissions based on impacts to the maximum exposed individual. This is a person hypothetically exposed to project emissions at a location where the highest ambient impacts were calculated using worst-case assumptions, as described above.

As described earlier, noncriteria pollutants for this project are evaluated for long-term (chronic) noncancer health effects as well as cancer (long-term) health effects. The significance of project health impacts is determined separately for each of these categories.

Chronic Noncancer Health Effects

Staff assesses the significance of noncancer health effects by calculating a *hazard index*. A hazard index is a ratio comparing exposure from facility emissions to the reference (safe) exposure level. A ratio of less than 1.0 signifies that the worst-case exposure is below the safe level. The hazard index for every toxic substance that has the same type of health effect is added to yield a Total Hazard Index. A Total Hazard Index of less than 1.0 indicates that cumulative worst-case exposures are less than the

reference exposure levels. Under these conditions, health protection from the project is likely to be achieved, even for sensitive members of the population. In such a case, staff presumes that there would be no significant noncancer project-related public health impacts.

Cancer Risk

Staff relied upon regulations implementing the provisions of Proposition 65, the Safe Drinking Water and Toxic Enforcement Act of 1986, (Health & Safety Code, §§25249.5 et seq.) for guidance to determine a cancer risk significance level. Title 22, California Code of Regulations section 12703(b) states that "the risk level which represents no significant risk shall be one which is calculated to result in one excess case of cancer in an exposed population of 100,000, assuming lifetime exposure." This level of risk is equivalent to a cancer risk of 10 in 1 million, which is also written as 10×10^{-6}. An important distinction is that the Proposition 65 significance level applies separately to each cancer-causing substance, whereas staff determines significance based on the total risk from all cancer-causing chemicals. Thus, the manner in which the significance level is applied by staff is more conservative (health-protective) than that applied by Proposition 65. The significant risk level of 10 in 1 million is consistent with the level of significance adopted by the MDAQMD in Rule 1320.

As noted earlier, the initial risk analysis for a project is typically performed at a screening level, which is designed to overstate actual risks, so that health protection can be ensured. Staff's analysis also addresses potential impacts on all members of the population including the young, the elderly, people with existing medical conditions that may make them more sensitive to the adverse effects of toxic air contaminants and any minority or low-income populations that are likely to be disproportionately affected by impacts. To accomplish this goal, staff uses the most current acceptable public health exposure levels set to protect the public from the effects of airborne toxics. When a screening analysis shows cancer risks to be above the significance level, refined assumptions would likely result in a lower, more realistic risk estimate. Based on refined assumptions, if risk posed by the facility exceeds the significance level of 10 in 1 million, staff would require appropriate measures to reduce the risk to less than significant. If, after all risk reduction measures had been considered, a refined analysis identifies a cancer risk greater than 10 in 1 million, staff would deem such risk to be significant and would not recommend project approval.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

PUBLIC HEALTH AND SAFETY Table 1
Laws, Ordinances, Regulations, and Standards (LORS)

Applicable Law	Description
Federal	
Clean Air Act section 112 (Title 42, U.S. Code section 7412)	This act requires new sources that emit more than 10 tons per year of any specified Hazardous Air Pollutant (HAP) or more than 25 tons per year of any combination of HAPs to apply Maximum Achievable Control Technology.
State	
California Health and Safety Code section 25249.5 et seq. (Proposition 65)	These sections establish thresholds of exposure to carcinogenic substances above which Prop 65 exposure warnings are required.
California Health and Safety Code section 41700	This section states that "no person shall discharge from any source whatsoever such quantities of air contaminants or other material which cause injury, detriment, nuisance, or annoyance to any considerable number of persons or to the public, or which endanger the comfort, repose, health, or safety of any such persons or the public, or which cause, or have a natural tendency to cause injury or damage to business or property."
California Health and Safety Code Sections 44300 et seq.	Air Toxics Hot Spots Program requires participation in the inventory and reporting program at the District level.
California Health and Safety Code Sections 44360 - 44366	Air Toxics Hot Spots Information and Assessment Act requires that based on results of an HRA conducted per CARB/OEHHA guidelines, toxic contaminants do not exceed acceptable levels.
California Public Resource Code section 25523(a); Title 20 California Code of Regulations (CCR) section 1752.5, 2300–2309 and Division 2 Chapter 5, Article 1, Appendix B, Part (1); California Clean Air Act, Health and Safety Code section 39650, et seq.	These regulations require a quantitative health risk assessment for new or modified sources, including power plants that emit one or more toxic air contaminants (TACs).
Local	
Mojave Desert Air Quality Management District (MDAQMD) Rule 1320	Requires the use of BACT and T-BACT at certain projects and the preparation of an HRA.

C.5.4 PROPOSED PROJECT

C.5.4.1 SETTING AND EXISTING CONDITIONS

This section describes the environment in the vicinity of the proposed project site from the public health perspective. Features of the natural environment, such as meteorology and terrain, affect the project's potential for causing impacts on public health. An emissions plume from a facility may affect elevated areas before lower terrain areas, due to a reduced opportunity for atmospheric mixing. Consequently, areas of elevated terrain can often be subjected to increased pollutant impacts. Also, the types of land use near a site influence the surrounding population distribution and density, which, in turn, affects public exposure to project emissions. Additional factors affecting potential public health impacts include existing air quality, existing public health concerns, and environmental site contamination.

Site and Vicinity Description

The proposed facility would be located in the Mojave Desert portion of eastern Riverside County, approximately 25 miles west of Blythe and 4 miles north of I-10. The topography of the site is essentially flat (about 370 to 400 feet above sea level). Land uses in the project vicinity include undeveloped desert, wilderness, and agricultural uses. Elevated terrain can be found at about 5-6 miles north and northwest of the site boundary where the Palen and McCoy mountains begin (GSEP 2009a, Sections 3.3 and Figure 3.2-1).

The general population includes many sensitive subgroups that may be at greater risk from exposure to emitted pollutants. These sensitive subgroups include the very young, the elderly, and those with existing illnesses. Sensitive receptors in the project vicinity are listed in Table 5.15-1 of the AFC. There are no sensitive receptors within a 6-mile radius of the project site, and there are no residences or other public receptors within a 4-mile radius of the site (GSEP 2009a, Section 5.15.1). The Chuckwalla Valley and Ironwood State Prisons are located about nine miles south and the nearest schools or medical facilities are in Blythe, about 25 miles away (GSEP 2009a, 5.12.1.1).

Meteorology

Meteorological conditions, including wind speed, wind direction, and atmospheric stability, affect the extent to which pollutants are dispersed into ambient air as well as the direction of pollutant transport. This, in turn, affects the level of public exposure to emitted pollutants and associated health risks. When wind speeds are low and the atmosphere is stable, for example, dispersion is reduced and localized exposure may be increased.

This region of Riverside County (part of the Mojave Desert) is characterized by a dry-hot desert climate; summers are hot and dry, winters are moderate with low precipitation, and temperature inversions are strong. The region typically experiences over 345 sunny days per year. Winds generally flow from the south and southwest across the region and tend to transport air pollutants from the Los Angeles area into the Mojave Desert Air Basin (GSEP 2009a, section 5.2.1.3).

Atmospheric stability is a measure related to turbulence, or the ability of the atmosphere to disperse pollutants due to convective air movement. Mixing heights (the height above ground level through which the air is well mixed and in which pollutants can be dispersed) are lower during mornings due to temperature inversions and increase during the warmer afternoons. Staff's **AIR QUALITY** section presents more detailed meteorological data.

Existing Air Quality

The proposed site is within the jurisdiction of the Mojave Desert Air Quality Management District (MDAQMD). By examining average toxic concentration levels from representative air monitoring sites in the project vicinity with cancer risk factors specific to each contaminant, lifetime cancer risk can be calculated to provide a background risk level for inhalation of ambient air. For comparison purposes, it should be noted that the overall lifetime cancer risk for the average individual in the United States from all causes is about 1 in 3, or 333,000 in one million. For the year 2004, the American Cancer Society estimated that the death rate due to cancer was 23.1%, about 1 in 4.

The California Air Resources Board (CARB) published a report on emissions and air quality in the state of California in 2008, showing that concentrations of the top ten toxic air contaminants (TAC) and their associated health risk have been substantially reduced since 1990. The concentrations of TACs estimated for the Mojave Desert Air Basin (MDAB) during 2008 are presented in AFC Table 5.15-2 (GSEP 2009a), which shows that diesel PM, formaldehyde, benzene, and acetaldehyde contribute the majority of TAC emissions in the MDAB.

There are no monitoring stations within the MDAB that actively report TACs, and therefore the background cancer risk in the MDAB cannot be determined. The nearest CARB air toxics monitoring station that actively reports values is located in Calexico, approximately 80 miles southwest of the project site. Although staff does not consider this location to be representative of air quality in the area of the proposed site, it serves to show the upper-bound levels of toxic air contaminants found in the region. In 2008, the background cancer risk calculated by CARB for the Calexico monitoring station was about 135 in one million (CARB 2009). The pollutants 1,3-butadiene and benzene, emitted primarily from mobile sources, accounted together for more than half of the total risk. The risk from 1,3-butadiene was about 43 in one million, while the risk from benzene was about 44 in one million. Formaldehyde accounts for about 13% of the 2008 average calculated cancer risk based on air toxics monitoring results, with a risk of about 18 in one million. Formaldehyde is emitted directly from vehicles and other combustion sources, such as the proposed facility. The risk from hexavalent chromium was about 14 in one million, or ~10% of the total risk.

The use of reformulated gasoline, beginning in the second quarter of 1996, as well as other toxics reduction measures, have led to a decrease of ambient levels of toxics and associated cancer risk in all areas of California during the past few years. For example, in one large air district, cancer risk was 342 in one million based on 1992 data and in 2002, the average inhalation cancer risk decreased to 162 in one million (BAAQMD 2004, p. 12). Similar reductions occurred throughout the state's major metropolitan areas.

Existing Public Health Concerns

When evaluating a new Project, staff conducts a study and analysis of existing public health issues in the Project vicinity. This analysis is prepared in order to identify the current status of respiratory diseases (including asthma), cancer, and childhood mortality rates in the population located near the proposed Project, which provides a basis on which to evaluate the significance of any additional health impacts from the proposed Project. Because of the very low population in the immediate vicinity of the project and because no existing health concerns within a 6-mile radius of the project have been identified by the applicant (GSEP 2009a, Section 5.15.1), staff did not conduct an analysis of existing public health issues.

Environmental Site Contamination

Site disturbances occur during demolition of existing structures, facility construction from excavation, grading, and earth moving. Such activities have the potential to adversely affect public health through various mechanisms, such as the creation of airborne dust, material being carried off-site through soil erosion, and uncovering buried hazardous substances. The Phase I Environmental Site Assessment conducted for this site in 2009 found no "Recognized Environmental Conditions" per the American Society for Testing and Materials Standards (ASTM) definition. That is, there was no evidence or record of any use, spillage, or disposal of hazardous substances on the site, nor was there any other environmental concern that would require remedial action (GSEP 2009a, Section 5.13.1.3).

To address the possibility that soil contamination would be encountered during construction of the GSEP, proposed Conditions of Certification **WASTE-1** and **WASTE-2** require a registered professional engineer or geologist to be available during soil excavation and grading to ensure proper handling and disposal of contaminated soil. Staff believes that adherence to current ordinances and to staff's proposed Conditions of Certification mentioned above will be adequate to address any soil or groundwater contamination that exists on this site. See the PSA/DPA/DEIS section on **WASTE MANAGEMENT** for a more detailed analysis of this topic.

C.5.4.2 ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

Construction Impacts and Mitigation

Potential risks to public health during construction may be associated with exposure to toxic substances in contaminated soil disturbed during site preparation (discussed in the "Setting" section above), as well as diesel exhaust from heavy equipment operation. Criteria pollutant impacts from the operation of heavy equipment and particulate matter from earth moving are examined in staff's **AIR QUALITY** analysis.

The operation of construction equipment will result in air emissions from diesel-fueled engines. Diesel emissions are generated from sources such as trucks, graders, cranes, welding machines, electric generators, air compressors, and water pumps. Although diesel exhaust contains criteria pollutants such as nitrogen oxides, carbon monoxide, and sulfur oxides, it also includes a complex mixture of thousands of gases and fine particles. These particles are primarily composed of aggregates of spherical carbon

particles coated with organic and inorganic substances. Diesel exhaust contains over 40 substances that are listed by the U.S. Environmental Protection Agency (U.S. EPA) as hazardous air pollutants and by the California Air Resources Board (ARB) as toxic air contaminants.

Exposure to diesel exhaust may cause both short- and long-term adverse health effects. Short-term effects can include increased cough, labored breathing, chest tightness, wheezing, and eye and nasal irritation. Long-term effects can include increased coughing, chronic bronchitis, reductions in lung function, and inflammation of the lung. Epidemiological studies also strongly suggest a causal relationship between occupational diesel exhaust exposure and lung cancer.

Based on a number of health effects studies, the Scientific Review Panel (SRP) on Toxic Air Contaminants recommended a chronic REL (see REL discussion in Method of Analysis section above) for diesel exhaust particulate matter of 5 $\mu g/m^3$ and a cancer unit risk factor of $3x10^{-4}$ $(\mu g/m^3)^{-1}$ (SRP 1998, p. 6). [The SRP, established pursuant to California Health and Safety Code section 39670, evaluates the risk assessments of substances proposed for identification as Toxic Air Contaminants by ARB and the Department of Pesticide Regulation (DPR). The SRP reviews the exposure and health assessment reports and the underlying scientific data upon which the reports are based.] The SRP did not recommend a value for an acute REL, since available data in support of a value was deemed insufficient. On August 27, 1998, ARB listed particulate emissions from diesel-fueled engines as a toxic air contaminant and approved SRP's recommendations regarding health effect levels.

Construction of the GSEP, including site preparation, is anticipated to take place over a period of 37 months (GSEP 2009a, Section 3.7.1). As noted earlier, assessment of chronic (long-term) health effects assumes continuous exposure to toxic substances over a significantly longer time period, typically from eight to seventy years.

AFC Table B.5-5 (GSEP 2009a) and its updated version table K.5-5 (GSEP 2009f) present maximum daily and annual emissions from construction activities including fugitive dust and diesel exhaust. In response to Data Request # 137, the applicant conducted a health risk assessment for diesel particulate matter (DPM) from construction equipment emissions in accordance with methods provided by the South Coast AQMD in their guidance documents on modeling cancer risk from mobile sources. The applicant's modeling of worst-case construction emissions adjusted to a 37-month period (lifetime exposure adjustment factor of 0.0126) found that the cancer risk was estimates to be 0.1 in one million at the maximum impact receptor (MIR), below the level of significance (10 in one million). The chronic hazard index was found to be 0.005 at the MIR, below the level of significance of 1.0 (GSEP 2009f, Data Response Item 137).

Mitigation measures are proposed by both the applicant and Air Quality staff to reduce the maximum calculated PM10 as well as PM2.5 concentrations. These include the use of extensive fugitive dust control measures that are assumed to result in 90% reduction of fugitive dust emissions. In order to mitigate potential impacts from particulate emissions during the operation of diesel-powered construction equipment, Air Quality staff recommends the use of ultra low-sulfur diesel fuel and Tier 2 or Tier 1 California Emission Standards for Off-Road Compression-Ignition Engines or the installation of an

oxidation catalyst and soot filters on diesel equipment. The catalyzed diesel particulate filters are passive, self-regenerating filters that reduce particulate matter, carbon monoxide, and hydrocarbon emissions through catalytic oxidation and filtration. The degree of particulate matter reduction is comparable for both mitigation measures in the range of approximately 85-92%. Such filters will reduce diesel emissions during construction and further reduce the impacts associated with diesel exhaust. (See the **Air Quality** section of this SA/DPA/DEIS for staff's proposal to control particulate matter.)

Operation Impacts and Mitigation

Emissions Sources

The emissions sources at the proposed GSEP site include two natural gas-fired auxiliary boilers, two cooling tower, two diesel-fueled emergency generators, two diesel-fueled emergency fire pumps, DPM from maintenance vehicles, and VOCs from HTF fugitive emissions. In response to Data Requests 139 and 142, the applicant revised the HRA for the entire facility to include maintenance vehicle DPM and HTF fugitive emissions.

As noted earlier, the first step in a health risk assessment is to identify potentially toxic compounds that may be emitted from the facility. Table 5.15-3 of the AFC lists toxic air contaminants that may be emitted by the project. Each TAC has a toxicity value published in the OEHHA Guidelines that includes the REL used to calculate short-term and long-term noncancer health effects, and the cancer unit risks used to calculate the lifetime risk of developing cancer (OEHHA 2003).

Public Health Table 2 lists toxic emissions potentially emitted from the GSEP and shows how each contributes to the health risk analysis. For example, the first row shows that oral exposure to acetaldehyde is not of concern, but if inhaled, may have cancer and chronic (long-term) noncancer health effects, but not acute (short-term) effects.

Public Health Table 2 Types of Health Impacts and Exposure Routes Attributed to Toxic Emissions*

Substance	Oral Cancer	Oral Noncancer	Inhalation Cancer	Noncancer (Chronic)	Noncancer (Acute)
Acetaldehyde			✔	✔	
Acrolein				✔	✔
Arsenic	✔	✔	✔	✔	✔
Benzene			✔	✔	✔
Biphenyl					
1-3 Butadiene			✔	✔	
Cadmium		✔	✔	✔	
Copper				✔	✔
Diesel Exhaust			✔	✔	
Ethylbenzene				✔	
Formaldehyde			✔	✔	✔
Hexane				✔	
Naphthalene		✔	✔	✔	
Polycyclic Aromatic Hydrocarbons (PAHs)	✔	✔	✔	✔	
Propylene				✔	
Propylene oxide			✔	✔	✔
Selinium				✔	✔
Toluene				✔	✔
Xylene				✔	✔

*Source: OEHHA 2003 Appendix L and GSEP 2009a, Table 5.15-3.

Appendix B.1 of the AFC (GSEP 2009a) and Data Responses Set 1A Appendix K (GSEP 2009f) list non-criteria pollutants and their emission factors that may be emitted from the sources listed above. Emission factors were obtained from the U.S. EPA emission factors database (AP-42), the California Air Toxics Emission Factors (CATEF II) database, and the vendors for particular equipment. Table B.1-7 of the AFC (GSEP 2009a) and its updated version Table K.1-7 (GSEP 2009f) list emissions from maintenance vehicles including DPM.

Staff requested in Data Requests 141 and 142 that emissions of HTF toxic thermal degradation products be determined and considered in a HRA. According to the applicant's response, HTF may decompose into the following gases in the ullage system (GSEP 2009f, Data Response Item 141):

- 89.9% by weight Benzene
- 9.8% by weight Phenol
- 0.3 % by weight Other VOCs

The applicant noted that the MSDS sheet for the HTF states that decomposition products of HTF (benzene and phenol) occur in trace amounts. In addition, the applicant proposes to use carbon adsorption technology for the HTF ullage system which is assumed to result in 99% control of VOCs. Therefore, 5% by weight of total VOCs were used to represent the upper limit for trace amounts of benzene and phenol. Table 3 of Data Response #141 provides the estimated emissions of benzene and phenol from HTF system components (GSEP 2009f).

Emissions Levels

Once potential emissions are identified, the next step is to quantify them by conducting a "worst case" analysis. Maximum hourly emissions are required to calculate acute (one-hour) noncancer health effects, while estimates of maximum emissions on an annual basis are required to calculate cancer and chronic (long-term) noncancer health effects.

The next step in the health risk assessment process is to estimate the ambient concentrations of toxic substances that may result from the project. This is accomplished by using a screening air dispersion model and assuming conditions that result in maximum impacts. The applicant's screening analysis was performed using the ARB/OEHHA Hotspots Analysis and Reporting Program (HARP) modeling program. Finally, ambient concentrations were used in conjunction with RELs and cancer unit risk factors to estimate health effects which might occur from exposure to facility emissions. Exposure pathways, or ways in which people might come into contact with toxic substances, include inhalation, dermal (through the skin) absorption, soil ingestion, consumption of locally grown plant foods, and mother's milk.

The above method of assessing health effects is consistent with OEHHA's Air Toxics Hot Spots Program Risk Assessment Guidelines (OEHHA 2003) referred to earlier, and results in the following health risk estimates.

Impacts

The applicant's revised screening health risk assessment for the project including all sources as presented in Data Response 139 resulted in a maximum acute hazard index of 0.00668 and a maximum chronic hazard index of 0.00119 at the Maximum Impact Receptor (MIR). The MIR represents the residential receptor where the highest concentrations of project-related pollutants would exist. The cancer risk was calculated to be 3.27 in 1,000,000 at the MIR.

As **Public Health Table 3** shows, both acute and chronic hazard indices are under the significance level of 1.0 and cancer risk is under the significant level of 10 in 1,000,000, indicating that no cancer or short- or long-term adverse health effects are expected.

Public Health Table 3 Operation Hazard/Risk at the Maximum Impact Receptor

Type of Hazard/Risk	Hazard Index/Risk	Significance Level	Significant?
Acute Noncancer	0.007	1.0	No
Chronic Noncancer	0.001	1.0	No
Individual Cancer	3.3 in one million	10 in one million	No

Source: Data Response Item 139 (GSEP 2009f).

Staff conducted a quantitative evaluation of the risk assessment results presented in the Genesis Solar Energy Project AFC (09-AFC-8) and in the "Data Request Set 1A (#1-227)" (December 2009). Modeling files provided by the applicant were also reviewed.

Construction Phase Analysis

For the construction phase analysis, atmospheric dispersion modeling of diesel particulate matter (DPM) emissions from construction equipment and vehicles was conducted by the applicant using AERMOD. The maximum predicted offsite concentration of diesel particulate matter was reported by the applicant to be 0.02562 ug/m^3. Cancer risk due to diesel exhaust emissions was determined by multiplying the DPM concentration by the diesel cancer inhalation unit risk of 0.0003 $(ug/m^3)^{-1}$ and an adjustment factor of 0.0126 to account for the 37 month construction period. Cancer risk at the location of the maximum offsite concentration was determined to be 0.1 in a million and chronic HI to be 0.005 (noncancer chronic REL is 5 ug/m^3).

Operations Phase Analysis

For the operations phase analysis, atmospheric dispersion modeling of facility emissions was conducted by the applicant using AERMOD. Local meteorological data were used, on-site buildings were included for building downwash effects, and 6814 grid receptors were modeled.

A total of 23 emitting units were modeled by the applicant for facility operations including:

- 2 auxiliary boilers
- 2 diesel emergency generators
- 2 diesel firewater pumps
- 2 HTF (heat transfer fluid) vents
- 14 wet cooling tower cells (2 cooling towers, each with 7 cells)
- Fugitive emissions of toxic thermal degradation products of HTF and fugitive emissions of mobile sources involved in routine operations. These emissions were modeled as being emitted from a single area source located between the two solar fields.
- Total of 23 emitting sources evaluated at the proposed facility.

The HTF (heat transfer fluid) is circulated through the solar field where it is heated by sunlight concentrated on the receiver tube elements of the solar collectors. HTF is comprised biphenyl/diphenyl oxide. Thermal decomposition of HTF results in decomposition products that can include benzene, phenol and toluene. In modeling HTF fugitive loss emissions, the applicant assumed that 89.9% of the emissions would be comprised of benzene and 9.8% of phenol.

Staff used the HARP On-Ramp program to load the applicant's AERMOD results into the CARB/OEHHA Hotspots Analysis and Reporting Program (HARP), Version 1.4a for the risk analysis. Exposure pathways assessed include inhalation, ingestion of home-grown produce, dermal absorption, soil ingestion and mother's milk. Emission factors obtained from the applicant's modeling files and used in this analysis are listed in **Public Health Table 5**. For risk calculations using the HARP model, the "Derived (Adjusted) Method" was used for cancer risk and the "Derived (OEHHA) Method" was used for chronic noncancer hazard.

Cancer risk and chronic and acute hazard index values obtained by staff are compared to results reported by the applicant in the December 2009 response to data requests in **Public Health Table 6**. Risk and hazard were determined at the point of maximum impact, PMI, under the 70 year residential scenario, located between the two solar fields. The nearest residential receptor is located 15 miles from the site and there are no sensitive receptors within six miles of the project site.

Public Health Table 7 presents substance- and source-specific cancer risks at the PMI. Analysis of this table indicates that 100% of the cancer risk at the PMI is attributed to emissions from two sources: 12% due to emissions from the HTF vents and 88% due to fugitive emissions. Additional analysis indicates that 100% of cancer risk at the PMI is attributed to emissions of two substances: 47% due to benzene emissions (from the auxiliary boiler, the HTF vents and fugitive emissions) and 52% due to diesel particulate matter emissions (from onsite mobile sources as well as the two diesel engines).

Cumulative impacts were not evaluated as there are no facilities within an eight mile radius of the project site (source: page 5.15-10 of the AFC).

Public Health Table 5. Operation Phase Emission Rates

Substance	Annual Average Emissions (lbs/year)	Maximum 1-Hour Emissions (lbs/hour)
EMISSION RATES FROM EACH OF 2 AUXILIARY BOILERS		
Acetaldehyde	1.99E-03	1.36E-04
Acrolein	1.95E-03	1.33E-04
Benzene	1.05E-03	7.15E-05
Ethylbenzene	9.73E-04	6.62E-05
Formaldehyde	2.05E-03	1.40E-04
Hexane	2.72E-03	1.85E-04
Naphthalene	1.03E-04	6.97E-06
PAHs (4)	3.50E-05	2.38E-06
Propylene	2.00E-01	1.36E-02
Toluene	1.40E-02	9.50E-04
Xylene	8.09E-03	5.50E-04
EMISSION RATES FROM EACH OF 14 COOLING TOWER CELLS		
Arsenic	2.98E-03	9.32E-07
Barium	1.07E-02	3.34E-06
Manganese	9.40E-03	2.94E-06
EMISSION RATES FROM OPERATION OF EACH OF 2 EMERGENCY GENERATORS		
Diesel PM	2.76E+00	5.00E-02
EMISSION RATES FROM OPERATION OF EACH OF 2 EMERGENCY FIRE PUMPS		
Diesel PM	1.98E+00	4.00E-02
EMISSION RATES FROM EACH OF 2 HTF VENTS		
Benzene	4.85E+02	1.53E-01
Phenol	5.30E+01	1.65E-02
EMISSION RATES FROM FUGITIVE EMISSIONS		
Benzene	6.90E+02	1.67E-01
Phenol	6.90E+02	1.67E-01
Diesel PM	4.60E+01	5.25E-03

Public Health Table 6. Cancer Risk and Hazard Due to Operation Phase Emissions.

	Staff's Analysis			Applicant's Analysis		
	Cancer Risk (per million)	Acute HI	Chronic HI	Cancer Risk (per million)	Acute HI	Chronic HI
PMI (Rec. #1)	3.27	0.0085*	0.0013	3.27	0.0067	0.0012

PMI (point of maximum impact) is located between the two solar fields.
** At Rec. #266*

Public Health Table 7. Results of Staff's Analysis: Contribution to Total Cancer Risk by Individual Substances from All Sources at the Point of Maximum Impact (PMI).

Substance	Auxiliary Boilers (2 units)	Cooling Towers (14 cells)	Diesel Generators (2 units)	Diesel Firewater Pumps (2 units)
Acetaldehyde	1.48E-14			
Arsenic		1.21E-09		
Benzene	7.80E-14			
DieselExhPM*			1.99E-09	6.56E-09
DieselExhPM*			1.99E-09	6.56E-09
Ethyl Benzene	6.29E-15			
Formaldehyde	3.19E-14			
Naphthalene	9.18E-15			
PAHs-w/o	1.46E-11			
TOTAL	1.48E-11	1.21E-09	3.97E-09	1.31E-08

Substance	HTF Vents (2 units)	Fugitive Emissions (1 area source)	Total Cancer Risk
Acetaldehyde			1.48E-14
Arsenic			1.21E-09
Benzene	3.88E-07	1.16E-06	1.55E-06
DieselExhPM*		8.52E-07	8.60E-07
DieselExhPM*		8.52E-07	8.60E-07
Ethyl Benzene			6.29E-15
Formaldehyde			3.20E-14
Naphthalene			9.18E-15
PAHs-w/o			1.46E-11
TOTAL	3.88E-07	2.87E-06	3.27E-06

** DieselExhPM is listed twice in the applicant's emissions modeling file and risks are reported in the same manner. It is unclear to staff why this substance is listed twice, however staff retained it as such in staff's calculations of risk.*

Cooling Towers

In addition to being a source of potential toxic air contaminants, the possibility exists for bacterial growth to occur in the two wet cooling towers, including Legionella. Legionella is a bacterium that is ubiquitous in natural aquatic environments and is also widely distributed in man-made water systems. It is the principal cause of legionellosis, otherwise known as Legionnaires' Disease, which is similar to pneumonia. Transmission to people results mainly from inhalation or aspiration of aerosolized contaminated water. Untreated or inadequately treated cooling systems, such as industrial cooling towers and building heating, ventilating, and air conditioning systems, have been correlated with outbreaks of legionellosis.

Legionella can grow symbiotically with other bacteria and can infect protozoan hosts. This provides Legionella with protection from adverse environmental conditions, including making it more resistant to water treatment with chlorine, biocides, and other disinfectants. Thus, if not properly maintained, cooling water systems and their components can amplify and disseminate aerosols containing Legionella.

The State of California regulates recycled water for use in cooling towers in Title 22, Section 60303, California Code of Regulations. This section requires that, in order to protect workers and the public who may come into contact with cooling tower mists, chlorine or another biocide must be used to treat the cooling system water to minimize the growth of Legionella and other micro-organisms. This regulation does not apply to the GSEP project since it intends to use groundwater supplied from on-site wells; however, the potential remains for Legionella growth in cooling water at the GSEP due to nutrients found in groundwater.

The U.S. EPA published an extensive review of Legionella in a human health criteria document (EPA 1999). The U.S. EPA noted that Legionella may propagate in biofilms (collections of microorganisms surrounded by slime they secrete, attached to either inert or living surfaces) and that aerosol-generating systems such as cooling towers can aid in the transmission of Legionella from water to air. The U.S. EPA has inadequate quantitative data on the infectivity of Legionella in humans to prepare a dose-response evaluation. Therefore, sufficient information is not available to support a quantitative characterization of the threshold infective dose of Legionella. Thus, the presence of even small numbers of Legionella bacteria presents a risk - however small - of disease in humans.

In February of 2000 the Cooling Technology Institute (CTI) issued its own report and guidelines for the best practices for control of Legionella (CTI 2000). The CTI found that 40-60 percent of industrial cooling towers tested was found to contain Legionella. More recently, staff has received a 2005 report of testing in cooling towers in Australia that found the rate of Legionella presence in cooling tower waters to be extremely low, approximately three to six percent. The cooling towers all had implemented aggressive water treatment and biocide application programs similar to that required by proposed condition of certification **Public Health-1**.

To minimize the risk from Legionella, the CTI noted that consensus recommendations included minimization of water stagnation, minimization of process leads into the cooling

system that provide nutrients for bacteria, maintenance of overall system cleanliness, the application of scale and corrosion inhibitors as appropriate, the use of high-efficiency mist eliminators on cooling towers, and the overall general control of microbiological populations.

Good preventive maintenance is very important in the efficient operation of cooling towers and other evaporative equipment (ASHRAE 1998). Preventive maintenance includes having effective drift eliminators, periodically cleaning the system if appropriate, maintaining mechanical components in working order, and maintaining an effective water treatment program with appropriate biocide concentrations. Staff notes that most water treatment programs are designed to minimize scale, corrosion, and biofouling and not to control Legionella.

The efficacy of any biocide in ensuring that bacterial and in particular Legionella growth, is kept to a minimum is contingent upon a number of factors including but not limited to proper dosage amounts, appropriate application procedures and effective monitoring.

In order to ensure that Legionella growth is kept to a minimum, thereby protecting both nearby workers as well as members of the public, staff has proposed Condition of Certification **Public Health-1**. The condition would require the project owner to prepare and implement a biocide and anti-biofilm agent monitoring program to ensure that proper levels of biocide and other agents are maintained within the cooling tower water at all times, that periodic measurements of Legionella levels are conducted, and that periodic cleaning is conducted to remove bio-film buildup. Staff believes that with the use of an aggressive antibacterial program coupled with routine monitoring and biofilm removal, the chances of Legionella growing and dispersing would be reduced to insignificance. The applicant has stated that an appropriate biocide program and anti-biofilm agent monitoring program would be implemented for the cooling towers (GSEP 2009a, Section 5.15.2.9). (note: The requirements for the use, storage, and spill response for all chemicals, including biocides, are described in the **HAZARDOUS MATERIALS MANAGEMENT** section of this SA/DPA/DEIS.)

Closure and Decommissioning Impacts and Mitigation

Closure of the proposed GSEP (temporary or permanent) would follow a closure plan prepared by the applicant and designed to minimize public health and environmental impacts. Permanent closure would presumably occur 30 years after the start of operation unless the project remains economically viable. Decommissioning procedures would be consistent with all applicable LORS and would be submitted to the CEC for approval before implementation (GSEP 2009a, Section 3.9). Staff expects that impacts to public health from the closure and decommissioning process would represent a fraction of the impacts associated with the construction or operation of the proposed GSEP. Therefore based on staff's analysis for the construction and operation phases of this project, staff concludes that public health-related impacts from closure and decommissioning of the GSEP would be insignificant.

C.5.4.3 CEQA LEVEL OF SIGNIFICANCE

Staff's analysis of public health impacts from the proposed GSEP has determined that impacts would be below the CEQA level of significance.

C.5.5 REDUCED ACREAGE ALTERNATIVE

The Reduced Acreage Alternative would essentially be Unit 1 of the proposed project, including a 125 MW solar facility located within the boundaries of the proposed project as defined by NextEra. This alternative is analyzed for two major reasons: (1) it eliminates about 50 percent of the proposed project area so all impacts are reduced, and (2) by eliminating the eastern solar field, it would reduce the water required for wet cooling by 50 percent. The boundaries of the Reduced Acreage Alternative are shown in **Alternatives Figure 1**.

C.5.5.1 SETTING AND EXISTING CONDITIONS

This alternative is located entirely within the boundaries of the proposed project. It simply eliminates effects to the eastern 125 MW solar field and relocates the gas yard approximately 1.75 miles northwest of its present location. As a result, the environmental setting consists of the western portion of the proposed project, as well as the area affected by the linear project components.

C.5.5.2 ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

Emissions associated with the construction and operation of the Reduced Acreage Alternative would be reduced by approximately 50% from those estimated for the GSEP as proposed. The reduced emissions would decrease the cancer risk and chronic and acute hazard indices predicted for the 250 MW project as proposed. However, the public health analysis has determined that the cancer risk and chronic and acute hazard indices are far below the level of significance at the point of maximum impact for the project as proposed, indicating that no significant public health impacts are expected. Therefore staff concludes that with respect to public health impacts, the Reduced Acreage Alternative is not preferable over the project as proposed

C.5.5.3 CEQA LEVEL OF SIGNIFICANCE

The CEQA level of significance for public health would not change with the Reduced Acreage Alternative, as both the project as proposed and the Reduced Acreage Alternative would have impacts below the level of significance. The same conditions of certification would be required for the Reduced Acreage Alternative and the project as proposed.

C.5.6 DRY COOLING ALTERNATIVE

This section identifies the potential impacts of using air-cooled condenser (ACC) systems rather than the cooling towers proposed by NextEra for the Genesis project. It is assumed that the ACC systems would be located where the cooling towers are currently proposed for each of the two 125 MW power block, as illustrated in **Alternatives Figure 2** (see Section B.3).

Approximately 18 ACC fans would be required for each of the two solar fields. The 18 fans, or ACC's, would operate when the ambient temperature is above 50 degrees Fahrenheit. When the temperature is below 50 degrees Fahrenheit, only 10 of the fans

would be used (GSEP 2009f). The 18 ACC fans described in the GSEP cooling study would have a length of approximately 279 feet, a width of approximately 127 feet, and a height of 98 feet (GSEP 2009f). However, based on the ACC preliminary designs for nearby solar thermal projects in similar ambient temperatures, an additional 11,690 square feet could be required for siting of the fans and the fans would be up to 120 feet in height. In addition to the ACC fans, NextEra would use a small Wet Surface Air Cooler when needed to provide auxiliary cooling during extremely hot days (GSEP 2009f). This alternative is analyzed because it would reduce the amount of water required for steam turbine cooling from 822 acre-feet per year (AFY) to 66 AFY. This reduction in water use would reduce impacts to water and biological resources.

C.5.6.1 Setting and Existing Conditions

This alternative is located entirely within the boundaries of the proposed project. It simply eliminates the use of wet-cooling towers and incorporated the use of air-cooled condensers (ACC) in the same location. As a result, the environmental setting would be the same as for the proposed project.

C.5.6.2 Assessment of Impacts and Discussion of Mitigation

The **Public Health and Safety** section of this SA/DPA/DEIS discusses toxic emissions to which the public could be exposed during project construction and routine operation. The majority of the toxic emissions from the proposed project would not change with the inclusion of dry cooling and would not cause additional impacts. Dry cooking would however eliminate the risk of contracting legionellosis by inhaling aerosolized Legionella-contaminated water from wet cooling towers.

As noted in the **Air Quality** section, the additional construction activities from erecting a dry cooling structure would increase the dust-related PM10 emissions. PM10 impacts are of concern in this public health analysis because health effects can result from the interaction of the toxic pollutants that might be adsorbed to the PM10. Such adsorption would be associated with specific soil contamination that must be remediated before beginning construction. The toxic health risks from diesel equipment emissions would be minimized through implementation of the Conditions of Certification in the **Air Quality** section, which would also apply to construction of any cooling structures that might be used for the project.

C.5.6.3 CEQA Level of Significance

No new impacts to health and safety resources would be created with use of ACCs in place of cooling towers, and the potential impacts of Legionella growth in the cooling towers would be eliminated. The overall impacts of the project with dry cooling would be similar to those of the proposed project as both would have impacts below the level of significance with incorporated mitigation measures.

C.5.7 NO PROJECT/NO ACTION ALTERNATIVE

There are three No Project/No Action Alternatives evaluated in this section, as follows:

C.5.7.1 NO ACTION ON PROPOSED PROJECT APPLICATION AND ON CDCA LAND USE PLAN AMENDMENT

Under this alternative, the proposed Genesis Solar Energy Project would not be approved by the CEC and BLM and BLM would not amend the CDCA Plan. As a result, no solar energy project would be constructed on the project site and BLM would continue to manage the site consistent with the existing land use designation in the CDCA Land Use Plan of 1980, as amended.

Because there would be no amendment to the CDCA Plan and no solar project approved for the site under this alternative, it is expected that the site would continue to remain in its existing condition, with no new structures or facilities constructed or operated on the site. As a result, none of the construction or operation air emissions from the proposed project would occur and none of the benefits of the proposed project in displacing fossil fuel fired generation and reducing associated pollutant emissions would occur. However, the land on which the project is proposed would become available to other uses that are consistent with BLM's land use plan, including another solar project requiring a land use plan amendment. In addition, in the absence of this project, other renewable energy projects may be constructed to meet State and Federal mandates, and those projects would have similar impacts in other locations.

C.5.7.2 NO ACTION ON PROPOSED PROJECT APPLICATION AND AMEND THE CDCA LAN USE PLAN TO MAKE THE AREA AVAILABLE FOR FUTURE SOLAR DEVELOPMENT

Under this alternative, the proposed Genesis Solar Energy Project would not be approved by the CEC and BLM and BLM would amend the CDCA Land Use Plan of 1980, as amended, to allow for other solar projects on the site. As a result, it is possible that another solar energy project could be constructed on the project site.

Because the CDCA Plan would be amended, it is possible that the site would be developed with the same or a different solar technology. As a result, air emissions would result from the construction and operation of the solar technology and would likely be similar to the air quality impacts from the proposed project. Different solar technologies require different amounts of grading and maintenance; however, it is expected that all the technologies would require some grading and maintenance. The benefits of the proposed project in displacing fossil fuel fired generation and reducing associated pollutant emissions could occur with a different solar technology at this site and therefore with this alternative. As such, this No Project/No Action Alternative could result in air quality impacts and benefits similar to the impacts under the proposed project.

C.5.7.3 NO ACTION ON PROPOSED PROJECT APPLICATION AND AMEND THE CDCA LAND USE PLAN TO MAKE THE AREA UNAVAILABLE FOR FUTURE SOLAR DEVELOPMENT

Under this alternative, the proposed Genesis Solar Energy Project would not be approved by the CEC and BLM and the BLM would amend the CDCA Plan to make the proposed site unavailable for future solar development. As a result, no solar energy

project would be constructed on the project site and BLM would continue to manage the site consistent with the existing land use designation in the CDCA Land Use Plan of 1980, as amended.

Because the CDCA Plan would be amended to make the area unavailable for future solar development, it is expected that the site would continue to remain in its existing condition, with no new structures or facilities constructed or operated on the site. As a result, the air quality of the site is not expected to change noticeably from existing conditions and, as such, this No Project/No Action Alternative would not result in air quality impacts under the proposed project nor would it result in the air quality benefits from the proposed project. However, in the absence of this project, other renewable energy projects may be constructed to meet State and Federal mandates, and those projects would have similar impacts in other locations.

C.5.8 CUMULATIVE IMPACTS

Section B.3, Cumulative Scenario, provides detailed information on the potential cumulative solar and other development projects in the project area. Together, these projects comprise the cumulative scenario which forms the basis of the cumulative impact analysis for the proposed project. In summary, these projects are:

- Renewable energy projects on BLM, State, and private lands, as shown on **Cumulative Figure 1** and in **Cumulative Tables 1A and 1B.** Although not all of those projects are expected to complete the environmental review processes, or be funded and constructed, the list is indicative of the large number of renewable projects currently proposed in California.
- Foreseeable future projects in the immediate area as shown on **Cumulative Impacts Figure 2, I-10 Corridor Existing and Future/Foreseeable Projects, and Cumulative Tables 2 and 3**. Table 2 presents existing projects in this area and Table 3 presents future foreseeable projects in the I-10 Corridor Area. Both tables indicate project name and project type, its location and its status.

These projects are defined within a geographic area that has been identified by the CEC and BLM as covering an area large enough to provide a reasonable basis for evaluating cumulative impacts for all resource elements or environmental parameters. Most of these projects have, are, or will be required to undergo their own independent environmental review under CEQA and/or NEPA. Even if the cumulative projects described in Section B.3 have not yet completed the required environmental processes, they were considered in the cumulative impacts analyses in this SA/DPA/DEIS.

C.5.8.1 GEOGRAPHIC SCOPE OF ANALYSIS

For the purpose of the public health cumulative analysis, emissions from construction or operation of the GSEP could potentially combine with emissions from past, present and reasonably foreseeable projects to result in adverse health effects to the public. Cumulative impacts in the area of public health could occur if emission sources are close enough so that their plumes combine. Due to differences in emission source elevations, terrain features, wind direction, and other meteorological factors, it is unlikely

that emission plumes from two or more facilities would combine unless they are located in very close proximity. Furthermore, dispersion of plumes tends to occur in parallel, preventing the mixing of plumes from separate locations. On the basis of numerous previous air dispersion modeling conducted by staff to assess public health cumulative impacts, staff finds that the geographic area considered for cumulative impacts on Public Health is only within the project boundaries or within 1/4 mile of project emission sources.

C.5.8.2 EFFECTS OF PAST AND PRESENT PROJECTS

For this analysis, staff analyzed the potential of existing projects in the vicinity of the GSEP to contribute to cumulative impacts. The only existing facility located within nine miles of the project site is the Ironwood State Prison, which has a “no” risk prioritization score according to CARB. This means that emissions from this facility are either below the levels for which a health risk assessment is required or else the calculated risk from this facility is insignificant (GSEP 2009a, Section 5.15.3). The nearest existing source of emissions is Interstate 10, a major route for trucks delivering goods to and from California, located about 4 miles south of the GSEP. As mentioned above, none of these emission sources are close enough to cause cumulative impacts with the proposed GSEP. Staff’s previous modeling has shown repeatedly that unless two sources are within approximately half a mile, their cumulative health risks do not combine to turn an insignificant individual health risk into a significant one.

C.5.8.3 EFFECTS OF REASONABLY FORESEEABLE FUTURE PROJECTS

There is a substantial amount of development planned in the I-10 corridor including over 10 solar power plants and one natural gas-fired power plant as well as commercial and residential projects. Public Health impacts at the proposed project are also not expected to be affected by any reasonably foreseeable future projects, including the proposed Palen and Blythe solar projects proposed for the I-10 corridor. The reasons for staff’s position are described above.

Contribution of the Genesis Solar Energy Project to Cumulative Impacts

Construction. The construction of the GSEP is not expected to result in short term adverse impacts related to public health. It is expected that some of the cumulative projects described above which are not yet built may be under construction the same time as the GSEP, however, short term impacts related to Public Health during construction of those cumulative projects are not expected to occur.

Operation. The operation of the GSEP is not expected to result in long term adverse impacts related to Public Health during operation of the project even though it is expected that some of the cumulative projects described above may be operational at the same time as the GSEP.

Decommissioning. The decommissioning of the GSEP is not expected to result in adverse impacts related to Public Health. It is unlikely that the construction or decommissioning of any of the cumulative projects would occur concurrently with the decommissioning of this project, because the decommissioning is not expected to occur

for approximately 40 years. As a result, it is not expected that significant impacts related to Public Health during decommissioning of the GSEP generated by the cumulative projects will occur.

C.5.9.4 OVERALL CONCLUSION

Public health impacts of the GSEP project would not combine with impacts of any past, present, or reasonably foreseeable projects to result in cumulatively considerable local or regional impacts. Therefore, no mitigation is recommended to address potential cumulative project impacts.

C.5.10 COMPLIANCE WITH LORS

Staff has considered the minority population as identified in **Socioeconomics Figure 1** in its impact analysis and has found no potential significant adverse impacts for any receptors, including environmental justice populations. In arriving at this conclusion, staff notes that its analysis complies with all directives and guidelines from the Cal/EPA Office of Environmental Health Hazard Assessment and the California Air Resources Board. Staff's assessment is biased toward the protection of public health and takes into account the most sensitive individuals in the population. Using extremely conservative (health-protective) exposure and toxicity assumptions, staff's analysis demonstrates that members of the public potentially exposed to toxic air contaminant emissions of this project—including sensitive receptors such as the elderly, infants, and people with pre-existing medical conditions—will not experience any significant chronic or cancer health risk as a result of that exposure. Staff believes that it incorporated every conservative assumption called for by state and federal agencies responsible for establishing methods for analyzing public health impacts. The results of that analysis indicate that there would be no direct or cumulative significant public health and safety impact to any population in the area. Therefore, given the absence of any significant health impacts, there are no disparate health impacts and there are no environmental justice issues associated with **PUBLIC HEALTH AND SAFETY**.

Staff concludes that construction and operation of the GSEP will be in compliance with all applicable LORS regarding long-term and short-term project impacts in the area of **PUBLIC HEALTH AND SAFETY**.

C.5.11 NOTEWORTHY PUBLIC BENEFITS

It is noteworthy that a solar electric generating facility such as the proposed GSEP project would emit significantly less TACs to the environment than other energy sources available in California such as natural gas or biomass, thereby reducing the health risks that would otherwise occur with these non-renewable energy sources. At the same time, the proposed GSEP would provide much needed electrical power to California residences and businesses, and will contribute to electric reliability. Electrical power is not only necessary to maintain a functioning society, but it also benefits many individuals who rely on powered equipment for their health (such as dialysis equipment and temperature control equipment). For example, it is documented that during heat waves in which elevated air-conditioning use causes an electrical blackout, hospitalizations and deaths due to heat stroke are increased.

C.5.12 PROPOSED CONDITIONS OF CERTIFICATION/MITIGATION MEASURES

Public Health-1 The Project owner shall develop and implement a Cooling Water Management Plan to ensure that the potential for bacterial growth in cooling water is kept to a minimum. The Plan shall be consistent with either staff's "Cooling Water Management Program Guidelines" or with the Cooling Technology Institute's "Best Practices for Control of Legionella" guidelines but in either case, the Plan must include sampling and testing for the presence of Legionella bacteria at least every six months. After two years of power plant operations, the Project owner may ask the CPM to re-evaluate and revise the Legionella bacteria testing requirement.

Verification: At least 60 days prior to the commencement of cooling tower operations, the Cooling Water Management Plan shall be provided to the CPM for review and approval.

C.5.13 CONCLUSIONS

Staff has analyzed potential public health risks associated with construction and operation of the GSEP and does not expect any significant adverse cancer, short-term, or long-term health effects to any members of the public including low income and minority populations, from project toxic emissions. Staff also concludes that its analysis of potential health impacts from the proposed GSEP uses a conservative health protective methodology that accounts for impacts to the most sensitive individuals in a given population, including newborns and infants. According to the results of staff's health risk assessment, emissions from the GSEP project would not contribute significantly to morbidity or mortality in any age or ethnic group residing in the project area. With the incorporation of staff's proposed mitigation (Condition of Certification **Public Health-1**), the proposed facility will not present a significant health risk to the public.

C.5.14 REFERENCES

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SRP. 1998. Scientific Review Panel on Toxic Air Contaminants. Findings of the Scientific Review Panel on The Report On Diesel Exhaust as adopted at the Panel's April 22, 1998 Meeting.

C.6 – LAND USE, RECREATION, AND WILDERNESS

Testimony of Negar Vahidi

C.6.1 SUMMARY OF CONCLUSIONS

The U.S. Bureau of Land Management (BLM) and Energy Commission staff (hereafter jointly referred to as "staff") have reviewed the proposed Genesis Solar Energy Project in accordance with the requirements of the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA). This section addresses land use issues related to agriculture and rangeland resources, wilderness and recreation resources, wild horses and burros, and compatibility with existing land uses and applicable laws, ordinances, regulations, and standards (LORS). Implementation of the proposed Genesis Solar Energy Project (GSEP or "proposed project") would not result in any adverse impacts to the aforementioned resources.

The applicant has submitted an application to the BLM requesting a right-of-way (ROW) grant to construct the proposed project and its related facilities. Pursuant to the California Desert Conservation Area (CDCA) Plan (1980, as amended), sites associated with power generation or transmission not identified in the CDCA Plan are considered through the Land Use Plan Amendment process. Because the proposed project is not currently identified in the CDCA Plan, the proposed project would require a BLM ROW grant and an approved project-specific CDCA Plan Amendment.

For purposes of CEQA compliance, the level of significance of each impact of the proposed project on land use resources has been determined and is discussed in detail in Section C.6.4.3 (CEQA Level of Significance). In summary, impacts on agricultural lands and rangeland management would be less-than-significant, and there would be no impacts related to Williamson Act contracts. Impacts to recreation and wilderness resources would be less-than-significant. Impacts to horses and burros would be less-than-significant. As discussed in **LAND USE Table 3,** the project would comply with all applicable LORS.

The Reduced Acreage Alternative to the proposed project would essentially be Unit 1 of the proposed project, and would occupy approximately 990 acres of land. The conversion of 990 acres of land to support the components and activities associated with this alternative would disrupt current recreational activities in established federal recreation areas, but would not result in adverse effects on recreational users of these lands. This effect would be proportionally less than the 1,890 acres affected by the proposed project.

The Dry Cooling Alternative would disturb approximately the same amount of land as the proposed project, 1,890 acres of land. The bulk and noise of the ACCs used in this alternative would be marginally more disruptive to current recreational activities in established federal recreation areas, but would not result in adverse effects on recreational users of these lands.

Approximately one million acres of land are proposed for solar and wind energy development in southern California desert lands. Cumulative impacts to approximately

one million acres of land would all combine to result in adverse effects on agricultural lands and recreational resources. The proposed GSEP (and its alternatives) would not contribute to cumulative impacts to agricultural resources or rangelands. The potential of the GSEP (and its alternatives) to disrupt recreational activities would be limited and less than cumulatively considerable when considered in the context of past, present and reasonably foreseeable future projects. However, the GSEP (and its alternatives) would combine with other past and reasonably foreseeable future projects to substantially reduce scenic values of wilderness areas and recreational resources in the Chuckwalla Valley and southern California desert region and therefore, would result in a significant and unavoidable cumulative land use impact.

C.6. 2 INTRODUCTION

The land use analysis focuses on the project's consistency with existing land use resources, land use plans, ordinances, regulations, policies, and the project's compatibility with existing or reasonably foreseeable land uses. In addition, an energy generating system and its related facilities generally have the potential to create impacts in the areas of air quality, noise, dust, public health, traffic and transportation, and visual resources. These individual resource areas are discussed in detail in separate sections of this document.

C.6.3 METHODOLOGY AND THRESHOLDS FOR DETERMINING ENVIRONMENTAL CONSEQUENCES

The analysis of proposed project effects must comply with both CEQA and NEPA requirements given the respective power plant licensing and land jurisdictions of the California Energy Commission and U.S. Bureau of Land Management (BLM). CEQA requires that the significance of individual effects be determined by the lead state Agency; however, the use of specific significance criteria is not required under NEPA.

Because this document is intended to meet the requirements of both NEPA and CEQA, the methodology used for determining environmental impacts of the proposed project includes a consideration of guidance provided by both laws and NEPA Implementing Regulations (40 CFR Parts 1500-1508).

CEQA requires a list of criteria that are used to determine the significance of identified impacts. A significant impact is defined by CEQA as "a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project" (State CEQA Guidelines Section 15382).

In comparison, the Council on Environmental Quality Regulations for Implementing the Procedural Provisions of the NEPA (CEQ NEPA Regulations) states that "'Significantly' as used in NEPA requires considerations of both context and intensity…" (40 CFR 1508.27). Therefore, thresholds serve as a benchmark for determining if a project action will result in a significant adverse environmental impact when evaluated against the baseline. CEQ NEPA Regulations require that an Environmental Impact Statement (EIS) be prepared when a proposed major federal action (project) as a whole has the potential to "significantly affect the quality of the human environment." By preparing this

EIS, the BLM (as the NEPA lead Federal agency) has deemed that the project would generally have a significant impact on the environment.

Thresholds for determining significance in this section are based on Appendix G of the CEQA Guidelines (CCR 2006) and performance standards or thresholds identified by Energy Commission staff. In addition, staff's evaluation of the environmental effects of the proposed project on land uses (i.e., those listed below) includes an assessment of the context and intensity of the impacts, as defined in the CEQ NEPA Regulations 40 CFR Part 1508.27.

Effects of the proposed project on the land use environment (and in compliance with both CEQA and NEPA) have been determined using the thresholds listed below.

Agricultural Lands and Rangeland Management

- Conversion of Farmland or Rangeland
  - Conversion of Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use.
  - Conflict with existing zoning for agricultural use, or a Williamson Act contract.
  - Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland to non-agricultural uses.

Wilderness and Recreation

- Directly or indirectly disrupt activities in established federal, state, or local recreation areas and/or wilderness areas.
- Substantially reduce the scenic, biological, cultural, geologic, or other important factors that contribute to the value of federal, state, local, or private recreational facilities or wilderness areas.

Horses and Burros

- Involve changes in the existing environment which, due to their nature or location, result in interference with BLM's management of Herd Areas (HAs) and Herd Management Areas (HMAs).

Land Use Compatibility and LORS Compliance

- Directly or indirectly divide an established community or disrupt an existing or recently approved land use.
- Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction, or that would normally have jurisdiction, over the project adopted for the purpose of avoiding or mitigating environmental effects.

Cumulative Land Use Effects

- Individual environmental effects, which, when considered with other impacts from the same project or in conjunction with impacts from other closely related past,

present, and reasonably foreseeable future projects, are considerable, compound, or increase other environmental impacts.

C.6.4 PROPOSED PROJECT

C.6.4.1 SETTING AND EXISTING CONDITIONS

Proposed Project

The proposed Genesis Solar Energy Project (GSEP) site is approximately 1,890 acres and is located in the eastern region of Riverside County. The Applicant has requested a 4,640-acre ROW on public land administered by the Bureau of Land Management (BLM), but only 1,890 acres would be used for the GSEP. The northern boundary of the proposed project site is adjacent to the Palen-McCoy Wilderness, and the southern boundary is approximately two miles north of Interstate Highway 10 (I-10). The Palen Dry Lake Area of Critical Environmental Concern (ACEC), administered by the BLM, is approximately 5.5 miles west of the GSEP site, and the BLM's Chuckwalla Valley Dune Thicket ACEC is adjacent to the southwest of the proposed transmission interconnection.

The GSEP site currently consists of largely undisturbed desert land. A single four-wheel drive road runs north-south through the western portion of the greater 4,640-acre ROW area, but would be approximately 4.5 miles west of the GSEP facility. Access to the GSEP facility would be provided via a new access road constructed to the site from the Wiley Well Rest Area off of I-10 (GSEP 2009a).

Construction and operation of the GSEP would include the following features and facilities:

- two independent 125-MW solar electric generating facilities utilizing parabolic trough technology and associated equipment and infrastructure;
- one 0.46-acre laydown area;
- a minimum of two groundwater wells and a set of storage tanks for each 125-MW unit that would include a 500,000 gallon raw water/fire water tank, a 1,250,000 gallon treated water tank, and a 250,000 gallon wastewater tank;
- each 125-MW unit would have three 8-acre double-lined evaporation ponds, totaling 48 acres of ponds for the two units;
- a common administration building and warehouse would be located between the two units and each unit would have a control building located in each power block, totaling approximately 0.89 acres;
- an approximately 2.5-acre, 230-kV switchyard near the power block of unit two;
- approximately 6.5 miles of 230-kV gen-tie transmission line routed in a southeasterly ROW connecting to the Blythe Energy Project Transmission Line (BEPTL) and ultimately terminating at the proposed Southern California Edison (SCE) Colorado River Substation;

- approximately 6.5-miles of natural gas pipeline roughly paralleling the proposed transmission line to connect with existing Southern California Gas (SCG) infrastructure one mile west of the Wiley Well Rest Area; and
- approximately 6.5-miles of paved access road, also following the proposed transmission line ROW, but extending out to Wiley Well Rest Area.

All of the facilities described above, with the exception of the transmission line, access road, and natural gas pipeline would be enclosed in an eight-foot high chain-link security fence to restrict public access to the site.

Surrounding Area

The proposed project site is located in eastern Riverside County, approximately 25 miles west of the City of Blythe and approximately 35 miles west of the California-Arizona border. The City of Desert Center is located approximately 27 miles west of the proposed GSEP site. The Ironwood and Chuckwalla State Prisons are located adjacent to each other approximately nine miles south of the GSEP site. The surrounding area consists of undeveloped desert land surrounded by the McCoy Mountains to the east, the Palen Mountains (including the Palen/McCoy Wilderness Area) to the north, Ford Dry Lakebed to the south, and I-10 approximately two miles south of the southern border of the project site.

Agricultural Lands and Rangeland Management

According to the California Department of Conservation (DOC) Farmland Mapping and Monitoring Program (FMMP) maps, the majority of the county's existing agricultural land is located in three portions of the county, the San Jacinto and Coachella Valleys in the western half of the county and the Palo Verde Valley in the eastern portion of the county, along the Colorado River. The county's major urban areas such as Riverside, Moreno Valley, Corona, Palm Springs, Palm Desert, and Indio are surrounded by these agricultural lands. The proposed project site is located between the cities of the Desert Center and Blythe. According to the BLM, the proposed project site and associated linear facilities are located wholly within BLM-administered land.

The United States Department of Agriculture (USDA), Natural Resource Conservation Service (NRCS) provides information on designation of soils in areas with agricultural lands (NRCS 2009a). According to the NRCS's Web Soil Survey (WSS), the entire project site is outside the NRCS survey area (NRCS 2009b).

In addition, the Farmland Mapping and Monitoring Program (FMMP) of the California Department of Conservation (DOC) provides statistics on conversion of farmland to non-agricultural uses throughout the State. According to the farmland map of Riverside County, the proposed project site is entirely within BLM-administered lands, and has not been surveyed or included in a farmland mapping category (DOC 2008) of the DOC. No surveyed agricultural lands are adjacent to the proposed GSEP site.

The BLM manages rangelands throughout the west for the use of wildlife and livestock. The rangelands are divided into allotments and pastures for management purposes (BLM 2009b). Livestock grazing allotments on BLM-administered land may be

authorized under a permit or lease. The proposed GSEP site was previously a part of the Ford Dry Lake Pasture livestock grazing allotment, although this allotment was canceled after the Northern and Eastern Colorado Desert Coordinated Management Plan Amendment (NECO) was approved (BLM 2009c, GSEP 2009a).

Wilderness and Recreation

Wilderness land in Riverside County is administered by the BLM. According to the federal Wilderness Act, a designated Wilderness Area is defined as having four primary characteristics, including the following:

- a natural and undisturbed landscape;
- extensive opportunities for solitude and unconfined recreation;
- at least 5,000 contiguous acres; and
- feature(s) of scientific, educational, scenic, and/or historic value (16 USC § 1132(c)).

The wilderness areas closest to the proposed project site are the Palen Dry Lake ACEC, which is approximately 5.5 miles west of proposed project site, the Chuckwalla Valley Dune Thicket ACEC located adjacent to the southwest of the linear ROW, and the Mule Mountain ACEC approximately 12 miles southeast of the GSEP. The 3,632-acre Palen Dry Lake and 4,092-acre Mule Mountain ACECs are closed to recreation and are designated for their archaeological values. The 2,273-acre Chuckwalla Valley Dune Thicket ACEC is also closed to recreation and is designated due to its wildlife habitat (BLM 1999).

The Palen/McCoy Wilderness located adjacent to the northern boundary of the ROW and project site. Spanning 236,488 acres, the Palen/McCoy Wilderness is notable for its opportunities for solitude and unconfined recreational activities including camping, hunting and fishing (BLM 2009d).

The vast majority of Riverside County land is designated as “Open Space/Conservation” according to the county Land Use Map, and the open space and recreation use areas under BLM management are designated as “open” or “limited use” for OHV designations. (RCTLMA 2008; BLM 1999). In “open” areas, all forms of cross-country travel are permitted within the posted boundaries, and in “limited use” areas vehicle travel is limited to approved/signed routes of travel and no cross-country vehicle travel is allowed. The NECO is an amendment to the BLM’s California Desert Conservation Area (CDCA) Plan. Under both the CDCA and the NECO, the proposed project site is categorized as Class M (Moderate Use). Recreational opportunities in Class M (Moderate Use) range from backpacking and primitive, unimproved site camping to hiking to vehicle touring and competitive motorized-vehicle events on approved routes of travel. Prior to adoption of the NECO, Ford Dry Lake was an OHV area without amenities, but allowed cross-country travel. With adoption of the NECO, OHV use within Ford Dry Lake was restricted to approved open routes. There are three (3) approved open routes designated by NECO within the greater 4,640-acre BLM ROW requested by the applicant, but the proposed project site would not be traversed by any open routes. The linear ROW would cross one (1) approved open route that could be disturbed by operation or construction activities related to the proposed project. **Land**

Use Table 1 describes recreation areas beginning with the area closest to the proposed project site.

LAND USE Table 1
Open Space and Recreation Areas

Recreation Area	Jurisdiction/ Administration	Approximate Distance from the Proposed Project Site	Approximate Acreage	Allowed Uses
Palen/McCoy Wilderness	Open Area- BLM	Adjacent to northern boundary	236,488	Camping, hiking, hunting, fishing
Chuckwalla Valley Dune Thicket ACEC	Limited Area-BLM; ACEC	Adjacent to linear facilities ROW	2,273	Closed to recreation
Palen Dry Lake ACEC	Limited Area-BLM; ACEC	5.5 miles west	3,632	Closed to recreation
Mule Mountains ACEC	Limited Area-BLM; ACEC	12 miles southeast	4,092	Closed to recreation
Wiley Well Campground	Open Area-BLM	7 miles south	NA	Camping
Coon Hollow Campground	Open Area-BLM	10 miles south	NA	Camping
Bradshaw Trail	Limited Area-BLM	10 miles south	NA	OHV, Camping

Source: BLM 2009d; BLM 2002.

Horses and Burros

The BLM administers wild horses and burros as guided by the Wild and Free-Roaming Horse and Burro Act of 1971. This includes the management of Herd Areas (HA), which are geographic areas where wild horse and/or burro populations were found at the passage of the Act in 1971 (BLM 2009e) and Herd Management Areas (HMAs), which are designated by BLM through the land use planning process. California contains 33 HAs and 22 HMAs. According to BLM maps, the Chocolate-Mule Mountains HA/HMA is located approximately two miles southeast of the proposed project site in Riverside County near the California-Arizona border (BLM 2009f, BLM 2009g). As such, the proposed project would not contain or traverse any established HMAs or HAs.

Land Use and LORS Compliance

The proposed project site (1,890 acres) is located within the “Moderate Use” category of the BLM’s CDCA Plan. **LAND USE Table 2** provides a general description of the land use LORS applicable to the proposed project and surrounding lands. The project’s consistency with these LORS is discussed in **LAND USE Table 3**. Because the proposed project site would be located solely on BLM-administered land and the only portion of the linear ROW that would be outside of BLM boundaries would be limited to

stringing conductor on existing transmission poles, no state or local LORS are applicable to the proposed project.

LAND USE Table 2
Laws, Ordinances, Regulations, and Standards (LORS)

Applicable LORS	Description
Federal	
Federal Land Policy and Management Act (FLPMA), 1976 – 43 CFR 1600	Establishes public land policy; guidelines for administration; and provides for the management, protection, development, and enhancement of public lands. FLPMA mandates that public lands be managed on the basis of multiple use and sustained yield unless otherwise specified by law. In particular, the FLPMA's relevance to the proposed project is that Title V, Section 501 establishes BLM's authority to grant rights-of-way for generation, transmission, and distribution of electrical energy (FLPMA 2001).
Farmland Protection Policy Act, Subtitle I of Title XV, Section 1539-1549 of the Agriculture and Food Act of 1981(NRCS 2009)	The FPPA is intended to minimize the impact federal programs have on the unnecessary and irreversible conversion of farmland to nonagricultural uses. It assures that—to the extent possible—federal programs are administered to be compatible with state, local units of government, and private programs and policies to protect farmland. Federal agencies are required to develop and review their policies and procedures to implement the FPPA every two years. For the purpose of FPPA, farmland includes prime farmland, unique farmland, and land of statewide or local importance. Farmland subject to FPPA requirements does not have to be currently used for cropland. It can be forest land, pastureland, cropland, or other land, but not water or urban built-up land.
Bureau of Land Management - California Desert Conservation Area (CDCA) Plan, 1980 as Amended (BLM 1980)	The 25 million-acre CDCA contains over 12 million acres of public lands spread within the area known as the California Desert, which includes the following three deserts: the Mojave, the Sonoran, and a small portion of the Great Basin. The 12 million acres of public lands administered by the BLM are half of the CDCA. The CDCA Plan is a comprehensive, long-range plan with goals and specific actions for the management, use, development, and protection of the resources and public lands within the CDCA, and it is based on the concepts of multiple use, sustained yield, and maintenance of environmental quality. The plan's goals and actions for each resource are established in its 12 elements. Each of the plan elements provides both a desert-wide perspective of the planning decisions for one major resource or issue of public concern as well as more specific interpretation of multiple-use class guidelines for a given resource and its associated activities.
Northern and Eastern Colorado Desert Coordinated Management Plan (BLM 2002)	The BLM's Northern and Eastern Colorado Desert Coordinated Management Plan establishes goals and planned actions that are designed to meet the goals of the CDCA Plan. They emphasize the protection of wildlife and cultural resource values while permitting a compatible level of motorized vehicle use.

Applicable LORS	Description
Public Rangelands Improvement Act (1978) (PRIA 1978)	Establishes and reaffirms the national policy and commitment to inventory and identify current public rangeland conditions and trends; manage, maintain and improve the condition of public rangelands so that they become as productive as feasible for all rangeland values in accordance with management objectives and the land use planning process; and continue the policy of protecting wild free-roaming horses and burros from capture, branding, harassment, or death, while at the same time facilitating the removal and disposal of excess wild free-roaming horses and burros which pose a threat to themselves and their habitat and to other rangeland values.
The Wild Free-Roaming Horses and Burros Act of 1971 (BLM 2009h)	The BLM protects, manages, and controls wild horses and burros under the authority of the Wild Free-Roaming Horses and Burros Act of 1971 (Act) to ensure that healthy herds thrive on healthy rangelands. The BLM manages these animals as part of its multiple-use mission under the 1976 Federal Land Policy and Management Act. One of the BLM's key responsibilities under the Act is to determine the "appropriate management level" (AML) of wild horses and burros on the public rangelands.
State	
None	
Local	
None	

C.6.4.2 ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

Construction and Operation

Agricultural Lands and Rangeland Management

According to the AFC, "no lands designated as containing Prime farmland or Farmland of Statewide Importance are present within the Project site…The nearest farmland of Statewide Importance, which is also Prime Farmland, is approximately 15 miles to the east of the Project, in Blythe. The Project area lies outside of the FMMP [Farmland Mapping and Monitoring Program] survey area" (GSEP 2009a). Staff conducted analysis of agricultural land and rangeland to verify the Applicant's assessment.

As described in detail above under the section entitled **Agricultural Lands**, multiple governmental agencies at the federal, state, and local level have information regarding the agricultural lands relating to the proposed project and the surrounding area. To summarize, the following is a list of the various designations or categorizations these multiple governmental agencies have provided for the proposed project site and construction laydown area:

- **California DOC:** As the project site and linear ROW are located entirely within lands under BLM jurisdiction, this land is unsurveyed by the FMMP (DOC 2008).

- **USDA NRCS:** As with the California DOC, as the project site and linear ROW are located entirely within BLM lands, soil surveys for these sites have not been completed (NRCS 2009b).
- **Riverside County:** As the project site and linear ROW are entirely within BLM lands, these lands are not subject to Riverside County land use regulations (GSEP 2009a).
- **Williamson Act**: The project site is not located in an area that is under a Williamson Act contract (GSEP 2009a).

The DOC's FMMP mapping information is used in Staff Assessments to analyze impacts to important farmlands (i.e., Prime Farmland, Unique Farmland, or Farmland of Statewide Importance) in the state. FMMP designations for the proposed project site and linear ROW are unsurveyed and are not included in any other mapping category, such as Prime Farmland, Farmland of Statewide Importance, Unique Farmland, or Farmland of Local Importance (DOC 2008). Therefore, no farmland conversion impacts are expected as a result of proposed project or linear facilities' construction, and the project would not involve other changes in the existing environment which could result in conversion of farmland, to non-agricultural uses.

In regards to rangeland management, as noted in the "Setting and Exiting Conditions," the project site and linear ROW are located on the canceled Ford Dry Lake Pasture livestock grazing allotment. As the Ford Dry Lake Pasture allotment has been canceled, no livestock grazing would be adversely affected by construction or operation of the proposed project.

Wilderness and Recreation

Approval of the proposed project would directly remove approximately 1,800 acres from potential use for recreational opportunities such as backpacking, camping, rockclimbing, hunting, or other activities. As noted in the "Setting and Existing Conditions" section, no recreational routes designated by the NECO are within the project site and construction laydown site. One "open" route would be crossed by the proposed linear ROW. While the proposed project would remove recreation opportunities at the site, due to the remote nature of the site along with the BLM's existing restrictions on recreational activities in the area, direct impacts to recreation use of the proposed project site would be limited. While construction of the proposed transmission line would traverse an "open" route and result in disruptions to motorized vehicle use along this route, as the transmission line would be strung over the route on existing structures, it would not permanently disrupt use of the route. Any impacts on the route by the linear ROW would be temporary and short-term.

The project would not be constructed on wilderness lands so it would not directly disrupt activities in a federal wilderness area. However, the Palen/McCoy Wilderness north of the project site attracts visitors based on its scenic, biological, cultural, and recreational amenities. The proposed project would not substantially reduce the scenic value of this wilderness area (see the **Visual Resources** section of this document).

The 3,632-acre Palen Dry Lake ACEC occurs southwest of the project site and is managed for protection of its prehistoric resources as a Multiple Use Class M (moderate) unit; the proposed project would not substantially reduce the cultural values of this wilderness area (see the **Cultural Resources** section of this document).

The 2,273-acre Chuckwalla Valley Dune Thicket ACEC occurs approximately two miles southeast of the project site and is managed for Moderate Use Class M unit for its wildlife habitat use, specifically desert tortoise. The proposed project would not substantially reduce the cultural values of this wilderness area (see the **Biological Resources** section of this document).

Thus, from a land use perspective, the proposed project would not adversely affect wilderness areas in the area.

Horses and Burros

The proposed project would not contain or traverse any established BLM HAs or HMAs. The nearest, the Chocolate-Mule Mountains HA/HMA, is located approximately two miles southeast of the proposed ROW in Riverside County near the California-Arizona border (BLM 2002). In addition, following construction, fencing around the site would keep any burros outside of the proposed project location. Therefore, the proposed project would not result in any interference with BLM's management of an HA or HMA. For a discussion of the proposed project's consistency with Chapter 3 of the BLM's CDCA Plan, Wild Horses and Burros Element, please see **LAND USE Table 3** (below).

Land Use Compatibility and LORS Compliance

Physical Division of an Existing Community

The proposed project would not physically divide an established community[1], because the proposed project and associated linear facilities would be located on undeveloped lands (and within existing utility ROWs) administered by the BLM. In addition, the proposed project would not be located within or near an established community. Neither the size nor the nature of the project would result in a physical division or disruption of an established community. In addition, no existing roadways or pathways within an established community would be blocked. Due to the temporary nature of construction activities, construction-generated nuisances such as dust and noise are not expected to adversely affect recreational uses in the area. Due to the intermittent nature of similar operation-related impacts, staff concludes that any potential impacts would not adversely affect recreational uses. For a detailed analysis of construction and operation-related nuisance impacts, please see the **Air Quality** and **Noise** sections.

Conflict with any Applicable Land Use Plan, Policy, or Regulation

As required by California Code of Regulations, Title 20, Section 1744, Energy Commission staff evaluates the information provided by the project owner in the AFC (and any amendments), project design, site location, and operational components to determine if elements of the proposed project would conflict with any applicable land

[1] An established community usually refers to a residential community.

use plan, policy, or regulation of an agency with jurisdiction over the project, or that would normally have jurisdiction over the project except for the Energy Commission's exclusive authority. As part of the licensing process, the Energy Commission must determine whether a proposed facility complies with all applicable state, regional, and local LORS (Public Resources Code section 25523[d][1]). The Energy Commission must either find that a project conforms to all applicable LORS or make specific findings that a project's approval is justified even where the project is not in conformity with all applicable LORS (Public Resources Code section 25525).

In addition, the applicant has submitted an application to the BLM requesting a ROW to construct the proposed project and its related facilities. Pursuant to the California Desert Conservation Area (CDCA) Plan (1980, as amended), sites associated with power generation or transmission not identified in the CDCA Plan are considered through a Land Use Plan Amendment process. Under Federal law, BLM is responsible for processing requests for ROWs to authorize such proposed projects and associated transmission lines and other appurtenant facilities on land it administers. The CDCA Plan, while recognizing the potential compatibility of solar generation facilities on BLM-administered land, requires that all sites associated with power generation or transmission not identified in the Plan be considered through a land use plan amendment process (FR 2008). BLM would use the following Planning Criteria during the Plan Amendment process:

- The plan amendment process would be completed in compliance with the Federal Land Policy and Management Act (FLPMA), NEPA, and all other Federal laws, regulations, and policies relevant to BLM-administered land;
- The plan amendment process would include an EIS (i.e., this joint Energy Commission Staff Assessment/BLM DEIS) to comply with CEQ NEPA Regulations;
- Where existing planning decisions are still valid, those decisions would remain unchanged and be incorporated into the new plan amendment;
- The plan amendment would recognize valid existing rights;
- Native American Tribal consultations would be conducted in accordance with policy, and Tribal concerns would be given due consideration. The plan amendment process would include the consideration of any impacts on Indian trust assets (please see the **Cultural Resources** section);
- Consultation with the State Office of Historic Preservation (SHPO) would be conducted throughout the plan amendment process (please see the **Cultural Resources** section); and
- Consultation with the US Fish and Wildlife Service (USFWS) would be conducted throughout the plan amendment process (please see the **Biological Resources** section).

If the ROW and potential land use plan amendment are approved by BLM, the proposed solar thermal power plant facility on BLM-administered land would be authorized in accordance with Title V of the FLMPA of 1976 and the Federal Regulations at 43 CFR part 2800. This Environmental Impact Statement (EIS) acts as the mechanism for

meeting CEQ NEPA Regulation requirements, and also provides the analysis required to support a land use plan amendment identifying the facility within the Plan.

The proposed project area is within the Northern and Eastern Colorado Desert Coordinated Management Plan (NECO) area. The NECO is an update amendment to the CDCA Plan to make it compatible with Desert tortoise conservation and recovery. The NECO is a landscape-scale planning effort for most of the California portion of the Sonoran Desert ecosystem that promotes desert tortoise conservation and recovery.

In 1990 the Desert tortoise was listed as a threatened species under the federal Endangered Species Act. By law, land managing agencies are required to review their current land use plans, adjust them as necessary, and consult on their adequacy with the U.S. Fish and Wildlife Service.

Energy Commission staff have concluded that without mitigation the project would be a substantial contributor to the cumulatively significant loss of biological resources within the Chuckwalla Valley and the NECO area. Staff has recommended compensatory mitigation to offset direct, indirect, and cumulative impacts to desert tortoise and other special-status species, and to assure compliance with state and federal laws such as the federal and state endangered species acts and regulations protecting waters of the state; see the **BIOLOGICAL RESOURCES** section of the SA/DEIS.

A Biological Resources Mitigation Implementation and Monitoring Plan (BRMIMP) will be required for the project by biological staff as a Condition of Certification by the California Energy Commission; see the **BIOLOGICAL RESOURCES** section. The BRMIMP comprehensively describes avoidance, minimization, and mitigation measures.

With the effective implementation of specific species and habitat mitigation, active management and restoration practices on the WHMA portion of the project area, there would not be a project conflict with this CEQA criterion under this land use plan.

As the proposed project would be located solely on BLM-administered land, there are no state, regional, county, or other local land use LORS applicable to the proposed project. Staff's analysis of the proposed project's consistency with applicable federal land use LORS is presented in **LAND USE Table 3.** Based on staff's independent review of applicable LORS documents, the proposed project would be consistent with applicable land use LORS**LAND USE Table 3.**

LAND USE Table 3
Project Compliance with Adopted Land Use LORS

Applicable LORS	Description of Applicable LORS	Consistent?	Basis for Consistency
Federal			
Federal Land Policy and Management Act, 1976 – 43 CFR 1600, **Sec. 501. [43 U.S.C**. **1761]**	(a) The Secretary, with respect to the public lands … are authorized to grant, issue, or renew rights-of-way over, upon, under, or through such lands for: (4) systems for generation, transmission, and distribution of electric energy, except that the applicant shall also comply with all applicable requirements of the Federal Energy Regulatory Commission under the Federal Power Act, including part I thereof (41 Stat. 1063, 16 U.S.C. 791a-825r) [P.L. 102-486, 1992]	YES	The FLPMA authorizes the issuance of a right-of-way grant for electrical generation facilities and transmission lines. In addition, based on staff's review of the Federal Power Act, the requirements would not be applicable to the proposed project as they are not related to renewable resources, and are otherwise related to administrative procedures. Therefore, the proposed project would be in compliance with this policy.
Farmland Protection Policy Act, Section 658.1	As required by section 1541(b) of the [Farmland Protection Policy] Act, 7 U.S.C. 4202(b), Federal agencies are (a) to use the criteria to identify and take into account the adverse effects of their programs on the preservation of farmland, (b) to consider alternative actions, as appropriate, that could lessen adverse effects, and (c) to ensure that their programs, to the extent practicable, are compatible with State and units of local government and private programs and policies to protect farmland.	YES	As discussed above in detail in Section C.6.4.2 (under the subsection entitled "Agricultural Lands and Rangeland Management"), no farmland would be converted under the proposed project and impacts to rangelands would not be adverse. In addition, construction of the proposed project and its associated linear facilities would be temporary, and the project would not involve other changes in the existing environment which could result in conversion of farmland, to non-agricultural uses. Therefore, proposed project would be consistent with the FPPA.

Applicable LORS	Description of Applicable LORS	Consistent?	Basis for Consistency
Bureau of Land Management – California Desert Conservation Area (CDCA) Plan (Including the Northern and Eastern Colorado Desert Coordinated Management Plan Amendment) (BLM 1980)	**Chapter 2 – Multiple-Use Classes** **MULTIPLE-USE CLASS GUIDELINES** MULTIPLE-USE CLASS M Moderate Use Multiple-Use Class M is based upon a controlled balance between higher intensity use and protection of public lands. This class provides for a wide variety of present and future uses such as mining, livestock grazing, recreation, energy, and utility development. Class M management is also designed to conserve desert resources and to mitigate damage to those resources which permitted uses may cause. All types of electrical generation plants may be allowed in accordance with state, federal, and local laws. New gas, electric, and water transmission facilities and cables for interstate communication may be allowed only within designated corridors. Existing facilities within designated corridors may be maintained and upgraded or improved in accordance with	YES (with an approved BLM project-specific CDCA Plan Amendment)	Approximately 1,890 acres of the proposed project site is administered by the BLM and is managed under multiple use Class M (MultipleUse) categories in conformance with the CDCA Plan (GSEP 2009a). The proposed project consists of an electrical generating facility, a transmission line, a natural gas pipeline, an access road and ancillary facilities. As such, development of the proposed project is an allowed use under the Multiple-Use Class Guidelines. In addition, the CDCA Plan, while recognizing the potential compatibility of solar generation facilities on public lands, requires that all sites associated with power generation or transmission not identified in the Plan be considered through the Plan Amendment process. Therefore, the BLM would undertake a project-specific CDCA Plan amendment along with the ROW grant for the proposed Genesis Solar Energy Project. Upon BLM's amendment of the CDCA plan for the Genesis Solar Energy Project, the proposed project would be fully compliant with the CDCA Plan. This Environmental Impact Statement (EIS) acts as the mechanism for meeting CEQ NEPA Regulation requirements, and also provides the analysis required to support a Land Use Plan Amendment identifying the facility within the Plan.

Applicable LORS	Description of Applicable LORS	Consistent?	Basis for Consistency
	existing rights of way grants or by amendments to right of way grants. Existing facilities outside designated corridors may only be maintained but not upgraded or improved.		
	Chapter 3 **Wild Horse and Burros Element** Goal 2. Protect wild horses and burros on public lands by conducting surveillance to prevent unauthorized removal or undue harassment of animals.	YES	As noted in the "Setting and existing Conditions" subsection above, the proposed project site is not in the vicinity of an HA or HMA; therefore, the project site and surrounding area are not notable for the presence of wild horses or burros. Therefore, the proposed project would not result in any interference with BLM's management of an HA or HMA, and would be consistent with this element of the CDCA Plan.
	Chapter 3 **Energy Production and Utility Element** Goal 1. Fully implement the network of joint-use planning corridors to meet projected utility needs to the year 2000. Specific electrical and natural gas right-of-way or power plant site applications made under the provisions of this element should be consistent with adopted California Energy Commission forecasts, which are reviewed biennially. Decision criteria are to: (1) Minimize the number of separate rights-of-way by utilizing existing rights-of-way as a basis for planning	YES	The proposed project's linear facilities would use existing and established utility ROWs to the greatest extent possible, connecting to existing access roads at Wiley Well and stringing transmission along the BEPTL poles. Therefore, the proposed project would utilize existing ROWs, and would be consistent with this element of the CDCA Plan.

Applicable LORS	Description of Applicable LORS	Consistent?	Basis for Consistency
	corridors; (2) Encourage joint use of corridors for transmission lines, canals, pipelines, and cables; (3) Provide alternative corridors to be considered during processing of applications; (4) Avoid sensitive resources wherever possible; (5) Conform to local plans whenever possible; (6) Consider wilderness values and be consistent with final wilderness recommendations; (7) Complete the delivery-systems network; (8) Consider ongoing projects for which decisions have been made, for example, the Intermountain Power Project; and (9) Consider corridor networks which take into account power needs and alternative fuel resources.		
	Addendum B: Interim Management Guidelines **Chapter III. Guidelines for Specific Activities** **Lands Actions – Disposal, Rights-of-Way, Access and Withdrawals**	YES	The non-impairment standard, directs that "until Congress has determined otherwise" the lands under review be managed so as not to impair their suitability as wilderness (CRS 2004). As the proposed project would not traverse an established Wilderness Area, the project would be in compliance with this guideline of the CDCA Plan.

Applicable LORS	Description of Applicable LORS	Consistent?	Basis for Consistency
	2. Rights-of-Way: Existing rights-of-way may be renewed if they are still being used for their authorized purpose. New rights-of-way may be approved only for temporary uses that satisfy the non-impairment criteria. 3. Right-of-Way Corridors: Right-of-way corridors may be designated on lands under wilderness review.		
Federal Wilderness Act, 16 U.S.C. § 1131-1136	**(a) Establishment; Congressional declaration of policy; wilderness areas; administration for public use and enjoyment, protection, preservation… provisions for designation as wilderness areas** In order to assure that an increasing population, accompanied by expanding settlement and growing mechanization, does not occupy and modify all areas within the United States and its possessions, leaving no lands designated for preservation and protection in their natural condition, it is hereby declared to be the policy of the Congress to secure for the American people of present and future generations the benefits of an enduring resource of wilderness.	YES	As the proposed project would not traverse an established Wilderness Area, the project would be consistent with this guideline.
Public Rangelands	Establishes and reaffirms the	YES	In regards to rangeland management, as noted in the “Setting and Exiting

Applicable LORS	Description of Applicable LORS	Consistent?	Basis for Consistency
Improvement Act	national policy and commitment to inventory and identify current public rangeland conditions and trends; manage, maintain and improve the condition of public rangelands so that they become as productive as feasible for all rangeland values in accordance with management objectives and the land use planning process; and continue the policy of protecting wild free-roaming horses and burros.		Conditions," the proposed project would be located on the canceled Ford Dry Lake Pasture livestock grazing allotment. As this livestock grazing allotment has been canceled, the proposed project would not convert any rangeland used for livestock grazing and so would be in compliance with this Act.
Wild and Free-Roaming Horse and Burro Act	Establishes BLM's authority to protect, manage, and control wild horses and burros to ensure that healthy herds thrive on healthy rangelands. BLM determines the "appropriate management level" (AML) of wild horses and burros on the public rangelands.	YES	As discussed above in detail in Section C.6.4.2, the proposed project would not contain or traverse an established HA or HMA. As such, the proposed project would be consistent with this Act.

Project Closure and Decommissioning

According to Section 3.12 of the applicant's project description, the solar generating facility is expected to have a lifespan of 30 years. At any point during this time, temporary or permanent closure of the solar facility could occur. Temporary closure would be a result of necessary maintenance, hazardous weather conditions, or damage due to a natural disaster. Permanent closure would be a result of damage that is beyond repair, adverse economic conditions, or other significant reasons.

Both temporary and permanent closures would require the applicant to submit to the CEC and BLM a contingency plan or a closure and decommissioning plan, respectively. A contingency plan would be implemented to ensure compliance with applicable LORS, and appropriate shutdown procedures depending on the length of the cessation. A closure and decommissioning plan would be implemented to ensure compliance with applicable LORS, removal of equipment and shutdown procedures, site restoration, potential decommissioning alternatives, and the costs and source of funds associated with decommissioning activities.

Upon closure of the facility decommissioning, the applicant would be required to restore lands affected by the project to their pre-project state. Given the fact that the proposed project site is located on undeveloped land, staff anticipates that project decommissioning would have impacts similar in nature to proposed project construction activities.

In addition, staff's proposed Condition of Certification **BIO-23** requires the applicant to develop a Decommissioning and Closure Plan and cost estimate that meets the requirements of BLM's 43 CFR 3809.550 et seq. Staff acknowledges the uncertainty in planning for conditions 30 to 50 years in the future, but the Decommissioning and Closure Plan cannot defer establishing reasonable performance standards and goals until that time.

Therefore, with proposed Condition of Certification BIO-23 and the eventual return of the lands to their current state, the land use effects of decommissioning would be short term and not adverse.

C.6.4.3 CEQA LEVEL OF SIGNIFICANCE

For the purposes of CEQA compliance, the significance of each identified impact of the proposed project has been determined. The CEQA Lead Agency is responsible for determining whether an impact is significant and is required to adopt feasible mitigation measures to minimize or avoid each significant impact. Conclusions in this section are presented to identify the level of significance of each identified impact (as required by CEQA) as follows: less-than-significant (i.e., adverse, but not significant); less-than-significant with mitigation (i.e., can be mitigated to a level that is not significant); or significant and unavoidable (i.e., cannot be mitigated to a level that is not significant).

Agricultural Lands and Rangeland Management

As discussed above in detail in Section C.6.4.2 (under the subsection entitled "Agricultural Lands and Rangeland Management") no farmland or rangeland used for

livestock grazing would be converted by the proposed project. In addition, construction of the proposed project and its associated linear facilities would be temporary, and the project would not involve other changes in the existing environment which could result in conversion of Farmland to non-agricultural uses. Therefore, proposed project impacts on agricultural lands and rangeland management would be less-than-significant.

Wilderness and Recreation

As discussed above in detail in Section C.6.4.2 (under the subsection entitled "Wilderness and Recreation"), the conversion of 1,890 acres of land to support the proposed project's components and activities would directly disrupt current recreational activities in established federal recreation areas and would result in adverse effects on recreational users of these lands. Due to the limited use of these recreational resources and existing BLM restrictions, however, the disruption to recreation would be less than significant.

The proposed project would not substantially reduce the scenic, biological, or cultural values of federal wilderness areas. Thus, land use impacts to the area's wilderness areas would be less-than-significant.

Horses and Burros

As discussed above in detail in Section C.6.4.2 (under the subsection entitled "Horses and Burros"), the proposed project would not contain or traverse any established BLM HAs or HMAs. Therefore, the proposed project would not result in any interference with BLM's management of an HA or HMA. Impacts would be less than significant.

Land Use Compatibility and LORS Compliance

As discussed above in detail in Section C.6.4.2 (under the subsection entitled "Land Use Compatibility"), the project would not physically divide or disrupt an established community. Impacts would be less than significant.

As the proposed project is located wholly on BLM-administered land, no state, regional, or local land use LORS are applicable to the proposed project. Staff's analysis of the proposed project's consistency with applicable federal land use LORS is presented in **LAND USE Table 3.** The proposed project would be consistent with applicable federal land use LORS. With BLM's approval of a project-specific CDCA Plan Amendment, the proposed project would fully conform to the CDCA. Therefore, impacts associated with compliance with federal land use LORS would be less than significant.

Cumulative Land Use Effects

Section C.6.8 (below) provides a detailed analysis of cumulative impacts. As discussed below, the potential combined development of approximately one million acres of land in the southern California desert, would all combine to result in adverse effects on agricultural lands (one of the state's most important resources), and recreational resources. Although the development of renewable resources in compliance with federal and state mandates is important and required, the conversion of thousands of acres of open space (including areas with high soil quality and agricultural resources) would result in a significant and unavoidable impact. In general, the land conversion

impacts to these lands would preclude numerous existing land uses including recreational activities, rangeland management, and open space. Because the GSEP would have no impacts on agricultural resources or rangelands, it would have no potential to contribute to cumulative impacts in this respect. The GSEP's potential to disrupt recreational activities would be limited and less than cumulatively considerable when considered in the context of past, present and reasonably foreseeable future projects. However, the GSEP would combine with other past and reasonably foreseeable future projects to substantially reduce scenic values of wilderness areas and recreational resources in the Chuckwalla Valley and southern California desert region and therefore, would result in a significant and unavoidable cumulative land use impact in this regard.

C.6.5 REDUCED ACREAGE ALTERNATIVE

The Reduced Acreage Alternative would essentially be Unit 1 of the proposed project, including a 125 MW solar facility located within the boundaries of the proposed project as defined by NextEra. This alternative is analyzed for two major reasons: (1) it eliminates about 50 percent of the proposed project area so all impacts are reduced, and (2) by eliminating the eastern solar field, it would reduce the water required for wet cooling by 50 percent. The boundaries of the Reduced Acreage Alternative are shown in **Alternatives Figure 1**.

C.6.5.1 SETTING AND EXISTING CONDITIONS

This alternative is located entirely within the boundaries of the proposed project site. It simply eliminates effects to the eastern 125 MW solar field and relocates the gas yard approximately 1.75 miles northwest of its present location. As a result, the environmental setting consists of the western portion of the proposed project, as well as the area affected by the linear project components.

C.6.5.2 ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

Agricultural Lands and Rangeland Management

While the Reduced Acreage Alternative would reduce any land conversion impacts by 50 percent, as discussed above in detail in Section C.6.4.2 (under the subsection entitled "Agricultural Lands and Rangeland Management"), no farmlands or rangelands used for livestock grazing would be converted. In addition, construction activities associated with the proposed project and its linear facilities would be temporary, and the project would not involve other changes in the existing environment that could result in conversion of farmland to non-agricultural uses.

Finally, given that this alternative would be located wholly on BLM-administered land, state land preservation contracts (i.e., Williamson Act Contract), and county zoning for agricultural use would not be affected.

Therefore, the types of effects on agricultural lands and rangeland management resulting from this alternative would be the same as the proposed project, but less intense given the reduced size of the site.

Wilderness and Recreation

The conversion of 990 acres of land to support the components and activities associated with this alternative would disrupt current recreational activities, although due to the remote nature of the site along with the BLM's existing restrictions on recreational activities in the area, direct impacts to recreation use of the alternative project site would be limited. Construction of the transmission line would traverse a single "open" route and result in disruptions to motorized vehicle use along this route. As the transmission line would be strung over the route, however, it would not permanently disrupt use of the route. Any impacts on the route by the linear ROW would be temporary and short-term.

This alternative would not be constructed on wilderness lands so it would not directly disrupt activities in a federal wilderness area

This alternative would have similar effects on wilderness and recreation resources that the proposed project would, but these effects would be less intense due to the reduction in the size of the project by 50 percent. Thus, this alternative would not substantially reduce the scenic, biological or cultural value of a wilderness area or recreational resources.

Horses and Burros

Similar to proposed project, this alternative would not contain or traverse any established BLM HAs or HMAs. Therefore, the Reduced Acreage Alternative would not result in any interference with BLM's management of an HA or HMA.

Land Use Compatibility and LORS Compliance

Similar to the proposed project, this alternative would not physically divide or disrupt an established community.

Staff's analysis of the proposed project's consistency with applicable federal land use LORS is presented in **LAND USE Table 3.** These federal LORS would apply to this alternative. Similar to the proposed project, this alternative would be consistent with applicable federal land use LORS. With BLM's approval of a project-specific CDCA Plan Amendment, the proposed project would fully conform with the CDCA.

Cumulative Land Use Effects

This alternative would result in the conversion of 990 acres of undeveloped open space with an industrial utility use (i.e., a 125 MW power plant and associated infrastructure). When compared to the proposed project, this alternative would result in approximately 50 percent less land conversion to industrial uses, and the cumulative effects of this amount of land conversion when combined with all other existing, planned, and proposed projects would result in adverse cumulative land conversion. Section C.6.8 (below) provides a detailed analysis of cumulative impacts. The potential combined development of approximately one million acres of land in the southern California desert, would all combine to result in adverse effects on agricultural lands (one of the state's most important resources), and recreational resources. In general, the conversion of vast amounts of open space lands would preclude numerous existing land

uses including recreational activities, rangeland management, and open space, and therefore, result in a significant cumulative land use impact.

Because this alternative would have no impact on agricultural resources or rangelands, it would have no potential to contribute to cumulative impacts in this respect. This alternative's potential to disrupt recreational activities would be limited and less than cumulatively considerable when considered in the context of past, present and reasonably foreseeable future projects. However, this alternative would combine with other past and reasonably foreseeable future projects to substantially reduce scenic values of wilderness areas and recreational resources in the Chuckwalla Valley and southern California desert region and therefore, would result in a significant and unavoidable cumulative land use impact in this regard.

C.6.5.3 CEQA LEVEL OF SIGNIFICANCE

Agricultural Lands and Rangeland Management

As discussed above in subsection C.6.5.2, and similar to the proposed project, impacts resulting from this alternative on agricultural and rangelands used for livestock grazing would be less than significant.

Wilderness and Recreation

As discussed above in subsection C.6.5.2, and similar to the proposed project, impacts resulting from this alternative to wilderness and recreation would be less than significant.

Horses and Burros

As discussed above in subsection C.6.5.2, and similar to the proposed project, impacts resulting from this alternative on horses and burros would be less than significant.

Land Use Compatibility and LORS Compliance

As discussed above in subsection C.6.5.2, and similar to the proposed project, this alternative would comply with federal LORS. Therefore, impacts would be less than significant.

Cumulative Land Use Effects

As discussed above in subsection C.6.5.2, and similar to the proposed project, the cumulative land use impacts of this alternative when combined with other existing, planned, and proposed projects would be significant and unavoidable.

C.6.6 DRY COOLING ALTERNATIVE

This section identifies the potential impacts of using air-cooled condenser (ACC) systems rather than the cooling towers proposed by NextEra for the Genesis project. It is assumed that the ACC systems would be located where the cooling towers are currently proposed for each of the two 125 MW power block, as illustrated in Alternatives Figure 2 (see Section B.3).

Approximately 18 ACC fans would be required for each of the two solar fields. The 18 fans, or ACC's, would operate when the ambient temperature is above 50 degrees Fahrenheit. When the temperature is below 50 degrees Fahrenheit, only 10 of the fans would be used (GSEP 2009f). The 18 ACC fans described in the GSEP cooling study would have a length of approximately 279 feet, a width of approximately 127 feet, and a height of 98 feet (GSEP 2009f). However, based on the ACC preliminary designs for nearby solar thermal projects in similar ambient temperatures, an additional 11,690 square feet could be required for siting of the fans and the fans would be up to 120 feet in height. In addition to the ACC fans, NextEra would use a small Wet Surface Air Cooler when needed to provide auxiliary cooling during extremely hot days (GSEP 2009f). This alternative is analyzed because it would reduce the amount of water required for steam turbine cooling from 822 acre-feet per year (AFY) per unit to 66 AFY. This reduction in water use would reduce impacts to water and biological resources.

C.7.6.1 SETTING AND EXISTING CONDITIONS

This alternative is located entirely within the boundaries of the proposed project site. It simply eliminates the use of wet-cooling towers and incorporated the use of air-cooled condensers (ACC) in the same location. As a result, the environmental setting would be the same as for the proposed project.

C.7.6.2 ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

The Dry Cooling Alternative and use of the ACC system would not require any additional use of land or any additional ground disturbing activities. In regard to land use, the impacts of the Dry Cooling Alternative in comparison to the proposed project would primarily include increased noise and increased facility size and bulk. However, because the increased facility size and bulk would occur within the GSEP site, impacts to land use would be expected to be similar as with the proposed GSEP project.

Because the ACC system is approximately 98-120 feet in height, the ACC system would be more visible from the surrounding areas. The Palen/McCoy Wilderness and several areas of critical environmental concern (ACEC) are located within the vicinity of the proposed GSEP site. As such, the ACC system would be visible from the Palen/McCoy Wilderness and ACECs and would potentially be more visible than the proposed GSEP with use of the wet-cooled system. However, even without the ACC system, the GSEP and the 1,800 acre fields of solar troughs would be visible from the Palen/McCoy Wilderness. For a detailed discussion of this alternatives visual impacts, please see the **Visual Resources** section of this document.

Agricultural Lands and Rangeland Management

The Dry Cooling Alternative and use of the ACC system would not require any additional use of land or any additional ground disturbing activities. In regard to land use, the impacts of the Dry Cooling Alternative in comparison to the existing facility would primarily include increased noise and increased facility size and bulk. However, because the increased facility size and bulk would occur within the GSEP site, impacts to land use would be expected to be similar as with the proposed GSEP project. As discussed above in detail in Section C.6.4.2 (under the subsection entitled "Agricultural Lands and Rangeland Management"), no farmlands or rangelands used for livestock

grazing would be converted. In addition, construction activities associated with the proposed project and its linear facilities would be temporary, and the project would not involve other changes in the existing environment that could result in conversion of farmland to non-agricultural uses.

Finally, given that this alternative would be located wholly on BLM-administered land, state land preservation contracts (i.e., Williamson Act Contract), and county zoning for agricultural use would not be affected.

Therefore, the types of effects on agricultural lands and rangeland management resulting from this alternative would be the same as the proposed project.

Wilderness and Recreation

The conversion of 1,890 acres of land to support the components and activities associated with this alternative would be the same as described for the proposed project. Similar to the proposed project, the Dry Cooling Alternative would disrupt recreational activities such as backpacking, camping, rockclimbing, hunting, or other activities by the removal of 1,890 acres from recreational use. The remote location of the site and the BLM's existing OHV use restrictions limit the direct impacts to these recreation uses. Construction of the transmission line would traverse a single "open" route and result in disruptions to motorized vehicle use along this route. As the transmission line would be strung over the route, however, it would not permanently disrupt use of the route. Any impacts on the route by the linear ROW would be temporary and short-term.

This alternative would not be constructed on wilderness lands so it would not directly disrupt activities in a wilderness area. The operational impacts of the Dry Cooling Alternative would be greater than the proposed project as a result of the greater bulk and noise of the ACCs. For a detailed discussion of this alternative's noise and visual impacts, please see the **Noise** and **Visual Resources** sections of this document. This alternative would not substantially reduce the scenic, biological, or cultural value of a wilderness area or recreational facility (see the **Visual Resources**, **Biological Resources** and **Cultural Resources** sections of this document).

Horses and Burros

Similar to proposed project, this alternative would not contain or traverse any established BLM HAs or HMAs. Therefore, the Dry Cooling Alternative would not result in any interference with BLM's management of an HA or HMA.

Land Use Compatibility and LORS Compliance

Similar to the proposed project, this alternative would not physically divide or disrupt an established community.

Staff's analysis of the proposed project's consistency with applicable federal land use LORS is presented in **LAND USE Table 3.** These federal LORS would apply to this alternative. Similar to the proposed project, this alternative would be consistent with applicable federal land use LORS. With BLM's approval of a project-specific CDCA Plan Amendment, the proposed project would fully conform to the CDCA.

Cumulative Land Use Effects

This alternative would result in the conversion of 1,890 acres of undeveloped open space with an industrial utility use (i.e., two 125 MW power plants and associated infrastructure). The potential combined development of approximately one million acres of land in the southern California desert, would all combine to result in adverse effects on agricultural lands (one of the state's most important resources), and recreational resources. In general, the conversion of vast amounts of open space lands would preclude numerous existing land uses including recreational activities, rangeland, and open space, and therefore, result in a significant cumulative land use impact. Because this alternative would have no impact on agricultural resources or rangelands, it would have no potential to contribute to cumulative impacts in this respect. This alternative's potential to disrupt recreational activities would be limited and less than cumulatively considerable when considered in the context of past, present and reasonably foreseeable future projects. However, this alternative would combine with other past and reasonably foreseeable future projects to substantially reduce scenic values of wilderness areas and recreational resources in the Chuckwalla Valley and southern California desert region and therefore, would result in a significant and unavoidable cumulative land use impact in this regard.

C.7.6.3 CEQA LEVEL OF SIGNIFICANCE

Agricultural Lands and Rangeland Management

As discussed above in subsection C.6.5.2, and similar to the proposed project, impacts resulting from this alternative on agricultural and rangeland management would be less than significant.

Wilderness and Recreation

As discussed above in subsection C.6.5.2, and similar to the proposed project, impacts resulting from this alternative to wilderness and recreation would be less than significant.

Horses and Burros

As discussed above in subsection C.6.5.2, and similar to the proposed project, impacts resulting from this alternative on horses and burros would be less than significant.

Land Use Compatibility and LORS Compliance

As discussed above in subsection C.6.5.2, and similar to the proposed project, this alternative would comply with federal LORS. Therefore, impacts would be less than significant.

Cumulative Land Use Effects

As discussed above in subsection C.6.5.2, and similar to the proposed project, the cumulative land use impacts of this alternative when combined with other existing, planned, and reasonably foreseeable projects would be significant and unavoidable.

C.6.7 NO PROJECT/NO ACTION ALTERNATIVES

There are three No Project/No Action Alternatives evaluated in this section, as follows:

NO PROJECT/NO ACTION ALTERNATIVE #1

No Action on Genesis Solar Energy Project application and on CDCA land use plan amendment

Under this alternative, the proposed Genesis Solar Energy Project would not be approved by the CEC and BLM, and BLM would not amend the CDCA Plan. As a result, no solar energy project would be constructed on the project site and BLM would continue to manage the site consistent with the existing land uses described and approved in the CDCA Plan of 1980, as amended.

Because there would be no amendment to the CDCA Plan and no solar project approved for the site under this alternative, it is expected that the site would continue to remain in its existing condition, with no new structures or facilities constructed or operated on the site and no land disturbance. As a result, the land use-related impacts of the Genesis Solar Energy Project would not occur at the proposed site. The conversion of 1,890 acres of land resulting from construction of the proposed project would not occur. In addition, recreationists would continue to be able to use the lands affected by the proposed project occurring under existing conditions. Although it is possible that the proposed project site could be developed with power generation and/or utility uses in the future given the existing and planned energy-related infrastructure and industrial uses in the area (i.e., Palen Power Solar Project, Blythe Solar Power Project, Mule Mountain Solar Project, McCoy Soleil Project, etc.), the specific size, type, and timing of such use would be unknown. In addition, in the absence of this project, other renewable energy projects may be constructed to meet State and Federal mandates, and those projects would have similar impacts in other locations.

NO PROJECT/NO ACTION ALTERNATIVE #2

No Action on Genesis Solar Energy Project and amend the CDCA land use plan to make the area available for future solar development

Under this alternative, the proposed Genesis Solar Energy Project would not be approved by the CEC and BLM, and BLM would amend the CDCA Plan of 1980, as amended, to allow for other solar projects on the site. As a result, it is possible that another solar energy project could be constructed on the project site.

Because the CDCA Plan would be amended, it is possible that the site would be developed with the same or a different solar technology. Different solar technologies require the use of different amounts of land; however, it is expected that all utility solar technologies would require the use of large amount of the site. As a result, construction and operation of the solar technology would likely result in the conversion of 1,890 acres of land and would create impacts to existing uses of the land, including recreational users. As such, this No Project/No Action Alternative could result in the conversion of 1,890 acres of land similar to the proposed project.

NO PROJECT/NO ACTION ALTERNATIVE #3

No Action on Genesis Solar Energy Project application and amend the CDCA land use plan to make the area unavailable for future solar development

Under this alternative, the proposed Genesis Solar Energy Project would not be approved by the CEC and BLM, and the BLM would amend the CDCA Plan to make the proposed site unavailable for future solar development. As a result, no solar energy project would be constructed on the project site and BLM would continue to manage the site consistent with the existing land use described and approved in the CDCA Plan of 1980, as amended.

Because the CDCA Plan would be amended to make the area unavailable for future solar development, it is expected that the site would continue to remain in its existing condition, and the conversion of 1,890 acres of land as a result of the proposed project would not occur. Recreationists would continue to be able to use the lands affected by the proposed project as is occurring under existing conditions. As a result, the use of the site is not expected to change noticeably from existing conditions and, as such, this No Project/No Action Alternative would not result in impacts from the conversion of 1,890 acres of land at the project site. However, in the absence of this project, other renewable energy projects may be constructed to meet State and Federal mandates, and those projects would have similar impacts in other locations.

C.6.8 CUMULATIVE IMPACT ANALYSIS

Section B.3, Cumulative Scenario, provides detailed information on the potential cumulative solar and other development projects in the project area. Together, these projects comprise the cumulative scenario which forms the basis of the cumulative impact analysis for the proposed project. In summary, these projects are:

- Renewable energy projects on BLM, State, and private lands, as shown on **Cumulative Figure 1** and in **Cumulative Tables 1A and 1B.** Although not all of those projects are expected to complete the environmental review processes, or be funded and constructed, the list is indicative of the large number of renewable projects currently proposed in California.
- Foreseeable future projects in the immediate area, as shown on **Cumulative Impacts Figure 2, I-10 Corridor Existing and Future/Foreseeable Projects, and Cumulative Tables 2 and 3**. Table 2 presents existing projects in this area and Table 3 presents future foreseeable projects in the I-10 Corridor Area. Both tables indicate project name and project type, its location and its status.

These projects are defined within a geographic area that has been identified by the Energy Commission and BLM as covering an area large enough to provide a reasonable basis for evaluating cumulative impacts for all resource elements or environmental parameters. Most of these projects have, are, or will be required to undergo their own independent environmental review under CEQA and/or NEPA. Even if the cumulative projects described in Section B.3 have not yet completed the required environmental processes, they were considered in the cumulative impacts analyses in this SA/Draft EIS.

Geographic Extent

The geographic scope for the analysis of cumulative impacts on land use encompasses Riverside County. As agricultural land statistics and characteristics are typically collected at the county level, cumulative impacts to agricultural land and rangeland management should be evaluated within the context of Riverside County and rangeland administered by BLM throughout the Riverside County region. Recreational opportunities primarily include OHV use and dispersed camping throughout the county. Likewise, wilderness areas and ACECs are located throughout Riverside County. While no HAs and HMAs would be affected by the proposed project, the geographic scope for the analysis of cumulative impacts related to horses and burros includes the Riverside County region to encompass other HAs and HMAs. Projects related to cumulative land use impacts consist of all construction activities and residential and industrial developments within the region. The geographic scope for the analysis of cumulative impacts related to land use compatibility and LORS compliance are the local and regional communities and sensitive receptors. For the purpose of this analysis, in addition to the projects listed in **Cumulative Tables 2 and 3,** data obtained from the NRCS, the U.S. Census, and the BLM's online GIS maps were considered when identifying activities that could contribute to cumulative land use impacts.

Effects of Past and Present Projects

A wide variety of past and present development projects contribute to the cumulative conditions for land use. As noted above in the "Setting and Existing Conditions" subsection for agricultural lands, the majority of the county's agricultural land is surrounded by the county's largest urban areas. According to the DOC, from 2006 to 2008, approximately 3 percent of Riverside County agricultural land was converted to non-agricultural uses (DOC 2008). This is an example of the decline in agricultural acreage throughout this portion of Riverside County. As a result, past and present residential, commercial, and industrial development has contributed to the conversion of existing rural and open space land uses, including agriculture, to other land uses. In regards to rangeland, three livestock grazing allotments are located within Riverside County. The BLM allotment closest to the project site is the Keough allotment north of the proposed project. Past and present projects contribute to the cumulative baseline conditions for rangeland management, including industrial and military developments.

Existing recreation and wilderness areas throughout the county are abundant and maintained by the BLM and California State Parks. However, past and present developments, in particular BLM ACECs, occupy significant portions of areas that could be used for recreation activities. The Chocolate-Mule Mountains HMA is the closest herd management area, which is located approximately 2 miles southeast of the project site near the California-Arizona border. This area is not notable for significant past or present development. Past and present projects occurring in the vicinity of the proposed project site include recreational activities proposed by the BLM, energy development in and around Blythe, and development of the existing state prisons south of I-10.

Effects of Reasonably Foreseeable Future Projects

As shown in **Cumulative Tables 1a, 1b, 2 and 3** renewable energy projects are proposed throughout the California desert lands. According to **Cumulative Tables 1a**

and **1b**, a total of 72 projects and 649,440 acres of solar energy and 61 projects and 433,721 acres of wind energy are currently proposed for development in the California desert lands. This represents a worst-case scenario and not all of these projects would be ultimately developed. As shown in **Cumulative Figures 1 and 2,** one other energy application is proposed in areas surrounding the Chocolate-Mule Mountains HMA.

Contribution of the Genesis Solar Energy Project to Cumulative Impacts

Construction. The construction of the Genesis Solar Energy Project is expected to result in short term adverse impacts related to construction activities. It is expected that some of the cumulative projects described above which are not yet built may be under construction the same time as the Genesis Solar Energy Project. As a result, there may be substantial short term impacts during construction of those cumulative projects related to land use. These short-term impacts would include dust, noise, and traffic. Because the project would not be constructed on wilderness lands the short-term construction impacts would not directly disrupt activities in a federal wilderness area, including, as described above, the Palen/McCoy Wilderness north of the project site, the 3,632-acre Palen Dry Lake ACEC southwest of the project site, and the 2,273-acre Chuckwalla Valley Dune Thicket ACEC approximately two miles southeast of the Project site.

Condition of Certification **TRANS- 1** requires applicants of the Palen, Blythe, and Genesis projects to coordinate construction schedules to ensure that during overlapping construction periods, parking for all workers would be provided at a location that will minimize traffic on I-10 and transport workers to their respective job sites to ensure that I-10, including all intersections, operate at an acceptable LOS.

Operation. The operation of the Genesis Solar Energy Project is expected to result in long term adverse impacts during operation of the project related to land use. It is expected that some of the cumulative projects described above may be operational at the same time as the Genesis Solar Energy Project. As a result, there may be substantial long term impacts during operation of those cumulative projects related to land use.

The proposed project would not convert any agricultural land to a nonagricultural use. The cumulative impacts of additional development projects that would convert the county's agricultural land to non-agricultural uses and conflict with agricultural operations, could be cumulatively considerable over time. However, all development projects must go through environmental review and be in compliance with all applicable LORS. Because the proposed project would not convert any agricultural land or rangeland to nonagricultural uses, the GSEP's contribution to cumulative impacts to agricultural resources and rangelands would be less than significant under CEQA.

The proposed project would permanently change the nature of land use at the proposed project site from Government Special Public Limited Use to an intensive utility for the generation of power. Although the proposed project's effects on recreation and wilderness areas would be less than significant, the combined effect of the overall cumulative past, present, and proposed and reasonably foreseeable projects in eastern

Riverside County could adversely affect recreation and wilderness resources. The GSEP's potential to disrupt recreational activities would be limited and less than cumulatively considerable when considered in the context of past, present and reasonably foreseeable future projects. However, the GSEP would combine with other past and reasonably foreseeable future projects to substantially reduce scenic values of wilderness areas and recreational resources in the Chuckwalla Valley and southern California desert region and therefore, would result in a significant and unavoidable cumulative land use impact in this regard.

Although the proposed GSEP facility would not adversely impact horses or burros, there are other present or reasonably foreseeable future actions that could contribute to impacts to HAs and HMAs within the region. Authorized and unauthorized vehicle use, and maintenance and construction of utility rights-of-way can have a slight impact to burros by removal of vegetation utilized for forage and the danger of vehicles colliding with burros. The impact of the proposed and probable development projects would cumulatively remove and isolate potential grazing sites for burros. However, in areas of close proximity to HAs and HMAs, development projects would be required to consider impacts related to wild horses and burros. Therefore, the GSEP would not contribute to a cumulative significant adverse impact to this resource.

Proposed developments near the project site that would have the potential to induce cumulative impacts include five transmission line projects, thirteen solar energy generation projects, and numerous residential developments. In consideration of cumulative land use compatibility impacts, the implementation of renewable projects in Southern California would occur mostly in undeveloped desert lands or areas of rural development and would not create physical divisions of established residential communities.

Decommissioning. The decommissioning of the Genesis Solar Energy Project is expected to result in adverse impacts related to land use similar to construction impacts. It is unlikely that the construction or decommissioning of any of the cumulative projects would occur concurrently with the decommissioning of this project, because the decommissioning is not expected to occur for approximately 30 years. As a result, there may not be impacts related to land use during decommissioning of the Genesis Solar Energy Project generated by the cumulative projects. However, due to the temporary nature of decommissioning activities and the eventual return of the lands to their current state, the impacts of the decommissioning of the Genesis Solar Energy Project would not be expected to contribute to cumulative impacts related to wilderness and recreation resources. Therefore, the effects of decommissioning on land use are not expected to be adverse.

C.6.9 COMPLIANCE WITH LORS

A detailed discussion of the proposed project's compliance with LORS applicable to land use, recreation, and wilderness is provided above in subsection C.6.4.2, and **LAND USE Table 3** (Project Compliance with Adopted Land Use LORS).

C.6.10 NOTEWORTHY PUBLIC BENEFITS

The proposed project would, for the life of the project, change the nature of land use from BLM-administered open space land, to an intensive utility for the generation of power. Therefore, from a land use perspective, development of the proposed project would not result in any noteworthy public benefits because:

- the Genesis Solar Energy Project site would result in approximately 1,890 acres of total permanent surface disturbance, converting the land from BLM-administered public land to solar energy capture and energy conversion apparatus, attendant outbuildings, supporting structures, roadways, and parking lots; and
- there would be a loss of recreational use at the project site that is used for dispersed camping and associated OHV use.

Therefore, although the development of the proposed project is intended to address the requirements of federal and State mandates for renewable energy, the land conversion and associated land use impacts would not yield any noteworthy public benefits related to land use, recreation, or wilderness.

C.6.11 PROPOSED CONDITIONS OF CERTIFICATION/MITIGATION MEASURES

No Conditions of Certification are proposed for this project.

C.6.12 CONCLUSIONS

- No farmland conversion impacts are expected as a result of linear facilities' construction, and the proposed project would not involve other changes in the existing environment which could result in conversion of farmland, to non-agricultural uses.
- No conversion of rangelands would occur, nor would they be adversely affected by construction or operation of the proposed project.
- The conversion of 1,890 acres of land to support the components and activities associated with the project would disrupt current recreational activities, although due to the remote nature of the site along with the BLM's existing restrictions on recreational activities in the area, direct impacts to recreation use of the project site would be less than significant. Construction of the transmission line would traverse a single "open" route and result in disruptions to motorized vehicle use along this route. As the transmission line would be strung over the route, however, it would not permanently disrupt use of the route.
- The Palen/McCoy Wilderness north of the project site, the Palen Dry Lake ACEC, and the Chuckwalla Valley Dune Thicket ACEC attract visitors based on their scenic, biological, cultural, and recreational amenities. The proposed project would not substantially reduce the scenic, biological or cultural value of a wilderness area.
- The proposed project would not contain or traverse any established BLM HAs or HMAs, and the Chocolate-Mule Mountains HMA and HA are approximately 2 miles

southeast of the proposed project site. In addition, following construction, fencing around the site would keep any burros outside of the proposed project location. Therefore, the proposed project would not result in any interference with BLM's management of an HMA or HA.

- The proposed project would not disrupt or divide the physical arrangement of an established community.
- The applicant has submitted an application to the BLM requesting a ROW to construct the proposed project and its related facilities. Pursuant to the CDCA Plan (1980, as amended), sites associated with power generation or transmission not identified in the CDCA Plan are considered through the Plan Amendment process. Under Federal law, BLM is responsible for processing requests for ROWs to authorize such proposed projects and associated transmission lines and other appurtenant facilities on land it manages. If the ROW and proposed land use plan amendment are approved by BLM, the proposed solar thermal power plant facility on public lands would be authorized in accordance with Title V of the FLMPA of 1976 and the Federal Regulations at 43 CFR part 2800.
- As the proposed project would be located wholly on BLM administered land, no state, regional, or local land use LORS would be applicable to the project. Based on staff's independent review of applicable federal LORS documents, the proposed project would be consistent with applicable land use LORS.
- For purposes of CEQA compliance, the level of significance of each impact of the proposed project on land use resources has been determined and is discussed in detail in Section C.6.4.3 (CEQA Level of Significance). In summary, impacts on agricultural lands and rangelands would be less than significant, and there would be no impacts related to Williamson Act contracts. Impacts to recreation and wilderness resources would be less than significant. Impacts to horses and burros would be less than significant. As proposed, the project would be in compliance with all LORS.
- The land use impacts associated with the Reduced Acreage Alternative would be similar to the proposed project, but less intense given that 50 percent less land would be affected.
- The land use impacts associated with the Dry Cooling Alternative would be similar to the proposed project, but more intense given the bulk and noise of the ACCs.
- The implementation of renewable projects in Southern California would occur mostly in undeveloped desert lands or areas of rural development, and therefore, would not create physical divisions of established residential communities. Nonetheless, approximately one million acres of land are proposed for solar and wind energy development in the Southern California desert lands. In general, the land conversion impacts to these lands would preclude numerous existing land uses including recreational activities, rangeland management, and open space. Because the GSEP would have no impacts on agricultural resources or rangelands, it would have no potential to contribute to cumulative impacts in this respect. The GSEP's potential to disrupt recreational activities would be limited and less than cumulatively considerable when considered in the context of past, present and reasonably foreseeable future projects. However, the GSEP would combine with other past and reasonably foreseeable future projects to substantially reduce scenic values of

wilderness areas and recreational resources in the Chuckwalla Valley and southern California desert region and therefore, would result in a significant and unavoidable cumulative land use impact in this regard.

C.6.13 REFERENCES

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C.7 - NOISE AND VIBRATION

Testimony of Erin Bright

C.7.1 SUMMARY OF CONCLUSIONS

California Energy Commission staff concludes that the Genesis Solar Energy Project can be built and operated in compliance with all applicable noise and vibration laws, ordinances, regulations, and standards and, if built in accordance with the conditions of certification proposed below, would produce no significant adverse noise impacts on people within the affected area, either direct, indirect, or cumulative.

C.7.2 INTRODUCTION

The construction and operation of any power plant creates noise, or unwanted sound. The character and loudness of this noise, the times of day or night that it is produced, and the proximity of the facility to sensitive receptors combine to determine whether the facility would meet applicable noise control laws and ordinances and whether it would cause significant adverse environmental impacts under CEQA. In some cases, vibration may be produced as a result of power plant construction practices, such as blasting or pile driving. The groundborne energy of vibration has the potential to cause structural damage and annoyance.

The purpose of this analysis is to identify and examine the likely noise and vibration impacts from the construction and operation of the Genesis Solar Energy Project (Genesis) and to recommend procedures to ensure that the resulting noise and vibration impacts would be adequately mitigated to comply with applicable laws, ordinances, regulations, and standards (LORS) and to avoid creation of significant adverse noise or vibration impacts. For an explanation of technical terms and acronyms employed in this section, please refer to **Noise Appendix A** immediately following.

C.7.3 METHODOLOGY AND THRESHOLDS FOR DETERMINING ENVIRONMENTAL CONSEQUENCES

California Environmental Quality Act

The California Environmental Quality Act (CEQA) requires that significant environmental impacts be identified and that such impacts be eliminated or mitigated to the extent feasible. Section XI of Appendix G of CEQA Guidelines (*See* Cal. Code Regs., tit. 14, Section 15063) sets forth some characteristics that may signify a potentially significant impact. Specifically, a significant effect from noise may exist if a project would result in:

1. exposure of persons to, or generation of, noise levels in excess of standards established in the local General Plan or noise ordinance or applicable standards of other agencies;

2. exposure of persons to or generation of excessive ground-borne vibration or ground-borne noise levels;

3. substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project; or

4. substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project.

The Energy Commission staff, in applying item 3 above to the analysis of this and other projects, has concluded that a potential for a significant noise impact exists where the noise of the project plus the background exceeds the background by 5 dBA or more at the nearest sensitive receptor. A change in level of at least 5 dB is required before any noticeable change in community response would be expected.

Staff considers it reasonable to assume that an increase in background noise levels up to 5 dBA in a residential setting is insignificant; an increase of more than 10 dBA is considered significant. An increase between 5 and 10 dBA should be considered adverse, but may be either significant or insignificant, depending on the particular circumstances of the case.

Factors to be considered in determining the significance of an adverse impact (as defined above) include:

1. the resulting combined noise level;[1]

2. the duration and frequency of the noise;

3. the number of people affected;

4. the land use designation of the affected receptor sites; and

5. public concern or controversy expressed at workshops or hearings or in correspondence.

Noise impacts due to construction activities are usually considered to be insignificant if:

- the construction activity is temporary;
- use of heavy equipment and noisy activities are limited to daytime hours; and
- all industry-standard noise abatement measures are implemented for noise-producing equipment.

Staff uses the above method and threshold to protect the most sensitive populations, including the minority population.

[1] For example, a noise level of 40 dBA would be considered quiet in many locations. A noise limit of 40 dBA would be consistent with the recommendations of the California Model Community Noise Control Ordinance for rural environments and with industrial noise regulations adopted by European jurisdictions. If the project would create an increase in ambient noise no greater than 10 dBA at nearby sensitive receptors, and the resulting noise level would be 40 dBA or less, the project noise level would likely be insignificant.

Laws, Ordinances, Regulations, and Standards

Noise Table 1
Laws, Ordinances, Regulations, and Standards

Applicable Law	Description
Federal (OSHA): 29 U.S.C. § 651 et seq.	Protects workers from the effects of occupational noise exposure.
State (Cal/OSHA): Cal. Code Regs., tit. 8, §§ 5095–5099	Protects workers from the effects of occupational noise exposure.
Local Riverside County General Plan - Noise Element	Establishes acceptable noise levels.
Riverside County Noise Ordinance	Limits hours of noisy construction.

FEDERAL

Under the Occupational Safety and Health Act of 1970 (29 USC § 651 et seq.), the Department of Labor, Occupational Safety and Health Administration (OSHA) has adopted regulations designed to protect workers against the effects of occupational noise exposure (29 CFR § 1910.95). These regulations list permissible noise exposure levels as a function of the amount of time during which the worker is exposed (see **NOISE Appendix A, Table A4** immediately following this section). The regulations further specify a hearing conservation program that involves monitoring the noise to which workers are exposed, assuring that workers are made aware of overexposure to noise, and periodically testing the workers' hearing to detect any degradation.

There are no federal laws governing off-site (community) noise.

The only guidance available for evaluation of power plant vibration is guidelines published by the Federal Transit Administration (FTA) for assessing the impacts of groundborne vibration associated with construction of rail projects. These guidelines have been applied by other jurisdictions to assess groundborne vibration of other types of projects. The FTA-recommended vibration standards are expressed in terms of the "vibration level," which is calculated from the peak particle velocity measured from groundborne vibration. The FTA measure of the threshold of perception is 65 VdB,[2] which correlates to a peak particle velocity of about 0.002 inches per second (in/sec). The FTA measure of the threshold of architectural damage for conventional sensitive structures is 100 VdB, which correlates to a peak particle velocity of about 0.2 in/sec.

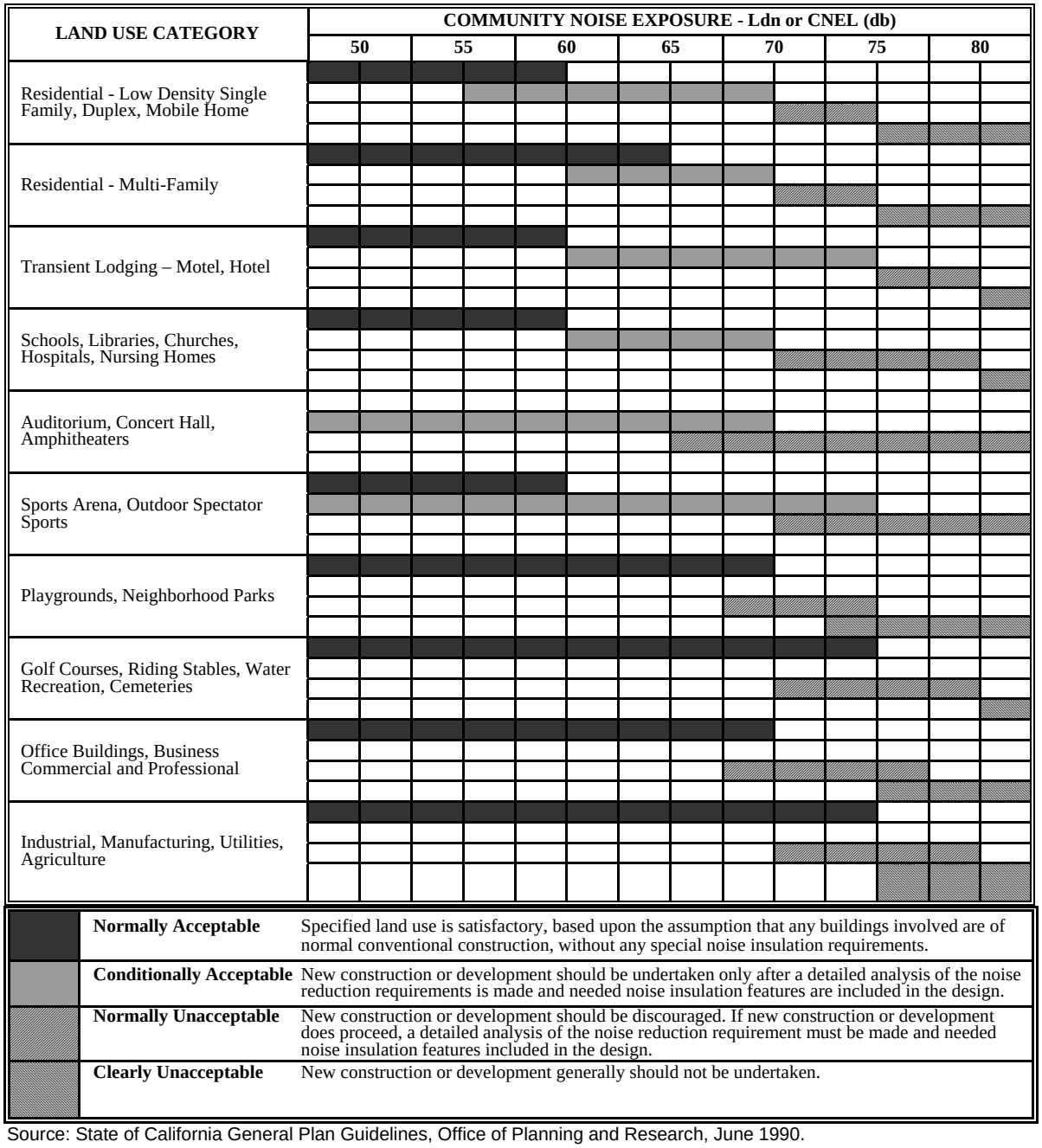
STATE

California Government Code section 65302(f) encourages each local governmental entity to perform noise studies and implement a noise element as part of its General Plan. In addition, the California Office of Planning and Research has published

[2] VdB is the common measure of vibration energy.

guidelines for preparing noise elements, which include recommendations for evaluating the compatibility of various land uses as a function of community noise exposure. The State land use compatibility guidelines are listed in **Noise: Table 2**.

Noise Table 2
Land Use Compatibility for Community Noise Environment



Source: State of California General Plan Guidelines, Office of Planning and Research, June 1990.

The California Occupational Safety and Health Administration (Cal/OSHA) has promulgated Occupational Noise Exposure Regulations (Cal. Code Regs., tit. 8, §§ 5095–5099) that set employee noise exposure limits. These standards are equivalent to the federal OSHA standards (see the **Worker Safety and Fire Protection** section of this document, and **NOISE Appendix A, Table A4**).

LOCAL

Riverside County General Plan Noise Element

The Noise Element of the Riverside County General Plan contains standards, policies and procedures that are intended to minimize noise impacts to the community (Riverside 2008). The noise level standards for new projects, including non-transportation noise sources, employ the Community Noise Equivalent Level (CNEL) or Day-Night Level (L_{dn}), and are similar to those shown by **Noise Table 2**. Specifically, the County Noise Element standards for residential land uses are: Normally Acceptable: CNEL or L_{dn} up to 60 dB; Conditionally Acceptable: up to 70 dB CNEL or Ldn.

Riverside County Code

Riverside County has adopted restrictions affecting construction noise sources in Ordinance 847 of the Riverside County Code. Construction within one-quarter mile of an occupied residence is prohibited between the hours of 6 p.m. and 6 a.m., except as allowed with the written consent of the building official (Riverside 2007).

C.7.4 ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

The analysis of proposed project effects must comply with both CEQA and NEPA requirements given the respective power plant licensing and land jurisdictions of the California Energy Commission and U.S. Bureau of Land Management (BLM). Because this document is intended to meet the requirements of both NEPA and CEQA, the methodology used for determining environmental impacts of the proposed project includes a consideration of guidance provided by both laws.

As noted above, CEQA identifies criteria that may be used to determine the significance of identified impacts. A significant impact is defined by CEQA as “a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project” (Cal. Code Reg., tit. 14 (hereinafter State CEQA Guidelines) Section 15382).

In comparison, NEPA states that “‘Significantly’ as used in NEPA requires considerations of both context and intensity…” (40 CFR 1508.27). Therefore, thresholds serve as a benchmark for determining if a project action will result in a significant adverse environmental impact when evaluated against the baseline. NEPA requires that an Environmental Impact Statement (EIS) is prepared when the proposed federal action (project) as a whole has the potential to “significantly affect the quality of the human environment.”

Criteria for determining significance in this section are based on Appendix G of the CEQA Guidelines (CCR 2006) and performance standards or thresholds identified by the Energy Commission staff. In addition, staff’s evaluation of the environmental effects of the proposed project on land uses (i.e., those listed below) includes an assessment of the context and intensity of the impacts, as defined in the NEPA implementing regulations 40 CFR Part 1508.27.

Effects of the proposed project on noise and vibration (and in compliance with both CEQA and NEPA) have been determined using the thresholds listed below.

C.7.5 PROPOSED PROJECT

C.7.5.1 SETTING AND EXISTING CONDITIONS

The proposed Genesis Solar Energy Project would be constructed on a 1,800 acre site located approximately 25 miles west of the town of Blythe in Riverside County. The site is primarily on undisturbed federal land managed by the BLM (GSEP 2009a, AFC §§ 3.2, 5.9.1).

The ambient noise regime in the project vicinity consists of aircraft traffic, highway traffic, wind and wildlife. There are no noise sensitive receptors within 9 miles of the project site, however, two state prisons are located approximately 9 miles southeast of the project site (GSEP 2009a, AFC §§ 1.0, 5.9.1, 5.9.4.1).

Ambient Noise Monitoring

There are no noise sensitive receptors located within nine miles of the project site. The Energy Commission's siting regulations only require ambient noise measurements when it is likely that operational or construction noise from a project will increase the ambient noise levels at nearby noise sensitive receptors by 5 dBA or more. Given that there are no noise sensitive receptors located within nine miles of the project site, and that the ambient noise regime in the surrounding area includes highway traffic and aircraft traffic, it is extremely unlikely that the ambient noise at the nearest noise sensitive receptor (more than nine miles away from the project site) would be low enough that attenuated project noise would cause a 5 dBA increase in the ambient noise level. Thus, staff agrees with the applicant that ambient noise monitoring is not required.

C.7.5.2 ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

DIRECT IMPACTS AND MITIGATION

Noise impacts associated with the project can be created by short-term construction activities and by normal long-term operation of the power plant.

Construction Impacts and Mitigation

Construction of Genesis is expected to occur over a period of 37 months (GSEP 2009a, AFC § 3.7.1). Each unit of the project is expected to require approximately 25 months to be constructed, with the construction of each unit overlapping by 12 months.

Compliance with LORS

Construction of an industrial facility such as a power plant is typically noisier than permissible under usual noise ordinances. In order to allow the construction of new facilities, construction noise during certain hours of the day is commonly exempt from enforcement by local ordinances.

The Applicant has predicted that there will be no noise impacts due to project construction on the nearest sensitive receptors (GSEP 2009a, AFC §§ 5.9.4.1, 5.9.5.1, Table 5.9-5). Assuming an average construction noise of 93 dBA L_{eq} at 50 feet from the noise center (the upper range of noise levels for construction equipment), project construction noise would attenuate to 39 dBA at a distance of five miles from the acoustic center. Project construction noise would further attenuate to 34 dBA at the state prisons, 9 miles away.

There are no LORS that limit construction noise levels for the project. The Riverside County Code prohibits noisy construction work to daytime hours when a project is within one-quarter mile of a noise sensitive receptor. Given the distance between the proposed project site and the nearest noise sensitive receptor, this limitation does not apply. No limit on construction hours needs to be enforced for the Genesis project.

CEQA Impacts

Power Plant Site

To evaluate construction noise impacts, staff compares the projected noise levels to the ambient levels. Since construction noise typically varies continually with time, it is most appropriately measured by, and compared to, the L_{eq} (energy average) metric.

Ambient noise levels were not measured because there are no noise sensitive receptors within 9 miles of the project site. Aggregate construction noise would attenuate to less than 35 dBA at a distance of nine miles from the project site, which is generally considered to be very quiet. Given the lack of receptors in the vicinity of the project site, staff considers the noise impacts due to construction activity to be insignificant.

In the event that actual construction noise should annoy nearby residents, staff proposes Conditions of Certification **NOISE-1** and **NOISE-2**, which would establish a public notification process to notify nearby residents of the project construction and operation, and a Noise Complaint Process that would require the applicant to resolve any complaints regarding project noise.

Linear Facilities

Linear facilities include a new six-mile natural gas pipeline connecting to an existing Southern California Edison pipeline located north of highway I-10, as well as new electrical transmission lines interconnecting to the transmission system to the southeast of the project site. Both the natural gas pipeline and the transmission lines would extend past the project site boundaries; neither would pass close to noise sensitive receptors (GSEP 2009a, AFC Figure 5.12-1).

Steam Blows

Typically, the loudest noise encountered during construction, inherent in building any project incorporating a steam turbine, is created by the steam blows. After erection and assembly of the feedwater and steam systems, the piping and tubing that comprises the steam path has accumulated dirt, rust, scale and construction debris such as weld

spatter, dropped welding rods and the like. If the plant were started up without thoroughly cleaning out these systems, all this debris would find its way into the steam turbine, quickly destroying the machine.

In order to prevent this, before the steam system is connected to the turbine, the steam line is temporarily routed to the atmosphere. High pressure steam is then raised in a heat recovery steam generator (HRSG) or a boiler and allowed to escape to the atmosphere through the steam piping. This flushing action, referred to as a steam blow, is quite effective at cleaning out the steam system. A series of short steam blows, lasting two or three minutes each, is performed several times daily over a period of two or three weeks. At the end of this procedure, the steam line is connected to the steam turbine, which is then ready for operation.

These steam blows can produce noise as loud as 130 dBA at a distance of 100 feet. This would attenuate to about 82 dBA at a distance of five miles from the project site, and 77 dBA at the prisons nine miles from the project site. While this is an annoying noise level, even at these great distances from the project site, there are no noise sensitive receptors within these distances and the noise would attenuate further with greater distances. Staff concludes that steam blows would likely not cause a significant impact.

Pile Driving

The applicant does not explicitly state that pile driving would be necessary for construction of Genesis. However, staff has analyzed the potential noise impacts of pile driving in case it is found necessary during the construction process. If pile driving is required for construction of the project, the noise from this operation could be expected to reach 101 dBA at a distance of 50 feet (GSEP 2009a, AFC Table 5.9-5). Pile driving noise would thus be projected to reach levels of 47 dBA at distance of five miles from the project site, and 42 dBA at the prisons nine miles from the project site. Impacts due to pile driving, if it should occur, would not be significant.

Vibration

The only construction operation likely to produce vibration that could be perceived off site would be pile driving, should it be employed. Vibration attenuates rapidly; it is likely that no vibration would be perceptible at any appreciable distance from the project site. Staff therefore believes there would be no significant impacts from construction vibration.

Worker Effects

The applicant has acknowledged the need to protect construction workers from noise hazards and has recognized those applicable LORS that would protect construction workers (GSEP 2009a, AFC § 5.9.5.4). To ensure that construction workers are, in fact, adequately protected, staff has proposed Condition of Certification **NOISE-3**, below.

Operation Impacts and Mitigation

The primary noise sources of Genesis include the steam turbine generators, cooling tower, start-up boiler, and various pumps and fans (GSEP 2009a, AFC §§ 3.5.1,

5.9.5.2; Table 5.9-7). Staff compares the projected noise with applicable LORS. In addition, staff evaluates any increase in noise levels at sensitive receptors due to the project in order to identify any significant adverse impacts.

Common noise mitigating factors included in parabolic trough solar thermal generating facilities include:

- metal acoustical steam turbine enclosure; and
- 25-foot high solar mirror arrays surrounding the power block.

Compliance with LORS

The applicant did not perform full noise modeling for project operation because there were no noise sensitive receptors in the vicinity of the project that would be impacted by operating noise (GSEP 2009a, AFC §§ 5.9.4.1, 5.9.5.2; Figure 3.2-1).

The applicant estimates that project operational noise levels would be less than 30 dBA at a distance of five miles; staff considers this a reasonable estimation. Project operating noise would thus comply with the standard set by the Riverside County General Plan (60 dBA CNEL at the nearest receptor).

CEQA Impacts

Power plant noise is unique. Essentially, a power plant operates as a steady, continuous, broadband noise source, unlike the intermittent sounds that comprise the majority of the noise environment. As such, power plant noise contributes to, and becomes part of, the background noise level, or the sound heard when most intermittent noises cease. Where power plant noise is audible, it will tend to define the background noise level. For this reason, staff compares the projected power plant noise to the existing ambient background (L_{90}) noise levels at the affected sensitive receptors. If this comparison identifies a significant adverse impact, then feasible mitigation must be incorporated in the project to reduce or remove the impact.

In many cases, a power plant will be intended to operate around the clock for much of the year. As a solar thermal generating facility, Genesis would operate only during the daytime hours, typically 15 hours per day during the summer (with fewer hours during the fall, winter, and spring), when sufficient solar insulation is available. Typically, daytime ambient noise consists of both intermittent and constant noises. The noise that stands out during this time is best represented by the average noise level, or L_{eq}. Thus, staff normally compares a project's daytime noise levels to the daytime ambient L_{eq} levels at the project's noise-sensitive receptors.

As noted above, there are no sensitive receptors within nine-miles of the project site. The applicant has predicted that project operational noise levels would attenuate to less than 30 dBA at a distance of five miles from the project site, which would attenuate further at greater distances. At the state prisons located nine miles from the project site, project operating noise would attenuate to less than 25 dBA, which is a very quite level for daytime ambient even in rural areas. Given the distance, and thus the amount of noise attenuation, project noise levels would not be expected to be higher than ambient

values at the prison or any noise sensitive receptors further away. No change in ambient noise would be expected to result from plant operation.

Tonal Noises

One possible source of disturbance would be strong tonal noises. Tonal noises are individual sounds (such as pure tones) that, while not louder than permissible levels, stand out in sound quality. The applicant plans to avoid the creation of annoying tonal (pure-tone) noises by balancing the noise emissions of various power plant features during plant design. Given the lack of noise sensitive receptors within the vicinity of the project, tonal noises would not be expected to cause annoyance.

Linear Facilities

The electrical interconnection line would not pass by any noise sensitive receptors and would thus not be expected to have any effects. Additionally, noise effects from electrical interconnection lines typically do not extend beyond the right-of-way easement of the line and thus are generally inaudible to any nearby receptors.

Vibration

Vibration from an operating power plant could be transmitted by two chief means; through the ground (groundborne vibration) and through the air (airborne vibration).

The operating components of the Beacon project consist of a high-speed steam turbine generator and various pumps and fans. All of these pieces of equipment must be carefully balanced in order to operate; permanent vibration sensors are attached to the turbines and generators. Based on experience with numerous previous projects employing similar equipment, Energy Commission staff believes that ground borne vibration from Genesis would be undetectable at distances greater than a few hundred feet from the power block. Given that there are no receptors within nine miles of the project, vibration would not have an impact on any receptors.

Airborne vibration (low frequency noise) can rattle windows and objects on shelves and can rattle the walls of lightweight structures. None of the project equipment is likely to produce low frequency noise; this makes it highly unlikely that Genesis would cause perceptible airborne vibration effects.

Worker Effects

The applicant has acknowledged the need to protect plant operating and maintenance workers from noise hazards and has committed to comply with applicable LORS (GSEP 2009a, AFC § 5.9.5.4). To ensure that plant operation and maintenance workers are, in fact, adequately protected, Energy Commission staff has proposed Condition of Certification **NOISE-4**, below.

FACILITY CLOSURE

In the future, upon closure of Genesis, all operational noise from the project would cease, and no further adverse noise impacts from operation of Genesis would be possible. The remaining potential temporary noise source is the dismantling of the structures and equipment and any site restoration work that may be performed. Since

the noise would be similar to that caused by the original construction, it would likely cause no noise impacts given the remote location of the project. Any noise LORS that are in existence at that time would apply. Applicable conditions of certification included in the Energy Commission decision would also apply unless modified by the Energy Commission.

C.7.5.3 CEQA LEVEL OF SIGNIFICANCE

For the purposes of CEQA compliance, the significance of construction and operating noise impacts of the proposed project at the nearest sensitive receptors has been determined.

Construction Impacts

As discussed in detail in section C.7.4.2 above (under the subsection entitled "Construction Impacts and Mitigation"), there are no noise sensitive receptors within nine miles of the project that would be impacted by construction noise; the impacts due to construction noise are considered insignificant.

Operation Impacts

As discussed in detail in section C.7.4.2 above (under the subsection entitled "Operation Impacts and Mitigation"), power plant noise levels are predicted to be less than 30 dBA L_{eq} at a distance of five miles from the project site during daytime operation, which would not likely result in an increase over ambient noise. No change in ambient noise at any sensitive receptor at night would result from plant operation. Thus, operation noise impacts of the project would be insignificant.

C.7.6 REDUCED ACREAGE ALTERNATIVE

The Reduced Acreage Alternative would essentially be Unit 1 of the proposed project, including a 125 MW solar facility located within the boundaries of the proposed project as defined by NextEra. This alternative is analyzed for two major reasons: (1) it eliminates about 50 percent of the proposed project area so all impacts are reduced, and (2) by eliminating the eastern solar field, it would reduce the water required for wet cooling by 50 percent. The boundaries of the Reduced Acreage Alternative are shown in **Alternatives Figure 1**.

C.7.6.1 Setting and Existing Conditions

This alternative is located entirely within the boundaries of the proposed project. It simply eliminates effects to the eastern 125 MW solar field and relocates the gas yard approximately 1.75 miles northwest of its present location. As a result, the environmental setting consists of the western portion of the proposed project, as well as the area affected by the linear project components.

C.7.6.2 Assessment of Impacts and Discussion of Mitigation

The Reduced Acreage alternative would most likely correspond to lower operational, given that only half of the noise generating equipment (steam turbine generator, wet cooling tower, etc) would be included in the project. Because there are no noise sensitive receptors within the vicinity of the project, noise impacts for the Reduced

Acreage alternative would most likely be the same, as for the proposed project, which as discussed above in section 10.4.2 are insigificant.
Because this alternative would result in fewer construction activities conducted at greater distances from sensitive receptors than the proposed project, the analysis for the proposed project demonstrates that the Reduced Acreage alternative can be built and operated in compliance with all applicable noise and vibration laws, ordinances, regulations, and standards. Also, if built in accordance with the conditions of certification proposed for the proposed project, it would produce no significant adverse noise impacts on people within the affected area, either direct, indirect, or cumulative.

C.7.6.3 CEQA Level of Significance

Like the proposed project, the Reduced Acreage alternative, if built and operated in conformance with the proposed conditions of certification defined for the proposed project, would comply with all applicable noise and vibration LORS and would produce no significant adverse noise impacts on people within the project area, directly, indirectly, or cumulatively.

C.7.7 DRY COOLING ALTERNATIVE

This section identifies the potential impacts of using air-cooled condenser (ACC) systems rather than the cooling towers proposed by NextEra for the Genesis project. It is assumed that the ACC systems would be located where the cooling towers are currently proposed for each of the two 125 MW power block, as illustrated in **Alternatives Figure 2** (see Section B.3).
Approximately 18 ACC fans would be required for each of the two solar fields. The 18 fans, or ACC's, would operate when the ambient temperature is above 50 degrees Fahrenheit. When the temperature is below 50 degrees Fahrenheit, only 10 of the fans would be used (GSEP 2009f). The 18 ACC fans described in the GSEP cooling study would have a length of approximately 279 feet, a width of approximately 127 feet, and a height of 98 feet (GSEP 2009f). However, based on the ACC preliminary designs for nearby solar thermal projects in similar ambient temperatures, an additional 11,690 square feet could be required for siting of the fans and the fans would be up to 120 feet in height. In addition to the ACC fans, NextEra would use a small Wet Surface Air Cooler when needed to provide auxiliary cooling during extremely hot days (GSEP 2009f). This alternative is analyzed because it would reduce the amount of water required for steam turbine cooling from 822 acre-feet per year (AFY) to 66 AFY. This reduction in water use would reduce impacts to water and biological resources.

C.7.7.1 Setting and Existing Conditions

This alternative is located entirely within the boundaries of the proposed project. It simply eliminates the use of wet-cooling towers and incorporated the use of air-cooled condensers (ACC) in the same location. As a result, the environmental setting would be the same as for the proposed project.

C.7.7.2 Assessment of Impacts and Discussion of Mitigation

The use of a Dry Cooling Alternative would introduce additional noise sources to the overall plant design, consisting of fans, motors, and gearboxes, but would eliminate

cooling tower noise (a noise source that significantly contributes to project noise levels). The overall difference in project noise level between dry cooling and wet cooling would be small.

The far field noise level for the Dry Cooling Alternative is expected to be approximately 60 dBA at 400 feet (GSEP 2009f). This level would attenuate to approximately 47 dBA at the facility fenceline (approximately 1,800 feet from the proposed position of the ACC) and approximately 25 dBA at a distance of five miles from the project site, compared to less than 30 dBA at five miles for the proposed project. As with the proposed cooling system, no change in ambient noise levels at any noise sensitive receptor would result from the project because there are no such receptors within the vicinity of the project. If the project were to use dry cooling, noise impacts would be insignificant.

C.7.7.3 CEQA Level of Significance

No new impacts to noise and vibration would be created with use of ACCs in place of cooling towers. The overall impact of the project with dry cooling would be similar to that of the proposed project.

C.7.8 NO PROJECT/NO ACTION ALTERNATIVES

No Project/No Action Alternative #1:

No Action on Genesis Solar Energy Project application and on CDCA land use plan amendment

Under this alternative, the proposed Genesis Solar Energy Project would not be approved by the CEC and BLM and BLM would not amend the CDCA Plan. As a result, no solar energy project would be constructed on the project site and BLM would continue to manage the site consistent with the existing land use designation in the CDCA Land Use Plan of 1980, as amended.

Because there would be no amendment to the CDCA Plan and no solar project approved for the site under this alternative, it is expected that the site would continue to remain in its existing condition, with no new structures or facilities constructed or operated on the site. As a result, the construction and operation noise-related impacts of the Genesis Solar Energy Project would not occur at the proposed site. However, the land on which the project is proposed would become available to other uses that are consistent with BLM's land use plan, including another solar project requiring a land use plan amendment. In addition, in the absence of this project, other renewable energy projects may be constructed to meet State and Federal mandates, and those projects would have similar impacts in other locations.

No Project/No Action Alternative #2:

No Action on Genesis Solar Energy Project and amend the CDCA land use plan to make the area available for future solar development

Under this alternative, the proposed Genesis Solar Energy Project would not be approved by the CEC and BLM and BLM would amend the CDCA Land Use Plan of

1980, as amended, to allow for other solar projects on the site. As a result, it is possible that another solar energy project could be constructed on the project site.
Because the CDCA Plan would be amended, it is possible that the site would be developed with the same or a different solar technology. Different solar technologies use different machinery during construction and would create different ambient noise levels during operation; however, it is expected all technologies would require the use of large construction vehicles that would create unwanted noise and some intermittent noise during operations. However, as with the proposed project, it is expected that solar technologies create minor increases in ambient noise during operation. As such, this No Project/No Action Alternative could result in an impact from increased ambient noise during construction and operation similar to under the proposed project.

No Project/No Action Alternative #3:

No Action on Genesis Solar Energy Project application and amend the CDCA land use plan to make the area unavailable for future solar development

Under this alternative, the proposed Genesis Solar Energy Project would not be approved by the CEC and BLM and the BLM would amend the CDCA Plan to make the proposed site unavailable for future solar development. As a result, no solar energy project would be constructed on the project site and BLM would continue to manage the site consistent with the existing land use designation in the CDCA Land Use Plan of 1980, as amended.
Because the CDCA Plan would be amended to make the area unavailable for future solar development, it is expected that the site would continue to remain with the existing ambient noise from its existing condition. Ambient noise of the site is not expected to change noticeably from existing conditions and, as such, this No Project/No Action Alternative would not result in impacts from any increase in noise at the project site. However, in the absence of this project, other renewable energy projects may be constructed to meet State and Federal mandates, and those projects would have similar impacts in other locations.

C.7.9 CUMULATIVE IMPACT ANALYSIS

Geographic Extent

The geographic scope for considering cumulative noise impacts on sensitive receptors for this project consists of the region immediately surrounding any identified receptors. There are no noise-sensitive receptors within nine miles of the project site, the fact of which inherently precludes the possibility for cumulative noise impacts from the project.

C.7.10 COMPLIANCE WITH LORS

A detailed discussion of the proposed project's compliance with LORS applicable to noise and vibration is provided above in subsection C.7.4.2.

C.7.11 NOTEWORTHY PUBLIC BENEFITS

The proposed project would affect the daytime ambient noise levels in the immediate project area. While this change would not be noticeable at the sensitive receptors near the project, and thus not significant, development of the proposed project would not result in any noteworthy public benefits.

C.7.12 PROPOSED CONDITIONS OF CERTIFICATION/MITIGATION MEASURES

NOISE-1 At least 15 days prior to the start of ground disturbance, the project owner shall notify all residents within two miles of the project site boundaries and one-half mile of linears, by mail or other effective means, of the commencement of project construction. At the same time, the project owner shall establish a telephone number for use by the public to report any undesirable noise conditions associated with the construction and operation of the project and include that telephone number in the above notice. If the telephone is not staffed 24 hours per day, the project owner shall include an automatic answering feature, with date and time stamp recording, to answer calls when the phone is unattended. This telephone number shall be posted at the project site during construction in a manner visible to passersby. This telephone number shall be maintained until the project has been operational for at least one year.

Verification: Prior to ground disturbance, the project owner shall transmit to the Compliance Project Manager (CPM) a statement, signed by the project owner's project manager, stating that the above notification has been performed and describing the method of that notification, verifying that the telephone number has been established and posted at the site, and giving that telephone number.

NOISE COMPLAINT PROCESS

NOISE-2 Throughout the construction and operation of Genesis, the project owner shall document, investigate, evaluate, and attempt to resolve all project-related noise complaints. The project owner or authorized agent shall:

- Use the Noise Complaint Resolution Form (below), or a functionally equivalent procedure acceptable to the CPM, to document and respond to each noise complaint;
- Attempt to contact the person(s) making the noise complaint within 24 hours;
- Conduct an investigation to determine the source of noise related to the complaint;
- Take all feasible measures to reduce the noise at its source if the noise is project related; and
- Submit a report documenting the complaint and the actions taken. The report shall include: a complaint summary, including final results of noise

reduction efforts, and if obtainable, a signed statement by the complainant stating that the noise problem is resolved to the complainant's satisfaction.

Verification: Within five days of receiving a noise complaint, the project owner shall file a copy of the Noise Complaint Resolution Form with the CPM, documenting the resolution of the complaint. If mitigation is required to resolve a complaint, and the complaint is not resolved within a three-day period, the project owner shall submit an updated Noise Complaint Resolution Form when the mitigation is implemented.

NOISE-3 The project owner shall submit to the CPM for review and approval a noise control program and a statement, signed by the project owner's project manager, verifying that the noise control program will be implemented throughout construction of the project. The noise control program shall be used to reduce employee exposure to high noise levels during construction and also to comply with applicable OSHA and Cal/OSHA standards.

Verification: At least 30 days prior to the start of ground disturbance, the project owner shall submit to the CPM the noise control program and the project owner's project manager's signed statement. The project owner shall make the program available to Cal/OSHA upon request.

NOISE-4 Following the project's first achieving a sustained output of 90 percent or greater of rated capacity, the project owner shall conduct an occupational noise survey to identify the noise hazardous areas in the facility.

The survey shall be conducted by a qualified person in accordance with the provisions of Title 8, California Code of Regulations sections 5095–5099 and Title 29, Code of Federal Regulations section 1910.95. The survey results shall be used to determine the magnitude of employee noise exposure.

The project owner shall prepare a report of the survey results and, if necessary, identify proposed mitigation measures that will be employed to comply with the applicable California and federal regulations.

Verification: Within 30 days after completing the survey, the project owner shall submit the noise survey report to the CPM. The project owner shall make the report available to OSHA and Cal/OSHA upon request.

C.7.13 CONCLUSIONS

Staff concludes that Genesis, if built and operated in conformance with the proposed conditions of certification below, would comply with all applicable noise and vibration LORS and would produce no significant adverse noise impacts on people within the project area, directly, indirectly, or cumulatively.

EXHIBIT 1 - NOISE COMPLAINT RESOLUTION FORM

Genesis Solar Energy Project
(09-AFC-8)

NOISE COMPLAINT LOG NUMBER _____

Complainant's name and address:

Phone number: _____

Date complaint received: _____
Time complaint received: _____

Nature of noise complaint:

Definition of problem after investigation by plant personnel:

Date complainant first contacted: _____

Initial noise levels at 3 feet from noise source _____ dBA Date: _____

Initial noise levels at complainant's property: _____ dBA Date: _____

Final noise levels at 3 feet from noise source: _____ dBA Date: _____

Final noise levels at complainant's property: _____ dBA Date: _____

Description of corrective measures taken:

Complainant's signature: _____ Date: _____

Approximate installed cost of corrective measures: $ _____
Date installation completed: _____
Date first letter sent to complainant: _____ (copy attached)
Date final letter sent to complainant: _____ (copy attached)

This information is certified to be correct:

Plant Manager's Signature: _____

(Attach additional pages and supporting documentation, as required).

C.7.14 REFERENCES

Riverside 2008. - Imperial County General Plan, Noise Element.

Riverside 2007 - Riverside County Code of Ordinance, Ordinance 847 Regulating Noise. Effective July 19, 2007.

GSEP 2009a – Genesis Solar Energy Project/T. Bernhardt (tn:) Application for Certification for the Genesis Solar Energy Project. 08/31/2009.

GSEP 2009f – Genesis Solar Energy Project/T. Bernhardt (tn:) Data Responses Set 1A (# 1-227) for the Genesis Solar Energy Project. 12/14/2009.

NOISE APPENDIX A
FUNDAMENTAL CONCEPTS OF COMMUNITY NOISE

To describe noise environments and to assess impacts on noise sensitive area, a frequency weighting measure, which simulates human perception, is customarily used. It has been found that "A-weighting" of sound intensities best reflects the human ear's reduced sensitivity to low frequencies and correlates well with human perceptions of the annoying aspects of noise. The A-weighted decibel scale (dBA) is cited in most noise criteria. Decibels are logarithmic units that conveniently compare the wide range of sound intensities to which the human ear is sensitive. **NOISE Table A1** provides a description of technical terms related to noise.

Noise environments and consequences of human activities are usually well represented by an equivalent A-weighted sound level over a given time period (L_{eq}), or by average day and night A-weighted sound levels with a nighttime weighting of 10 dBA (L_{dn}). Noise levels are generally considered low when ambient levels are below 45 dBA, moderate in the 45 to 60 dBA range, and high above 60 dBA. Outdoor day-night sound levels vary over 50 dBA depending on the specific type of land use. Typical L_{dn} values might be 35 dBA for a wilderness area, 50 dBA for a small town or wooded residential area, 65 to 75 dBA for a major metropolis downtown (e.g., San Francisco), and 80 to 85 dBA near a freeway or airport. Although people often accept the higher levels associated with very noisy urban residential and residential-commercial zones, those higher levels nevertheless are considered to be levels of noise adverse to public health.

Various environments can be characterized by noise levels that are generally considered acceptable or unacceptable. Lower levels are expected in rural or suburban areas than would be expected for commercial or industrial zones. Nighttime ambient levels in urban environments are about seven decibels lower than the corresponding average daytime levels. The day-to-night difference in rural areas away from roads and other human activity can be considerably less. Areas with full-time human occupation that are subject to nighttime noise, which does not decrease relative to daytime levels, are often considered objectionable. Noise levels above 45 dBA at night can result in the onset of sleep interference effects. At 70 dBA, sleep interference effects become considerable (U.S. Environmental Protection Agency, Effects of Noise on People, December 31, 1971).

To help the reader understand the concept of noise in decibels (dBA), **NOISE Table A2** illustrates common noises and their associated sound levels, in dBA.

NOISE Table A1 Definition of Some Technical Terms Related to Noise	
Terms	**Definitions**
Decibel, dB	A unit describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure, which is 20 micropascals (20 micronewtons per square meter).
Frequency, Hz	The number of complete pressure fluctuations per second above and below atmospheric pressure.
A-Weighted Sound Level, dBA	The sound pressure level in decibels as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise. All sound levels in this testimony are A-weighted.
L_{10}, L_{50}, & L_{90}	The A-weighted noise levels that are exceeded 10%, 50%, and 90% of the time, respectively, during the measurement period. L_{90} is generally taken as the background noise level.
Equivalent Noise Level, L_{eq}	The energy average A-weighted noise level during the noise level measurement period.
Community Noise Equivalent Level, CNEL	The average A-weighted noise level during a 24-hour day, obtained after addition of 4.8 decibels to levels in the evening from 7 p.m. to 10 p.m., and after addition of 10 decibels to sound levels in the night between 10 p.m. and 7 a.m.
Day-Night Level, L_{dn} or DNL	The Average A-weighted noise level during a 24-hour day, obtained after addition of 10 decibels to levels measured in the night between 10 p.m. and 7 a.m.
Ambient Noise Level	The composite of noise from all sources, near and far. The normal or existing level of environmental noise at a given location.
Intrusive Noise	That noise that intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, and time of occurrence and tonal or informational content as well as the prevailing ambient noise level.
Pure Tone	A pure tone is defined by the Model Community Noise Control Ordinance as existing if the one-third octave band sound pressure level in the band with the tone exceeds the arithmetic average of the two contiguous bands by 5 decibels (dB) for center frequencies of 500 Hz and above, or by 8 dB for center frequencies between 160 Hz and 400 Hz, or by 15 dB for center frequencies less than or equal to 125 Hz.

Source: Guidelines for the Preparation and Content of Noise Elements of the General Plan, Model Community Noise Control Ordinance, California Department of Health Services 1976, 1977.

NOISE Table A2 Typical Environmental and Industry Sound Levels			
Noise Source (at distance)	A-Weighted Sound Level in Decibels (dBA)	Noise Environment	Subjective Impression
Civil Defense Siren (100')	140-130		Pain Threshold
Jet Takeoff (200')	120		Very Loud
Very Loud Music	110	Rock Music Concert	
Pile Driver (50')	100		
Ambulance Siren (100')	90	Boiler Room	
Freight Cars (50')	85		
Pneumatic Drill (50')	80	Printing Press Kitchen with Garbage Disposal Running	Loud
Freeway (100')	70		Moderately Loud
Vacuum Cleaner (100')	60	Data Processing Center Department Store/Office	
Light Traffic (100')	50	Private Business Office	
Large Transformer (200')	40		Quiet
Soft Whisper (5')	30	Quiet Bedroom	
	20	Recording Studio	
	10		Threshold of Hearing

Source: Handbook of Noise Measurement, Arnold P.G. Peterson, 1980

Subjective Response to Noise

The adverse effects of noise on people can be classified into three general categories:

- Subjective effects of annoyance, nuisance, dissatisfaction.
- Interference with activities such as speech, sleep, and learning.
- Physiological effects such as anxiety or hearing loss.

The sound levels associated with environmental noise, in almost every case, produce effects only in the first two categories. Workers in industrial plants can experience noise effects in the last category. There is no completely satisfactory way to measure the subjective effects of noise or of the corresponding reactions of annoyance and dissatisfaction, primarily because of the wide variation in individual tolerance of noise.

One way to determine a person's subjective reaction to a new noise is to compare the level of the existing (background) noise, to which one has become accustomed, with the level of the new noise. In general, the more the level or the tonal variations of a new noise exceed the previously existing ambient noise level or tonal quality, the less acceptable the new noise will be, as judged by the exposed individual.

With regard to increases in A-weighted noise levels, knowledge of the following relationships can be helpful in understanding the significance of human exposure to noise.

1. Except under special conditions, a change in sound level of 1 dB cannot be perceived.

2. Outside of the laboratory, a 3-dB change is considered a barely noticeable difference.

3. A change in level of at least 5 dB is required before any noticeable change in community response would be expected.

4. A 10-dB change is subjectively heard as an approximate doubling in loudness and almost always causes an adverse community response (Kryter, Karl D., The Effects of Noise on Man, 1970).

Combination of Sound Levels

People perceive both the level and frequency of sound in a non-linear way. A doubling of sound energy (for instance, from two identical automobiles passing simultaneously) creates a 3-dB increase (i.e., the resultant sound level is the sound level from a single passing automobile plus 3 dB). **NOISE Table A3** indicates the rules for decibel addition used in community noise prediction.

NOISE Table A3
Addition of Decibel Values

When two decibel values differ by:	Add the following amount to the larger value
0 to 1 dB	3 dB
2 to 3 dB	2 dB
4 to 9 dB	1 dB
10 dB or more	0
Figures in this table are accurate to ± 1 dB.	

Source: Architectural Acoustics, M. David Egan, 1988.

Sound and Distance

Doubling the distance from a noise source reduces the sound pressure level by 6 dB.

Increasing the distance from a noise source 10 times reduces the sound pressure level by 20 dB.

Worker Protection

OSHA noise regulations are designed to protect workers against the effects of noise exposure and list permissible noise level exposure as a function of the amount of time to which the worker is exposed, as shown in **NOISE Table A4**.

NOISE Table A4
OSHA Worker Noise Exposure Standards

Duration of Noise (Hrs/day)	A-Weighted Noise Level (dBA)
8.0	90
6.0	92
4.0	95
3.0	97
2.0	100
1.5	102
1.0	105
0.5	110
0.25	115

Source: 29 CFR § 1910.95.

C.8 - SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

Testimony of Scott Debauche

C.8.1 SUMMARY OF CONCLUSIONS

Energy Commission staff (hereafter referred to as "staff") have reviewed the Genesis Solar Energy Project (GSEP or proposed project) in accordance with the requirements of the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA). With respect to CEQA and NEPA, staff concludes that the GSEP would not under CEQA cause a significant adverse direct or indirect impact or contribute to a cumulative socioeconomic impact on the area's housing, schools, parks and recreation, police, emergency medical services, or hospitals, because the project's construction and operation workforce currently resides in the regional or local labor market area. Staff also concludes that the project would not require the construction of new or altered public facilities.

The construction and operation of the proposed GSEP would not result in any disproportionate impacts to low-income or minority populations. Gross public benefits from the proposed project include capital costs, construction and operation payroll, and sales taxes from construction and operational spending.

Please refer to the **Land Use, Recreation, and Wilderness** section of this document for further analysis of recreation impacts.

C.8.2 INTRODUCTION

Staff's socioeconomics impact analysis evaluates project-induced changes on existing population and employment patterns, community services. In addition, this section provides demographic information related to environmental justice. A discussion of the estimated beneficial economic impacts of the construction and operation of the proposed GSEP and other related economic impacts are provided.

C.8.3 METHODOLOGY AND THRESHOLDS FOR DETERMINING ENVIRONMENTAL CONSEQUENCES

The analysis of proposed project effects must comply with both California Environmental Quality Act (CEQA) and National Environmental Policy Act (NEPA) requirements given the respective power plant licensing and land jurisdictions of the California Energy Commission and U.S. Bureau of Land Management (BLM). CEQA requires that the significance of individual effects be determined by the Lead State Agency. However, the use of specific significance criteria is not required under NEPA.

Because this document is intended to meet the requirements of both NEPA and CEQA, the methodology used for determining environmental impacts of the proposed project includes a consideration of guidance provided by both laws.

The Council on Environmental Quality Regulations for Implementing the Procedural Provisions of the NEPA (CEQ NEPA Regulations) states that “Significantly” as used under NEPA requires considerations of both context and intensity…” (40 CFR 1508.27). Significance varies with the setting of the proposed action (40 CFR 1508.27[a]); and 40 CFR 1508.8 adds that indirect effects may include those that are growth inducing and others related to induced changes in the pattern of land use, population density, or growth rate. With respect to CEQA, socioeconomic impacts are limited to those that would result in direct physical effects on the environment, such as changes to population and housing, and that are separate from strictly economic impacts, such as a loss of revenue.

Based on a review of recent environmental assessment documents prepared for the BLM and the CEQA Guidelines, Appendix G, staff has determined the list of thresholds below to be appropriate for analysis of socioeconomics impacts under both NEPA and CEQA. A project may have a significant effect on socioeconomics if the project would:

- Induce substantial population growth in an area, either directly or indirectly;
- Displace substantial numbers of people and/or existing housing, necessitating the construction of replacement housing elsewhere; or
- Adversely impact acceptable levels of service for fire and police protection, schools, parks and recreation, and other public facilities.

In addition to the above, the GSEP socioeconomics analysis identifies beneficial fiscal and economic effects, including impacts on local finances from property and sales taxes as well as the creation of employment, employment revenue, and the purchases of goods and services during both GSEP construction and operation.

To satisfy the requirements of Executive Order 12898, “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations,” this section identifies any disproportionate minority and low-income populations within the GSEP study area. Any disproportionate significant impacts to minority and low-income populations are discussed within each environmental issue area section of this document.

Criteria for subject areas such as utilities, fire protection, water use, and wastewater disposal are analyzed in the **Soil and Water Resources**, **Reliability**, **Worker Safety and Fire Protection**, and **Waste Management** sections of this document. Impacts on population, housing, parks and recreation, schools, medical services, law enforcement, and cumulative impacts are based on subjective judgments and data from local and state agencies. Typically, long-term employment of people from regions outside the study area could potentially result in significant adverse socioeconomic impacts.

C.8.4 PROPOSED PROJECT

C.8.4.1 SETTING AND EXISTING CONDITIONS

Laws, Ordinances, Regulations, and Standards

The following table contains all socioeconomic laws, ordinances, regulations, and standards (LORS) applicable to the GSEP.

SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE Table 1
Laws, Ordinances, Regulations, and Standards (LORS)

Applicable LORS	Description
Federal	
Emergency Economic Stabilization Act of 2008 (P.L. 110-343) Business Solar Investment Tax Credit (IR Code §48)	Extends the 30% investment tax credit (ITC) for solar energy property for eight years through December 31, 2016. The bill allows the ITC to be used to offset both regular and alternative minimum tax (AMT) and waives the public utility exception of current law (i.e., permits utilities to directly invest in solar facilities and claim the ITC). The five-year accelerated depreciation allowance for solar property is permanent and unaffected by passage of the eight-year extension of the solar ITC.
State	
California Revenue and Taxation Code, sections 721–725: California Board of Equalization (BOE) – Property Tax Rule 905 (BOE authority to assess electrical generating facilities is found in Article XIII, section 19, of California's Constitution)	Property Tax Rule 905 states "the Board shall annually assess every electric generation facility with generating capacity of 50 MW or more..." It also states that for purposes of this rule, "electric generation facility" does not include a qualifying small power production facility or qualifying cogeneration facility within the meaning of section 201 and section 210 of Title II of the Public Utility Regulatory Policies Act of 1978. According to this act, (16 USC, section 796 [17] [A]), a "small power production facility is defined as 'A facility which is eligible solar, wind, waste, or geothermal facility...[that] has a power production capacity, which together with any other facilities located at the same site, is not greater than 80 MW.'"
California Revenue and Tax Code 70-74.7	Property taxes are not assessed on solar facilities. Assembly Bill 1451 extended the current property tax exclusion for new construction of solar energy systems to January 1, 2017.
California Education Code, Section 17620	The governing board of any school district is authorized to levy a fee, charge, dedication, or other requirement for the purpose of funding the construction or reconstruction of school facilities.
California Government Code, Sections 65996-65997	Except for a fee, charge, dedication, or other requirement authorized under Section 17620 of the Education Code, state and local public agencies may not impose fees, charges, or other financial requirements to offset the cost for school facilities.

Regional Study Area

The proposed project includes the construction and operation of a solar generating facility located in the Southern California inland desert on federal land managed by the BLM, approximately 25 miles west of the City of Blythe and approximately 35 miles west of the California-Arizona border in unincorporated eastern Riverside County. The town of Desert Center is located approximately 27 miles west of the proposed GSEP site. The Ironwood and Chuckwalla State Prisons, which are technically part of the City of Blythe, are located adjacent to each other approximately 9 miles south of the GSEP site. Research shows that workers may commute as much as two hours each direction from their communities rather than relocate (EPRI 1982). Therefore, for purposes of this analysis, the socioeconomics study area is Riverside County, CA; San Bernardino County, CA; and La Paz County, AZ.

Current and forecasted population trends, as well as current housing trends for the study area are summarized in **SOCIOECONOMICS AND ENVIRONMENAL JUSTICE Table 2**. As shown in **Table 2.** From 2008 through 2030, the populations of Riverside and San Bernardino Counties are forecasted to comprise the majority of the total GSEP study area population, with Riverside County expected to experience the highest total population increase. Also shown in **Table 2**, the regional study area contains a high number of housing units, with San Bernardino and Riverside Counties contributing the largest numbers within the GSEP study area. Among all communities within the study area, La Paz County has the highest vacancy rate.

SOCIOECONOMICS AND ENVIRONMENAL JUSTICE Table 2
Population and Housing Profile of the Regional Study Area

Population				
Area	**Year**			
	2008 Population	**2010 Projected Population**	**2020 Projected Population**	**2030 Projected Population**
Riverside County, CA	2,078,601	2,239,053	2,904,848	3,507,498
San Bernardino County, CA	2,055,766	2,177,596	2,582,777	2,957,744
La Paz County, AZ	21,544	22,632	25,487	28,074
Housing				
Area	**2008 Total Housing Units**		**2008 Vacancy Rate Percentage (%)**	
Riverside County, CA	773,402		13.2	
San Bernardino County, CA	612,801		11.6	
La Paz County, AZ	15,577[1]		42.7[1]	

Notes: [1] Data from 2007.
Source: GSEP 2009a, Tables 5.11-4 and 5.11-5.

Local Study Area

As required by the Bureau of Land Management (BLM) Land Use Planning Handbook, Appendix D requirements (BLM 2009), a project analysis of this type needs to consider existing socioeconomic conditions and impacts on several geographic scales. An analysis at a local level presents a challenge because the proposed project is in a

sparsely populated area, with the largest urban center being the city of Riverside located approximately 100 miles west of the site. Based on BLM requirements, a reasonable study area for localized socioeconomic impacts would include the two nearest communities: the city of Blythe, CA (approximately 25 miles east of the GSEP site); and the city of Ehrenburg, AZ (approximately 30 miles east of the GSEP site). The most recently published population and housing data for these communities is presented below in **SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE Table 3.**

SOCIOECONOMICS AND ENVIRONMENAL JUSTICE Table 3
Population and Housing Profile of the Local Study Area

Area	Year		
	2008 Population	2008 Total Housing Units	2008 Vacancy Rate Percentage (%)
Blythe, CA	13,541	5,444	16.1
Ehrenburg, AZ	1,409	824[1]	34.9[1]

Notes: [1] Data from 2000.
Source: GSEP 2009a, Tables 5.11-4 and 5.11-5

Based on Staff research, the economic structure of these local study area communities that may be affected by the management of BLM lands includes primarily a tourism, mining, and infrastructure related economic base, with both communities being rural suburban locations closely tied to the Interstate 10 travel route between the cities of Los Angeles, CA and Phoenix, AZ.

Environmental Justice/Demographic Screening

Executive Order 12898, “Federal Actions to address environmental justice in Minority Populations and Low-Income Populations,” focuses federal attention on the environment and human health conditions of minority communities and calls on agencies to achieve environmental justice as part of this mission. The order requires the US Environmental Protection Agency (EPA) and all other federal agencies (as well as state agencies receiving federal funds) to develop strategies to address this issue. The agencies are required to identify and address any disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and/or low-income populations.

Civil Rights Act of 1964, Public Law 88-352, 78 Stat.241 (Codified as amended in scattered sections of 42 U.S.C.) Title VI of the Civil Rights Act prohibits discrimination on the basis of race, color, or national programs in all programs or activities receiving federal financial assistance.

California law defines environmental justice as “the fair treatment of people of all races, cultures and income with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies” (Government Code Section 65040.12 and Public Resources Code Section 72000).

All Departments, Boards, Commissions, Conservancies and Special Programs of the

Resources Agency must consider environmental justice in their decision-making process if their actions have an impact on the environment, environmental laws, or policies. Such actions that require environmental justice consideration may include:

- Adopting regulations;
- Enforcing environmental laws or regulations;
- Making discretionary decisions of taking actions that affect the environment;
- Providing funding for activities affecting the environment; and
- Interacting with the public on environmental issues.

In considering environmental justice in energy siting cases, staff uses a demographic screening analysis to determine whether a low-income and/or minority population exists within the potentially affected area of the proposed site. The potentially affected area consists of a six-mile radius of the site and is consistent with air quality modeling of the range of a project's air quality impacts. The demographic screening is based on information contained in two documents: *Environmental Justice: Guidance Under the National Environmental Policy Act* (Council on Environmental Quality, December, 1997) and *Guidance for Incorporating Environmental Justice Concerns in EPA's Compliance Analyses* (U.S. Environmental Protection Agency, April, 1998). The screening process relies on Year 2000 U.S. Census data to determine the presence of minority and below-poverty-level populations.

In addition to the demographic screening analysis, staff follows the steps recommended by the U.S. EPA's guidance documents which are outreach and involvement, and if warranted, a detailed examination of the distribution of impacts on segments of the population.

Staff has followed each of the above steps for the following 11 sections in the SA/DEIS: Air Quality, Hazardous Materials, Land Use, Noise, Public Health, Socioeconomics, Soils and Water, Traffic and Transportation, Transmission Line Safety/Nuisance, Visual Resources, and Waste Management. Over the course of the analysis for each of the 11 areas, staff considered potential impacts and mitigation measures, significance, and whether there would be a significant impact on an environmental justice population.

Minority Population

According to *Environmental Justice: Guidance Under the National Environmental Policy Act*, minority individuals are defined as members of the following groups: American Indian or Alaskan Native; Asian or Pacific Islander; Black, not of Hispanic origin; or Hispanic. A minority population, for the purposes of environmental justice, is identified when the minority population of the potentially affected area is greater than 50 percent or meaningfully greater than the percentage of the minority population in the general population or other appropriate unit of geographical analysis.

For the proposed GSEP, the total population within a six-mile radius of the proposed project is 8,308 persons (including prison populations of 3,913 at Chuckwalla and 3,945 at Ironwood state prisons), and the total minority population is 6,628 persons or 79.77

percent of the total population (see **SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE Figure 1**). As the demographic screening area as a whole exceeds 50.0 percent, as shown in **Figure 1**, staff in several technical areas identified in the Executive Summary has considered environmental justice in their environmental impact analyses.

Below-Poverty-Level Population

Staff has also identified the below-poverty-level population based on Year 2000 U.S. Census block data within a six-mile radius of the project site. Poverty status excludes institutionalized people, people in military quarters, people in college dormitories, and unrelated individuals under 15 years old. The below-poverty-level population within a six-mile radius of the proposed GSEP consists of no people or 0.0 percent of the total population in that area.

C.8.4.2 ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

Induce Substantial Population Growth

For the purpose of this analysis, staff defines "induce substantial population growth" as workers permanently moving into the project area because of project construction and operation, thereby encouraging construction of new homes or extension of roads or other infrastructure. To determine whether the project would induce population growth, staff analyzes the availability of the local workforce and the population within the region. Staff defines "local workforce" for the GSEP to be Riverside/San Bernardino/Ontario Metropolitan Statistical Area (MSA), which includes both Riverside and San Bernardino Counties.[1] While the city of Ehrenberg within La Paz County, AZ is located within the proposed project local and regional study areas, respectively, and could contribute to the local workforce, detailed labor skill data is unavailable for this limited portion of the regional and local study area. As shown above in **SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE Table 2**, due to the size of the La Paz County population, presenting local workforce data for the entire State of Arizona would not be representative of the available workforce within the county. However, it should be noted that construction workforce from within this county and local communities would contribute to the local workforce as identified in detail below.

Construction. It is anticipated that the construction period for the proposed GSEP would occur over a 37-month construction period. There would be an average of approximately 646 daily construction workers, with a peak daily workforce of 1,085, depending on the month and the work required. Laborers would consist of craftspeople and supervisory, support, and construction management personnel on site during construction. According to AFC section 5.8 (Socioeconomics), the peak construction labor force of 1,085 total daily construction workers would occur during the 23rd month of construction. This maximum employment number is used to analyze worst-case construction population and employment impacts. **SOCIOECONOMICS AND**

[1] Metropolitan Statistical Areas are geographic entities defined by the U.S. Office of Management and Budget (OMB) for use by Federal and State statistical agencies in collecting, tabulating, and publishing socioeconomic statistics.

ENVIRONMENTAL JUSTICE Table 4 shows Year 2006-2016 occupational employment projections for the Riverside/San Bernardino/Ontario MSA by construction labor skill as compared to the estimated number of total construction workers by craft needed during the peak month (month 23) as presented in the AFC (GSEP 2009a).

SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE Table 4
Total Labor by Skill in Riverside/San Bernardino/Ontario MSA (2006 and 2016 Estimate) and GSEP Required Construction by Craft Peak Month

Trade	Total # of Workers for Project Construction by Craft – Peak Month	Riverside/San Bernardino/Ontario MSA 2006	Riverside/San Bernardino/Ontario MSA 2016
Insulators[1]	24	27,930	32,080
Operating Engineers	60	4,790	5,460
Laborer[1]	96	27,930	32,080
Teamsters[1]	38	27,930	32,080
Painters[1]	15	27,930	32,080
Carpenter	44	28,850	32,390
Solar Field Craft[1]	305	27,930	32,080
Pipe Fitter	200	4,630	5,330
Electrician	105	6,740	7,600
Cement Mason	4	4,110	4,690
Ironworker	70	19,460	20,800
Millwright[3]	22	2,630	2,960
Construction Staff[4]	92	10,990	12,380

Notes: [1] The "Construction Laborers" category was used, [2] the "Plumbers, Pipefitters, and Steamfitters" category was used, [3] the "Machinists" category was used, [4] the "Supervisors, Construction and Extraction Workers" category was used, [5] the "Helpers-Construction Trades" category was used.
Source: GSEP 2009a, Tables 5.8-12 and 5.8-15.

As shown in **SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE Table 4**, there is more than adequate local availability of construction workforce within the Riverside/San Bernardino/Ontario MSA alone for the GSEP. As mentioned above, additional workforce would be available and likely come from within La Paz County, AZ and local communities within such as Ehrenberg and Quartzsite. Should some construction workers from within the study area choose to stay temporarily at a local area motel or hotel close to the GSEP site, there is ample transient housing available. There are approximately 630 hotel/motel rooms and suites among 11 different establishments in the Blythe area (AS 2009a). As such, staff finds that the proposed project would not induce substantial growth or concentration of population in either the regional or local study areas and construction of the GSEP would not encourage people to permanently relocate to the area.

Operation. The proposed GSEP is expected to require a total of 40 to 50 permanent full-time employees (GSEP 2009a). **SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE Table 5** shows Year 2006-2016 occupational employment projections for the Riverside/San Bernardino/Ontario MSA (by operational labor skill as compared to the estimated number of total operational workers needed as presented in the AFC (GSEP 2009a).

SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE Table 5
Total Labor by Skill in Riverside/San Bernardino/Ontario MSA (2006 and 2016 Estimate) and GSEP Required Operation

Trade	Total # of Workers for Project Operation	Riverside/San Bernardino/Ontario MSA 2006	Riverside/San Bernardino/Ontario MSA 2016
Plant and System Operators	--	2,030	2,380
Power Plant Operators	--	310	370
Total	*40-50*	*2,340*	*2,750*
Source: GSEP 2009a.			

As shown in **Table 5**, data for the Riverside/San Bernardino/Ontario MSA indicates that in the Year 2006, the "Plant and System Operators" and "Power Plant Operators" employment sector contained a total of 2,350 workers, with Year 2016 forecasts for these employment sectors to grow to a total of 2,750 employees. On p. 5.8-23 of the AFC, the applicant states that 50 percent of workers would come from within the regional study area workforce, resulting in a potential influx of approximately 25 workers in communities within the proposed GSEP regional and local study areas (GSEP 2009a). However, Staff's independent analysis (based on **Table 5**) shows that there is more than an adequate local workforce for project operation regardless of the specialized nature of the proposed project. Therefore, due to the labor force located within the Riverside/San Bernardino/Ontario MSA, Staff concludes that the new operational employees required for the GSEP would be found locally.

In the event any permanent operational employees chose to live closer to the GSEP site, as shown earlier in **Table 3** the current vacancy rates for the cities of Blythe, CA and Ehrenberg, AZ are 16.1 and 34.9 percent, respectively. These vacancy rates indicate ample local housing should operational employees choose to relocate. Staff concludes that under CEQA, inducement of substantial population growth either directly or indirectly by the GSEP would not be significant or adverse.

Displace Existing Housing and Substantial Numbers of People

The proposed GSEP site would be located within vacant BLM land and contains no housing. As such, no housing would be displaced. Furthermore, staff has determined that no housing would be displaced from required transmission line and other infrastructure linear connections associated with the GSEP. As discussed above, staff finds the required construction and operational workforce of the GSEP would be found locally and no inmigration would occur that would trigger the need for new housing. Furthermore, vacancy rates within the local study area offer operational employees wishing to relocate within the local study area ample available housing. A high number of transient lodging opportunities exist within the regional study area to serve construction employees. Therefore, staff concludes that no significant construction or operation-related impacts are expected for the regional and local study area housing supply, availability, or demand, and the GSEP would not displace any populations or existing housing, and it would not necessitate construction of replacement housing elsewhere.

Result in Substantial Physical Impacts to Government Facilities

Physical impacts to public services and facilities are usually associated with population in-migration and growth in an area, which increase the demand for a particular service and lead to the need for expanded or new facilities. Physical impacts to public services and facilities are usually associated with population in-migration and growth in an area, which increase the demand for a particular service, leading to the need for expanded or new facilities. Public service providers serving the GSEP site are located within Riverside County only and represent the local study area. Therefore, the study area for the public services analysis is limited to Riverside County.

As discussed under the subject headings below, the GSEP would not cause significant impacts to service ratios, response times, or other performance objectives relating to law enforcement, schools, parks and recreation, or emergency medical service facilities. Fire protection is analyzed in the **Worker Safety and Fire Protection** section of this document.

Police Protection

The GSEP site would be served by the Riverside County Sheriff's Department Colorado River Station at 260 North Spring Street in Blythe provides service to the unincorporated area from Red Cloud Road on the west, to the Arizona state line on the east, and county line to county line on the north and south. Communities included in this service area are Desert Center, Eagle Mountain, East Blythe, Hayfield, Midland, Nicholls Warm Springs, Ripley, and the Colorado River. Currently, the Riverside County Sheriff's Department average response time to the GSEP site depends on the severity of the incident and the location of the deputies on call; however, response time is estimated at 30 minutes.

Construction. As discussed above, the construction workforce for the GSEP would be hired locally. There would be no population inmigration occurring from GSEP construction that would increase the local population or would require the need for new or expanded law enforcement facilities or staff levels within the GSEP regional or local study areas.

Operation. As discussed above, staff's analysis shows the operational workforce for the GSEP would be hired locally and no population inmigration would occur. Staff concludes that operation of the proposed GSEP would not increase the local population or require the need for new or expanded law enforcement facilities or staff levels within the GSEP regional or local study areas.

Schools

The proposed GSEP site area is served by the Palo Verde Unified School District serving the city of Blythe and other remote areas of Riverside County and the Desert Center Unified School District in Desert Center (GSEP 2009a). **SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE Table 6** identifies the schools and year 2006-2007 student enrollments in each of the respective school districts. As shown in **Table 6**, Palo Verde Unified School District (PVUSD), approximately 25 miles east of the GSEP site,

offers a full range of educational opportunities with three elementary schools, one middle school, one high school, and a continuation high school.

SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE Table 6
Summary of Schools and Enrollment in Palo Verde and Desert Center School Districts, Year 2006–2007

Palo Verde Unified School District			
School Name	**Community**	**Grades**	**Students**
Felis J. Appleby Elementary School	Blythe	K-5	527
Margaret White Elementary School	Blythe	K-5	666
Ruth Brown Elementary School	Blythe	K-5	652
Blythe Middle School	Blythe	6-8	841
Palo Verde High School	Blythe	9-12	952
Twin Palms Continuation School	Blythe	9-12	97
Desert Center Unified School District			
School Name	**Community**	**Grades**	**Students**
Eagle Mountain Elementary School	Desert Center	K-8	16
Source: Solar Millennium2009a, Tables 5.11-14 and 5.11-15.			

Construction. As discussed above, the required construction workforce of the GSEP would be hired locally. There would be no population inmigration occurring from GSEP construction that would increase the local population or would require the need for new or expanded school facilities or staff levels within the GSEP regional or local study areas.

Operation. Like all school districts in the state, the PVUSD is entitled to collect school impact fees for new construction within their district under the California Education Code Section 17620. These fees are based on the project's square feet of industrial space. Because the main services complex of the GSEP (considered "industrial space") would be constructed entirely on BLM land, no private land would be affected and therefore, the provisions of Education Code Section 17620 would not apply to this project. Therefore, the GSEP would be in compliance with Education Code section 17620 (as described in **SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE Table 1)**. Additionally, as discussed above, the required operational workforce of the GSEP would be found locally with no population in-migration occurring that would increase the local population or would require the need for new or expanded school facilities or staff levels within the GSEP regional or local study areas.

Parks and Recreation

The site is currently undeveloped, although recreational use of the area is allowed under the BLM California Desert Conservation Area (CDCA), but infrequent (GSEP 2009a). The nearest park facilities to the GSEP site are located within the city of Blythe, located approximately 40 miles east of the GSEP site. The city of Blythe Parks Department is responsible for the maintenance and upkeep of the area's seven parks and one pocket park (City of Blythe, 2009).

Construction. As discussed above, the required construction workforce of the GSEP would be hired locally. There would be no population inmigration occurring that would

increase the local population or would require the need for new or expanded parks and recreational facilities or staff levels within the GSEP regional or local study areas.

Operation. As discussed above, the proposed GSEP would not eliminate any lands designated for recreational use. Furthermore, as the required operational workforce of the GSEP would be found locally, there would be no population inmigration occurring that would increase the local population or would require the need for new or expanded parks and recreational facilities or staff levels within the GSEP regional or local study areas.

Hospitals

The closest hospitals to the proposed GSEP site are the Palo Verde Hospital approximately 25 miles east in Blythe, the John F. Kennedy Memorial Hospital approximately 78 miles west in Indio, and the Desert Regional Medical Center approximately 99 miles west in Palm Springs. Palo Verde Hospital provides intensive care/critical/emergency care on site, including four adult intensive-care beds for critically ill patients, and contracts ambulance service to the hospital via private ambulance service providers within Blythe (Solar Millennium2009a).

SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE Table 7 identifies the nearest emergency medical service facilities to the site and their respective available services.

SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE Table 7
Hospitals and Services Serving the GSEP Site

Hospital/Address	Available Services
Palo Verde Hospital 251 First Street Blythe, CA	Hospital, blood bank, computerized tomography scan, intensive care unit, labor/delivery/recovery rooms, magnetic resonance imaging, nuclear medicine, outpatient services, ultrasound.
John F. Kennedy Memorial Hospital 47111 Monroe St. Indio, California	Hospital, cardiac and vascular, healthgrades, orthopedic and arthritis institute, outpatient rehabilitation, women and children, emergency department, free physician referral and community education, emergency and express care.
Desert Regional Medical Center 1150 N. Indian Canyon Dr. Palm Springs, California	Hospital, hematologists, pathologists, radiology, general surgeons, emergency medical and surgical service, anesthesiologists, physical therapists, obstetricians, and gynecologists, rehabilitation services.
Source: Solar Millennium2009a, Table 5.11-13.	

Construction. Construction of the proposed GSEP would last 39-months and include an average of 646 daily construction workers, peaking with a daily workforce of 1,085 workers during month 23 of construction (GSEP 2009a). In the event an on-site accident occurred during project construction, both private ambulance service and Riverside County Fire Department firefighters would provide first responder emergency medical care. As discussed in the **WORKER SAFETY AND FIRE PROTECTION** section of this document, the nearest Riverside County Fire Department fire stations are staffed full-time, 24 hours/7 days a week, with a minimum 3-person crew, including paramedics. Once transported, as shown above in **Table 7**, a number of local area

hospitals are available to provide emergency and express medical care. Therefore, while a high number of construction employees would be located on-site, local area emergency medical facilities are expected to adequately handle any worksite accidents requiring their attention. No additional constraints or physical impacts would occur to the local study area healthcare services or facilities identified in **Table 7** serving the GSEP site.

Operation. The proposed GSEP is expected to require a total of 40 to 50 permanent full-time employees (GSEP 2009a). As discussed above for construction, the available emergency medical and hospital facilities identified in **Table 7** and serving the GSEP site and local study area are expected to adequately handle the permanent addition of 50 on-site staff and the long-term demands of the GSEP. Furthermore, as all operational employees are expected to come from within the regional study area, no new population in migration would occur that could decrease existing emergency medical care providers existing service ratios. Operation of the GSEP is not expected to significantly impact the existing service levels, response times, or capacities of the hospitals serving the GSEP.

Project Closure and Decommissioning

According to Section 3.12 of the applicant's project description, the solar generating facility is expected to have a lifespan of 30 years. At any point during this time, temporary or permanent closure of the solar facility could occur. Temporary closure would be a result of necessary maintenance, hazardous weather conditions, or damage due to a natural disaster. Permanent closure would be a result of damage that is beyond repair, adverse economic conditions, or other significant reasons.

Both temporary and permanent closures would require the applicant to submit to the CEC and BLM a contingency plan or a decommissioning plan, respectively. A contingency plan would be implemented to ensure compliance with applicable LORS, and appropriate shutdown procedures depending on the length of the cessation. A decommissioning plan would be implemented to ensure compliance with applicable LORS, removal of equipment and shutdown procedures, site restoration, potential decommissioning alternatives, and the costs and source of funds associated with decommissioning activities. As described in the **Project Description** section of the Staff Assessment, it is assumed decommissioning of the facility would be similar to that described above for construction of the GSEP.

Staff cannot speculate as to the long-term economic and fiscal effects that closure and decommissioning activities would have on the study area because future conditions are unknown. Upon permanent closure of the GSEP, the beneficial socioeconomic operational impacts such as worker payroll, project expenditures, and local economic stimulus would no longer occur. It should be noted that closure and decommissioning of the GSEP would likely require further environmental impact evaluation, and most likely would have some beneficial fiscal and non-fiscal impacts to the area.

C.8.4.3 CEQA LEVEL OF SIGNIFICANCE

As discussed in the subject headings above, under CEQA, project-related socioeconomic impacts would be less than significant for population, housing, and public services including law enforcement, schools, parks and recreation, and emergency medical services.

C.8.5 REDUCED ACREAGE ALTERNATIVE

The Reduced Acreage Alternative would essentially be Unit 1 of the proposed project, including a 125 MW solar facility located within the boundaries of the proposed project as defined by NextEra. This alternative is analyzed for two major reasons: (1) it eliminates about 50 percent of the proposed project area so all impacts are reduced, and (2) by retaining the eastern solar field, which is located on flowing desert washes, it would reduce impacts to the sand dune and playa areas and to the Mojave Fringe-toed Lizard habitat. The alternative would also reduce impacts to wildlife movement by reducing obstruction of the Palen wash and would maintain, thru both fluvial and Aeolian processes, the dune and sandy habitats. The boundaries of the Reduced Acreage Alternative are shown in **Alternatives Figure 1**.

C.8.5.1 SETTING AND EXISTING CONDITIONS

This alternative is located entirely within the boundaries of the proposed project. It simply eliminates effects to the eastern 125 MW solar field and relocates the gas yard approximately 1.75 miles northwest of its present location. As a result, the environmental setting consists of the western portion of the proposed project, as well as the area affected by the linear project components.

C.8.5.2 ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

Induce Substantial Population Growth

Under the Reduced Acreage Alternative, only one generating unit would be constructed. Due to phasing of the construction of the generating units, the peak number of workers required for construction would be reduced from 1,085 to approximately 734. However, this potential reduction in construction would not result in a change to socioeconomic impacts when compared to the proposed GSEP as the regional study area provides a substantial number of construction workers by type to serve the Reduced Acreage Alternative as well as the GSEP (refer to **SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE Table 4**). Therefore, all construction workers required for the Reduced Acreage Alternative are expected to come from within the regional study area and would not result in population inmigration.

It is assumed that operation of this alternative would require a similar number of operational employees as the GSEP. As discussed above in Section C.8.4.2 (refer to **SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE Table 5**), operational employees are expected to come from within the regional study area and not result in population inmigration.

Displace Existing Housing and Substantial Numbers of People

The housing impacts of the Reduced Acreage Alternative would be identical to those of the proposed GSEP, as described in Section C.8.4.2. As discussed above, this alternative would reduce the footprint of the proposed GSEP site. Therefore, as discussed above for the GSEP, no housing would exist within the alternative site and required infrastructure ROW. Therefore, the Reduced Acreage Alternative would not displace any housing during construction or operation. Furthermore, similar to that of the GSEP, both construction and operational employment associated with the Reduced Acreage Alternative would not result in the demand for new housing in either the regional or local study areas (refer above to Section C.8.4.2).

Result in Substantial Physical Impacts to Government Facilities

The public services impacts of the Reduced Acreage Alternative would be similar to those of the proposed GSEP, as described in Section C.8.4.2. As discussed above, all construction and operational employees associated with the Reduced Acreage Alternative are expected to come from within the regional study area. Therefore, no new population inmigration would occur that could decrease existing public service providers service levels and ratios, response times, capacities, or require new or expanded facilities serving the GSEP regional or local study areas. As this alternative would also be located entirely within BLM lands, no private land would be affected and therefore, the provisions of Education Code Section 17620 would not apply to this alternative.

Cumulative Socioeconomics Effects

The cumulative socioeconomic impacts of the Reduced Acreage Alternative would be similar to those of the proposed GSEP, as described below in Section C.8.8. While this alternative could result in a decrease in construction schedule and required workforce, the regional and local study area would continue to provide adequate construction and operational employees for the Reduced Acreage Alternative and cumulative development projects. While these projects would combine to increase the demand for localized transient lodging and potentially permanent housing in the local study area, a large number of hotel/motel rooms are available and local study area vacancy rates indicate ample permanent housing is available to those operational employees choosing to relocate locally to the site. Therefore, the Reduced Acreage Alternative would not contribute to adverse cumulative socioeconomic impacts. It should be noted that any decrease in construction activities and site footprint associated with this alternative would likely result in a decrease in tax benefits to local governments and construction expenditures compared to those provided below in **SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE Table 8** for the proposed GSEP.

C.8.5.3 CEQA LEVEL OF SIGNIFICANCE

Induce Substantial Population Growth

As discussed above in subsection C.8.5.2, and similar to the proposed GSEP, impacts resulting from this alternative to socioeconomics would be less than significant.

C.8.6 DRY COOLING ALTERNATIVE

This section identifies the potential impacts of using air-cooled condenser (ACC) systems rather than the cooling towers proposed by NextEra for the Genesis project. It is assumed that the ACC systems would be located where the cooling towers are currently proposed for each of the two 125 MW power block, as illustrated in **Alternatives Figure 2** (see Section B.3).

This alternative is analyzed because it would reduce the amount of water required for steam turbine cooling from 822 acre-feet per year (AFY) to 66 AFY. This reduction in water use would reduce impacts to water and biological resources.

C.8.6.1 SETTING AND EXISTING CONDITIONS

This alternative is located entirely within the boundaries of the proposed project. It simply eliminates the use of wet-cooling towers and incorporates the use of air-cooled condensers (ACC) in the same location. As a result, the environmental setting would be the same as for the proposed project.

C.8.6.2 ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

Induce Substantial Population Growth

The Dry Cooling Alternative would be located in the same location as the proposed GSEP site and would use approximately the same amount of construction and operation workers as the proposed project. Impacts to population and employment are anticipated to be the same as the proposed project.

Displace Existing Housing and Substantial Numbers of People

The Dry Cooling Alternative would be located in the same location as the proposed GSEP site and would use approximately the same amount of construction and operation workers as the proposed project. Impacts to housing are anticipated to be the same as the proposed project.

Result in Substantial Physical Impacts to Government Facilities

The Dry Cooling Alternative would be located in the same location as the proposed GSEP site and would use approximately the same amount of construction and operation workers as the proposed project. Impacts to public services are anticipated to be the same as the proposed project.

Cumulative Socioeconomics Effects

The cumulative socioeconomic impacts of the Dry Cooling Alternative would be similar to those of the proposed GSEP, as described below in Section C.8.8. This alternative would result in a similar construction schedule and required workforce, and the regional and local study area would provide adequate construction and operational employees for the Dry Cooling Alternative and cumulative development projects. While these projects would combine to increase the demand for localized transient lodging and

potentially permanent housing in the local study area, a large number of hotel/motel rooms are available and local study area vacancy rates indicate ample permanent housing is available to those operational employees choosing to relocate locally to the site. Therefore, the Dry Cooling Alternative would not contribute to adverse cumulative socioeconomic impacts.

C.8.6.3 CEQA LEVEL OF SIGNIFICANCE

Induce Substantial Population Growth

As discussed above in subsection C.8.6.2, and similar to the proposed GSEP, impacts resulting from this alternative to socioeconomics would be less than significant.

C.8.7 NO PROJECT/NO ACTION ALTERNATIVES

There are three No Project/No Action Alternatives evaluated in this section, as follows:

NO PROJECT/NO ACTION ALTERNATIVE #1

No Action on Genesis Solar Energy Project application and on CDCA land use plan amendment

Under this alternative, the proposed Genesis Solar Energy Project would not be approved by the CEC and BLM and BLM would not amend the CDCA Plan. As a result, no solar energy project would be constructed on the project site and BLM would continue to manage the site consistent with the existing land use designation in the CDCA Land Use Plan of 1980, as amended.

Because there would be no amendment to the CDCA Plan and no solar project approved for the site under this alternative, it is expected that the site would continue to remain in its existing condition, with no new structures or facilities constructed or operated on the site. As a result, the socioeconomics impacts of the GSEP and the gross public benefits, including capital costs, construction and operation payroll and sales taxes, would not occur at the proposed site. However, the land on which the project is proposed would become available to other uses that are consistent with BLM's land use plan, including another solar project requiring a land use plan amendment. In addition, in the absence of this project, other renewable energy projects may be constructed to meet State and Federal mandates, and those projects would have similar impacts in other locations

NO PROJECT/NO ACTION ALTERNATIVE #2:

No Action on Genesis Solar Energy Project and amend the CDCA land use plan to make the area available for future solar development

Under this alternative, the proposed Genesis Solar Energy Project would not be approved by the CEC and BLM and BLM would amend the CDCA Land Use Plan of 1980, as amended, to allow for other solar projects on the site. As a result, it is possible that another solar energy project could be constructed on the project site.

Because the CDCA Plan would be amended, it is possible that the site would be developed with the same or a different solar technology. As a result, it is expected that

the socioeconomics impacts and the gross public benefits, including capital costs, construction and operation payroll and sales taxes, from the construction and operation of a different solar project would likely be similar to the socioeconomic impacts and benefits from the proposed project. As such, this No Project/No Action Alternative could result in socioeconomic impacts and benefits similar to the impacts under the proposed project.

NO PROJECT/NO ACTION ALTERNATIVE #3:

No Action on Genesis Solar Energy Project application and amend the CDCA land use plan to make the area unavailable for future solar development

Under this alternative, the proposed Genesis Solar Energy Project would not be approved by the CEC and BLM and the BLM would amend the CDCA Plan to make the proposed site unavailable for future solar development. As a result, no solar energy project would be constructed on the project site and BLM would continue to manage the site consistent with the existing land use designation in the CDCA Land Use Plan of 1980, as amended.

Because the CDCA Plan would be amended to make the area unavailable for future solar development, it is expected that the site would continue to remain in its existing condition, with no new structures or facilities constructed or operated on the site. As such, this No Project/No Action Alternative would not result in socioeconomics impacts nor would it provide the gross public benefits, including capital costs, construction and operation payroll and sales taxes from the proposed project. However, in the absence of this project, other renewable energy projects may be constructed to meet State and Federal mandates, and those projects would have similar impacts in other locations.

C.8.8 CUMULATIVE IMPACT ANALYSIS

C.8.8.1 POPULATION AND EMPLOYMENT

Section B.3, Cumulative Scenario, provides detailed information on the potential cumulative solar and other development projects in the project area. Together, these projects comprise the cumulative scenario which forms the basis of the cumulative impact analysis for the proposed project. In summary, these projects are:

- Renewable energy projects on BLM, State, and private lands, as shown on **Cumulative Figure 1** and in **Cumulative Tables 1A and 1B.** Although not all of those projects are expected to complete the environmental review processes, or be funded and constructed, the list is indicative of the large number of renewable projects currently proposed in California.
- Foreseeable future projects in the immediate area, as shown on **Cumulative Impacts Figure 2, I-10 Corridor Existing and Future/Foreseeable Projects, and Cumulative Tables 2 and 3**. Table 2 presents existing projects in this area and Table 3 presents future foreseeable projects in the I-10 Corridor Area. Both tables indicate project name and project type, its location and its status.

These projects are defined within a geographic area that has been identified by the CEC and BLM as covering an area large enough to provide a reasonable basis for evaluating cumulative impacts for all resource elements or environmental parameters. Most of these projects have, are, or would be required to undergo their own independent environmental review under CEQA and/or NEPA. Even if the cumulative projects described in Section B.3 have not yet completed the required environmental processes, they were considered in the cumulative impacts analyses in this SA/Draft EIS.

Geographic Extent

The area of cumulative effect for socioeconomic resources is Riverside and San Bernardino Counties, CA and La Paz County, AZ. The analysis of cumulative effects considers a number of variables including geographic (spatial) limits, time (temporal) limits, and the characteristics of the resource being evaluated. The geographic scope of cumulative impact analysis is based on the workforce boundaries of the cumulative development projects. While it is possible that the geographic scope of cumulative effects would extend beyond these three counties, with some workers potentially coming from adjacent counties beyond a two-hour commute radius of the proposed GSEP site, due the similar nature of skill set required by the workforce during construction activities, as well as the number of proposed cumulative renewable energy projects, it is not anticipated that the geographic scope for cumulative impact analysis extent beyond the scope of the direct and indirect effects of the proposed action.

Cumulative Impact Types

The GSEP cumulative analysis will separately assess cumulative impacts of the following two categories of cumulative projects:

- Existing cumulative conditions
- Future foreseeable projects

Effects of Past and Present Projects

A wide variety of past and present development projects contribute to the cumulative conditions for socioeconomics. As shown in **Cumulative Table 2** and in **Cumulative Impacts Figure 2, I-10 Corridor Existing and Future/Foreseeable Projects**, nine projects are ongoing or recently completed in immediate area around the proposed GSEP site and as shown in **SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE Table 2**, Riverside County population is estimated to have grown by 43 percent between the years 2000 and 2010. Riverside County's growth has resulted in the generation of jobs, revenue, housing, and public services. The projects shown in **Cumulative Table 2** largely represent development intended to meet the demand of Riverside County's increased population.

Effects of Reasonably Foreseeable Future Projects

Socioeonomics are also expected to be affected by the following reasonably foreseeable future projects as follows: a number of large electrical generation and distribution infrastructure development projects are proposed along the I-10 corridor (as

shown in **CUMULATIVE IMPACTS Figure 1** and **CUMULATIVE IMPACTS Table 3**); and solar and wind applications proposed on approximately 1,000,000 acres of BLM land in the California Desert District Planning Area as well as a large number of electrical generation and distribution infrastructure development projects proposed on non-federal land in the I-10 corridor (as shown in **CUMULATIVE IMPACTS Table 1b**, **CUMULATIVE IMPACTS Figure 1,** and **CUMULATIVE IMPACTS Table 1a**).

Contribution of the Genesis Solar Energy Project to Cumulative Impacts

Construction. The construction of the GSEP is expected to result in short term adverse impacts related to construction activities. It is expected that some of the cumulative projects described above which are not yet built may be under construction the same time as the GSEP. As a result, there may be adverse short term impacts during construction of those cumulative projects related to socioeconomics.

The GSEP would be expected to contribute only a small amount to the possible short-term cumulative impacts related to socioeconomics. Foreseeable development in the project area includes primarily renewable energy electrical generation and transmission infrastructure projects. With the large number of renewable energy projects occurring within the GSEP regional study area, it is possible that some overlap of construction phasing could occur between the GSEP and the cumulative development projects. **SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE Table 4** present the most recently published data (Year 2006-2016) on labor force characteristics for the GSEP regional study area. As discussed above, staff concludes that the required construction workforce of the proposed GSEP would be found locally, with no cumulative contribution to population inmigration that would increase the local population. Therefore, because the local labor force would adequately serve construction and operation of the GSEP, it would not contribute to cumulative increases in population that would generate an increase in demand for local housing and public services. However, a large influx in construction labor to the area could create demand for temporary housing that is greater than the existing supply.

All cumulative projects identified in **CUMULATIVE IMPACTS Tables 1a, 1b, 2** and **3** would be expected to draw on the large regional construction workforce in Riverside/San Bernardino/Ontario MSA, the State of Arizona, and likely extending to the Los Angeles County MSA. In the event an influx of construction workers occurred within the area as a result of the large renewable energy projects being constructed, due to the temporary duration of construction activities it is assumed these construction workers would choose to stay at a local area motel or hotel and not permanently relocate to the area. There are approximately 630 hotel/motel rooms and suites among 11 different establishments in the City of Blythe area serving the GSEP site and local study area, with extensive additional available temporary housing in the communities within 2 hours of the proposed project site serving the regional study area. Therefore, due to the availability of temporary and permanent housing to both the regional and local labor force associated with both the GSEP and cumulative development within the GSEP geographic extent for cumulative impacts, the GSEP would not contribute to cumulative increases in demand for local housing. Despite the potential for construction

schedule overlaps with known projects within the proposed GSEP study area, Staff concludes construction of the GSEP would not contribute to adverse cumulative socioeconomic impacts.

In addition, short-term construction-related spending activities of the GSEP project are expected to have cumulative economic benefits for the study area (refer below to **SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE Table 8**). The cumulative benefits would increase when revenues accrued as a result of the proposed GSEP are combined with spending, and any local revenues accrued as a result of current and future reasonably foreseeable cumulative development projects.

Operation. The operation of the GSEP is not expected to result in long-term adverse impacts during operation of the project related to socioeconomics. It is expected that some of the cumulative projects described above may be operational at the same time as the GSEP. However, the GSEP would be expected to contribute only a small amount to these possible long-term operational cumulative impacts related to socioeconomics. **SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE Table 5** present the most recently published data (Year 2006-2016 projections) on labor force characteristics for the GSEP regional study area. As discussed above, Staff concludes that the required operational workforce of the proposed GSEP would be found locally, with no cumulative contribution to population inmigration occurring that would increase the local population. Therefore, because the local labor force would adequately serve construction and operation of the GSEP, it would not contribute to cumulative increases in population that would generate an increase in demand for local housing and public services.

Based on the most recently published vacancy rates for both the regional and local study areas (refer to **SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE Tables 2** and **3**), a large number of permanent housing units are available to any operational employees who may choose to relocate locally and regionally to proposed cumulative development projects. Despite the potential for construction schedule overlaps with known projects within the proposed GSEP study area, Staff concludes operation of the GSEP would not contribute to adverse cumulative socioeconomic impacts.

In addition, the long-term operation-related spending activities of the GSEP project are expected to have cumulative economic benefits for the study area (refer below to **SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE Table 8**). The cumulative benefits would increase when revenues accrued as a result of the proposed GSEP are combined with spending, and any local revenues accrued as a result of current and future reasonably foreseeable cumulative development projects.

Decommissioning. The decommissioning of the Genesis Solar Energy Project is expected to result in adverse impacts related to socioeconomics similar to construction impacts. It is unlikely that the construction or decommissioning of any of the cumulative projects would occur concurrently with the decommissioning of this project, because the decommissioning is not expected to occur for approximately 30 years. As a result, there may not be impacts related to socioeconomics during decommissioning of the Genesis Solar Energy Project generated by the cumulative projects. Therefore, the effects of decommissioning on land use are not expected to be adverse.

C.8.9 COMPLIANCE WITH LORS

As the GSEP and all proposed alternatives would be located entirely within BLM lands, no private land would be affected and therefore, the provisions of Education Code Section 17620 would not apply to this alternative. Therefore, the GSEP and all proposed alternatives, as proposed, are consistent with applicable Socioeconomic LORS, as identified in **SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE Table 1**.

C.8.10 NOTEWORTHY PUBLIC BENEFITS

Important public benefits discussed under the fiscal and non-fiscal effects section are O&M capital expenditures, construction payroll, and annual property and sales taxes. **Socioeconomic Table 8** provides a summary of economic benefits of the GSEP.

SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE Table 8
Noteworthy Public Benefits
Related to Genesis Solar Energy Project

Fiscal Benefits	
Estimated annual property taxes	$627,000 per year (If the California property tax exemption for solar systems is not renewed when it expires during the 2015-2016 fiscal year, property taxes could be approximately $10,455,000)
State and local sales taxes: Construction	$1.3 million
State and local sales taxes: Operation	$44,000 per year
Non-Fiscal Benefits	
Total capital costs	$1,000 million
Construction payroll	$165 million
Operations payroll	$6 million
Construction materials and supplies	$14.5 million
Operations and maintenance supplies	$0.5 million per year
Direct, Indirect, and Induced Benefits	
Estimated Direct Employment	
Construction	An average of 646 jobs per month
Operation	40 to 50 full-time jobs
Estimated Secondary Employment	
Construction	446 jobs
Operation	124 jobs
Estimated Secondary Income	
Construction	$26.8 million
Operation	$3.0 million

C.8.11 PROPOSED CONDITIONS OF CERTIFICATION/MITIGATION MEASURES

No conditions of certification/mitigation measures are required as all potential socioeconomic impacts associated with the proposed GSEP and alternatives would be less than significant.

C.8.12 CONCLUSIONS

No significant adverse socioeconomics impacts would occur as result of the construction or operation of the proposed GSEP project. Staff believes the GSEP would not cause a significant adverse direct, indirect, or cumulative impact on population, housing, or public services. In addition, because there would be no adverse project-related socioeconomic impacts, minority and low-income populations would not be disproportionately impacted. The proposed GSEP would benefit the local and regional study areas in terms of an increase in local expenditures and payrolls during construction and operation of the facility, as well as a benefit to public finance and local economies through taxation. These activities would have a positive effect on the local and regional economy.

C.8.13 REFERENCES

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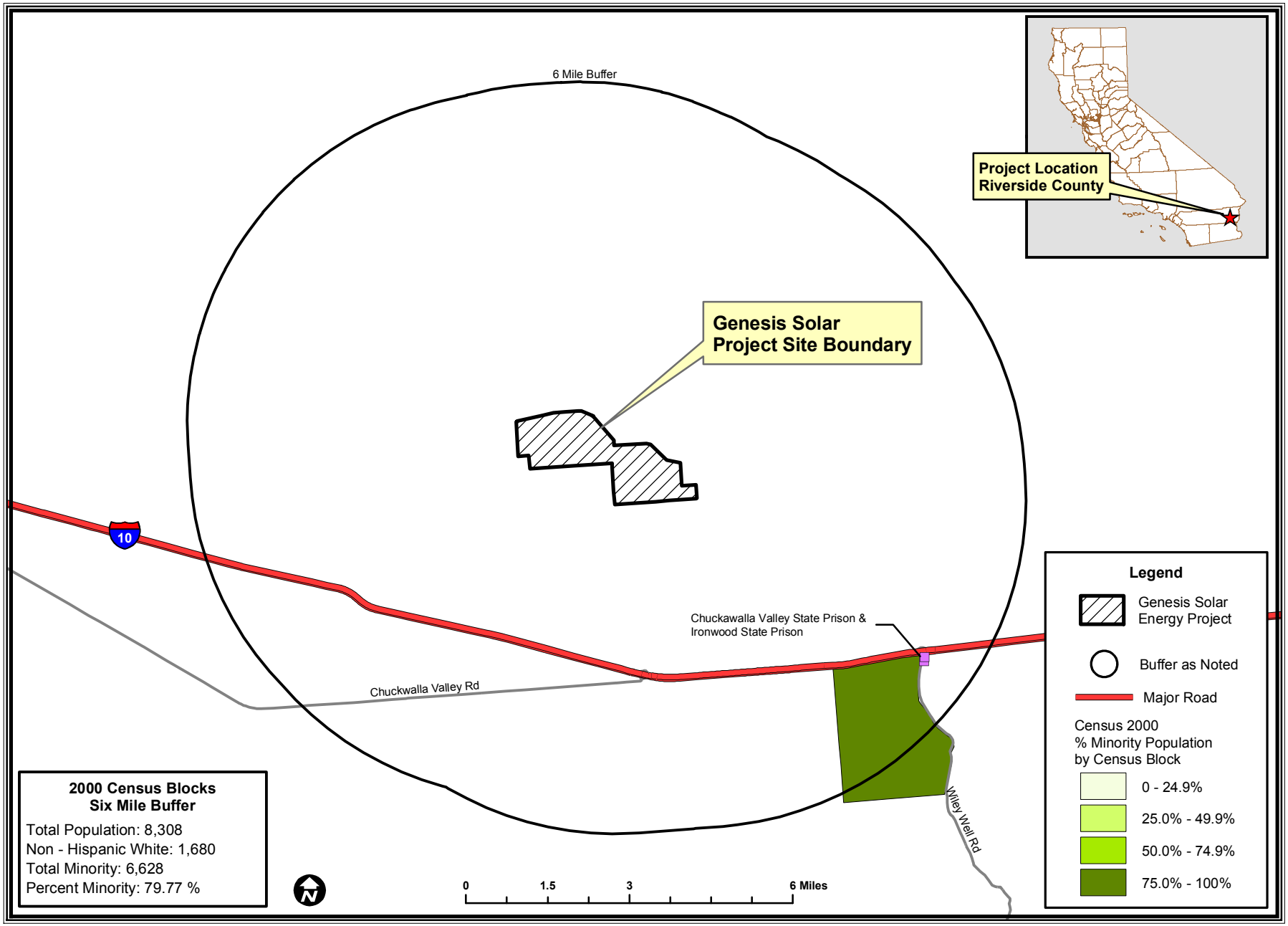
SOCIOECONOMICS - FIGURE 1

Genesis Solar Energy Project - Census 2000 Minority Population by Census Block - Six Mile Buffer

MARCH 2010



SOCIOECONOMICS

CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION, MARCH 2010

SOURCE: Tetratech - Census 2000 PL 94-171 Data - Matrix PL2

C.9 - SOIL AND WATER RESOURCES

Testimony of Michael Donovan P.G., C.Hg., Michael Daly P.E.,
Andrew Collison, Ph.D. and John Thornton P.E.

C.9.1 SUMMARY OF CONCLUSIONS

With the information provided to date, the Bureau of Land Management (BLM) and California Energy Commission staff (hereafter jointly referred to as staff) have determined that construction, operation, and decommissioning of the proposed Genesis Solar Energy Project (GSEP) could potentially impact soil and water resources. Where these potential impacts have been identified, staff has proposed mitigation measures to reduce identified impacts to levels that are less than significant. The mitigation measures, as well as specifications for laws, ordinances, regulations and standards (LORS) conformance, included herein as conditions of certification, address the California Environmental Quality Act (CEQA) requirements for the Energy Commission's analysis and BLM's needs for a National Environmental Policy Act (NEPA) analysis. With implementation of the water entitlement or offset measures identified by staff, the Project would conform to all applicable LORS. Staff's conclusions based on analysis of the information submitted to-date are as follows:

1. The proposed Project would be located on an alluvial fan where flash flooding and mass erosion could impact the Project. Project-related changes to the alluvial fan hydrology could result in impacts to adjacent land users. A Draft Drainage, Erosion, and Sedimentation Control Plan (DESCP) has been developed to mitigate the potential storm water and sediment project-related impacts. However, the calculations and assumptions used to evaluate potential storm water and sedimentation impacts are imprecise and have limitations and uncertainties associated with them such that the magnitude of potential impacts that could occur cannot be determined precisely. Based on these factors, the proposed Project could result in impacts that would be significant with respect to CEQA significance criteria specified herein and the Council on Environmental Quality Regulations for Implementing the Procedural Provisions of the NEPA (CEQ NEPA Regulations) significance criteria specified in 40 CFR 1508.27. Therefore, Conditions of Certification have been developed that define the requirements for reports, plans, monitoring, and inspection, as well as standards and procedures for implementing Best Management Practices during construction and operations.

2. The proposed Project would be located in an area with no designated entity responsible for maintaining integrity of the rerouted channels. Staff believes the applicant should be required to establish a Channel Maintenance Program as indicated in Condition of Certification **SOIL&WATER-13**.

3. The proposed Project would have an impact on levels of groundwater in the Chuckwalla Valley Groundwater Basin (CVGB). However, the calculations and assumptions used to evaluate potential groundwater level impacts are imprecise and have limitations and uncertainties associated with them such that the magnitude of potential impacts that could occur cannot be determined precisely. To ensure that the Project's proposed use of groundwater does not significantly impact the

groundwater levels in the CVGB, staff believes the Applicant should be required to develop a monitoring program and identify what changes are occurring in basin water levels. Substantial changes to groundwater levels caused by the proposed Project and other pumping in the basin would be documented by this monitoring, and a mitigation and reporting program would be required in accordance with Conditions of Certification **SOIL&WATER-3**, **-4**, **-5,** and **-20**.These measures, along with mitigation identified in the Biological Resources section of this Staff Assessment that could be required for impacts to groundwater-dependent vegetation that may occur, will be sufficient to ensure that significant impacts related to changes in groundwater levels do not occur.

The cumulative impact analysis indicates that groundwater extraction during construction and operation of this and other foreseeable projects would place the basin into an overdraft condition. This impact may be exacerbated by other unidentified renewable energy projects in the I-10 corridor, which has been targeted as a potential area for further renewable energy development. However, the amount of water in storage in the basin greatly exceeds the amount of cumulative overdraft, rendering the project's contribution to this cumulative impact less than cumulatively considerable.

Finally, the cumulative effects may indirectly impact the adjacent Palo Verde Mesa Groundwater Basin inducing underflow from the Colorado River. To mitigate the project's contribution to impacts to the Colorado River, the applicant must complete **SOIL&WATER-15** that would require mitigation to ensure that impacts to the Lower Colorado River do not occur.

4. The applicant has proposed to use groundwater for wet cooling when other feasible technologies are available. Staff believes the proposed use of groundwater for wet cooling would not comply with the state's water policies. To address this inconsistency with state water policy, staff recommends implementation of Condition of Certification **SOIL&WATER-18** that would require the project owner to reduce the proposed water use through a project design change(s) and/or through a water conservation program.

5. The applicant has proposed the use of evaporation ponds as the preferred method of wastewater disposal. Staff believes potential impacts related to the use of evaporation ponds to dispose of the industrial wastewater could be mitigated through effective application of state and local LORS. However, this method of wastewater disposal is not consistent with the Energy Commission's policy that encourages the use of zero liquid discharge (ZLD) systems that are designed to eliminate wastewater discharge and inherently conserve water. Therefore, staff finds that this method of wastewater disposal does not comply with the state's water policies. As discussed above, to, address this inconsistency with state water policy, staff recommends implementation of Condition of Certification **SOIL&WATER-18**

The state has expressed a strong interest in developing its solar energy resources. However, the construction and operation of solar energy facilities requires the use of water, which state policy also protects. The Energy Commission must balance the state's interest in promoting solar energy development with its interest in conserving and

protecting the state's water resources. Several projects currently proposed for the Mojave and Colorado deserts would use water for power plant cooling, which staff believes is contrary to the state's long term interest in maximizing solar power generation and minimizing adverse environmental impacts. This will be an especially critical issue in the renewable development areas that will be identified in the Desert Renewable Energy Conservation Plan (DRECP). Later this year, staff plans to file a request for an Order Instituting an Informational Proceeding to address this issue.

Completion of staff's analysis of the proposed Project is subject to the following:

- A finding by the U.S. Army Corps of Engineers of whether the ephemeral drainages on the Project site are jurisdictional waters of the U.S. Without this determination, staff cannot determine whether the Project would comply with Section 404 of the Clean Water Act.

C.9.2 INTRODUCTION

The proposed action evaluated within this Staff Assessment (SA)/Draft Environmental Impact Statement (DEIS) is the construction and operation of the Genesis Solar Energy Project (GSEP, referred to herein as the Project), a proposed solar-thermal electricity generation facility located on public lands administered by the BLM in Riverside County, California. The SA/DEIS represents a joint environmental analysis document developed by the Energy Commission and BLM to evaluate potential impacts associated with the proposed action.

Genesis Solar, LLC, a Delaware limited liability company and wholly owned subsidiary of NextEra Energy Resources, LLC, (herein referred to as the Applicant or owner), proposes to construct, own, and operate the Project. The Project consists of two independent solar electric generating facilities with a nominal net electrical output of 125 megawatts (MW) each, for a total net electrical output of 250 MW. The solar steam generators receive heated transfer fluid from solar thermal equipment comprised of arrays of parabolic mirrors that collect energy from the sun.

The Project proposes to use a wet cooling tower for power plant cooling. Water for cooling tower makeup, process water makeup, and other industrial uses such as mirror washing would be supplied from onsite groundwater wells. Project cooling water blowdown will be piped to lined, onsite evaporation ponds.

The Applicant has applied for a right-of-way (ROW) grant from the BLM for approximately 4,640 acres of flat desert terrain. Once constructed, the Project would permanently occupy approximately 1,800 acres in the eastern portion of the ROW (the Project footprint), plus approximately 90 acres of linear facilities. The remainder of the acreage in the ROW application is not anticipated to be needed for the Project.

This SA/DEIS examines engineering, environmental, public health and safety aspects of the proposed Project, based on the information provided by the applicant and other sources available at the time the SA/DEIS was prepared. The SA/DEIS contains analyses similar to those normally contained in an Environmental Impact Report (EIR)

required by CEQA, as well as analyses required for an EIS prepared under CEQ NEPA Regulations.

C.9.3 METHODOLOGY AND THRESHOLDS FOR DETERMINING ENVIRONMENTAL CONSEQUENCES

Significance criteria are based on those listed in CEQA Appendix G. Hydrology and water resources impacts would be significant if the project would:

- violate any water quality standards or waste discharge requirements.
- substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted).
- substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation onsite/offsite.
- substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding onsite/offsite,
- create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff.
- otherwise substantially degrade surface water or groundwater quality
- place structures within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map.

C.9.4 PROPOSED PROJECT

Water to supply the Project will be derived from a minimum of two groundwater supply wells located near each unit's power block area. The Project well field will also include a sufficient number of standby wells to provide the Project with water in the event the primary wells are shut down for maintenance. As currently planned, the wells will pump groundwater from the Bouse Formation and/or the underlying Fanglomerate within the Chuckwalla Valley Groundwater Basin. The Bouse Formation occurs at a depth of approximately 260 feet below ground surface (bgs) at the site and extends to approximately 2,050 feet bgs, and the Fanglomerate is inferred to extend from approximately 2,050 to 2,950 feet bgs. On a preliminary basis, the wells are proposed to pump groundwater from below 800 feet bgs.

Construction activities for a single 125 MW unit are expected to take place over a period of approximately 25 months with a 12-month delay between the start of construction for Unit 1 and the start of construction for Unit 2, for a total anticipated construction period

of 37 months. It is anticipated that water use during this period will be from on-site groundwater using the production wells that will be installed for the Project. It is anticipated that water usage for the construction period will proceed along the following schedule:

- Average water usage during earthwork (Month 1 to Month 5): 1.7 million gallons per day (mgd),
- Average water usage during post earthwork phase (Month 6 to Month 37: 0.55 mgd.
- Peak water usage: 3 mgd
- Total construction water demand: approximately 2,440 acre feet over approximately 3 years (1 acre-foot equals 325,851.429 gallons).

Initial construction water usage will be in support of site preparation and grading. Subsequent to Month Five of construction, water usage will be in support of dust suppression and normal construction water requirements that are associated with construction of the buildings, power block, and solar array.

The Project proposes to use a wet cooling tower for power plant cooling. Water for cooling tower makeup, process water makeup, and other industrial uses such as mirror washing will be supplied from selected onsite groundwater wells. Water from the on-site wells also will be used to supply nonpotable water for employees (*e.g.,* showers, sinks, toilets). A water treatment system will be used to treat the groundwater pumped for domestic use.

The average total annual water usage for each 125 MW power plant is estimated to be about 822 acre-ft/ yr, or 1,644 acre-ft/yr for the entire Project, which corresponds to an average daily flow rate of about 1,000 gallons per minute (gpm) and is presented in **Soil and Water Table 1**.

Soil and Water Table 1
Estimated Average and Peak Water Demand for GSEP

Water Use	Annualized Average Rate (gpm) (1)	Estimated Peak Rate (gpm) (2)	Estimated Annual Use (acre-feet)
Plant Operation			
125 MW Plant	500	2,013	822
125 MW Plant	500	2,013	822
Total Project	1,000	4,026	1,644

1) – The estimated groundwater usage in gallons per minute is based on an average daily consumption.
2) The peak rate is the instantaneous maximum for summer usage.

Usage rates will vary during the year and will be higher in the summer months when the peak maximum daytime usage rate could be as high as about 2,013 gpm for each 125 MW power plant, or about 4,026 gpm for the Project. However, assuming that the makeup operates at a constant flow rate throughout the night and day, then the makeup flow rate can be averaged. **Soil and Water Table 2** represents the average makeup flow rate (gpm) by month as well as the acre-feet per month for the total Project.

Soil and Water Table 2
Makeup Water Flow Rates for Total Project

Flow	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
gpm (average)	360	404	982	1,192	1,640	1,814	1,598	1,436	1,126	852	426	322
Acre-Feet	49.2	49.8	134.4	157.8	224	240	220	196.4	149.2	116.6	56.4	44.2

Source: Derived from WPAR, 2009.

C.9.4.1 SETTING AND EXISTING CONDITIONS

The Project is located between the communities of Blythe, California (approximately 25 miles east) and Desert Center, California (approximately 27 miles west) and is presented in **Soil and Water Figure 1**.

The Project site is located in the Mojave Desert Geomorphic Province. The Mojave Desert is a broad interior region of isolated mountain ranges separated by expanses of desert plains. It has an interior enclosed drainage and many playas. There are two important fault trends that control topography—a prominent NW-SE trend and a secondary east-west trend (apparent alignment with Transverse Ranges is significant). The Mojave province is wedged in a sharp angle between the Garlock Fault (southern boundary Sierra Nevada) and the San Andreas Fault, where it bends east from its northwest trend. The northern boundary of the Mojave is separated from the prominent Basin and Range by the eastern extension of the Garlock Fault.

Physiography

The Project Site lies on a broad, relatively flat, southward sloping surface dominantly underlain by alluvial deposits derived from the Palen Mountains to the north and the McCoy Mountains to the east. The alluvial deposits have created two distinct landform types and several discernable landform ages. The deposits immediately adjacent to the mountains have formed alluvial fans from multiple identifiable sources, and multiple fan surfaces have coalesced into a single bajada surface that wraps around each of these mountain fronts. Between the bajada surfaces from each mountain chain is a broad valley-axial drainage that extends southward between the mountains and drains to the Ford Dry Lake playa, located about 1 mile south of the Site (WPAR, 2009).

The elevation of Chuckwalla Valley ranges from under 400 feet at Ford Dry Lake to approximately 1,800 feet above mean sea level (msl) west of Desert Center and along the upper portions of the alluvial fans that ring the valley flanks. The surrounding mountains rise to approximately 3,000 and 5,000 feet msl.

The Site itself is relatively flat and generally slopes from north to south with elevations of approximately 400 to 370 feet msl. It is occupied by a community of low creosote and bursage scrub vegetation.

Climate and Precipitation

The climate in the Chuckwalla Valley, which is classified as a “low desert,” is characterized by high aridity and low precipitation. The region experiences a wide variation in temperature, with very hot summer months with an average maximum

temperature of 108 degrees Fahrenheit (ºF) in July and cold dry winters with an average minimum temperature of 66.7 ºF in December. The Blythe area receives an average of approximately 3.5 inches of rainfall per year. The majority of the rainfall occurs during the winter months, but rainfall during the late summer is not uncommon. The summer rainfall events tend to be a result of tropical storms that have a short duration and a higher intensity than the winter rains. Annual precipitation ranges from 0.02 to 0.47 inches per month for a total average annual precipitation of just under four inches per year. **Soil and Water Table 3** and **Soil and Water Table 4** display the average monthly and annual minimum and maximum temperatures and precipitation (rainfall) from 1913 to 2008 collected from the Blythe Airport, located approximately 35 miles southeast of the Project site.

Soil and Water Table 3
Climate Temperature Data for Blythe Airport, California

	Temperatures °F					Mean Number of Days			
	Monthly Averages			Record Extremes		Max. Temp.		Min. Temp.	
Month	Daily Max.	Daily Min.	Monthly	Record High	Record Low	90°F & Above	32°F & Below	32°F & Below	0°F & Below
Jan	66.7	41.5	54.1	89	20	0	0	2.7	0
Feb	72	45.4	58.7	93	22	0.2	0	0.8	0
Mar	78.4	50.2	64.3	100	30	3.1	0	0.1	0
Apr	86.4	56.5	71.5	107	38	11.6	0	0	0
May	95.2	64.4	79.8	114	43	23.8	0	0	0
Jun	104.5	72.7	88.6	123	46	29	0	0	0
Jul	108.4	81	94.7	123	62	30.9	0	0	0
Aug	106.6	80.2	93.4	120	62	30.6	0	0	0
Sep	101.3	73	87.2	121	51	28.4	0	0	0
Oct	89.8	60.9	75.3	111	27	17.6	0	0	0
Nov	75.8	48.6	62.2	95	27	0.8	0	0.1	0
Dec	66.7	41.2	53.9	87	24	0	0	1.8	0
Year	87.7	59.6	73.6	123	20	175.9	0	5.5	0
Source: Western Regional Climate Center (WRCC) 2009.									

Soil and Water Table 4
Precipitation Data for Blythe Airport, California

	Rainfall (inches) [1913-2008]			
Month	Mean	Highest Month	Lowest Month	Highest Daily
Jan	0.47	2.48	0	1.64
Feb	0.44	3.03	0	1.66
Mar	0.36	2.15	0	1.52
Apr	0.16	3	0	2.67
May	0.02	0.22	0	0.22
Jun	0.02	0.91	0	0.91
Jul	0.24	2.44	0	1.4
Aug	0.64	5.92	0	3
Sep	0.37	2.14	0	1.9
Oct	0.27	1.89	0	1.61
Nov	0.2	1.84	0	1.04
Dec	0.39	3.33	0	1.42
Year (1)	3.59	---	---	3
Notes: (1) Totals may not match the data in specific columns due to rounding errors. Source: WRCC, 2009.				

Monthly evapotranspiration rates average from 1.5 inches/month during the winter months to over 9 inches per month in the summer. Total yearly average evapotranspiration rates range from 60 to 70 inches/year. **Soil and Water Table 5** presents average monthly evapotranspiration rates for various stations located in the region.

Soil and Water Table 5
Monthly Average Evapotranspiration (ETo) Rates

Month	CIMIS Station #127 Station: Salton Sea West	CIMIS Station #128 Station: Salton Sea East	CIMIS Station #135 Station: Blythe NE	CIMIS Station #151 Station: Ripley	CIMIS Station #162 Station: Indio	CIMIS Station #175 Station: Palo Verde II	Regional
Jan (in/mo)	2.40	2.40	2.32	2.44	2.44	2.41	1.55
Feb (in/mo)	3.20	3.20	3.09	3.31	3.31	3.23	2.52
Mar (in/mo)	5.13	5.13	5.00	5.25	5.25	5.59	4.03
Apr (in/mo)	6.78	6.78	6.61	6.85	6.85	7.22	5.70
May (in/mo)	8.62	8.62	8.54	8.67	8.67	8.78	7.75
Jun (in/mo)	9.18	9.18	9.69	9.57	9.57	9.42	8.70
Jul (in/mo)	9.19	9.19	10.13	9.64	9.64	9.58	9.30
Aug (in/mo)	8.63	8.63	8.91	8.67	8.67	8.61	8.37
Sep (in/mo)	6.97	6.97	6.85	6.85	6.85	6.58	6.30
Oct (in/mo)	5.22	5.22	4.64	5.00	5.00	4.74	4.34
Nov (in/mo)	3.08	3.08	2.95	2.95	2.95	2.94	2.40
Dec (in/mo)	2.25	2.25	2.07	2.20	2.20	2.25	1.55
Year (in/yr)	70.65	70.65	70.8	71.4	71.4	71.35	62.50

Notes: Regional evapotranspiration values correspond to CIMIS Reference ETo Zone 16, which includes Westside of San Joaquin Valley and Mountains East & West of Imperial Valley.
Source: Solar Millennium2010a and CIMIS, 2010.

Soils

The USDA soil survey classified the soil on site as typical durorthids, loamy-skeletal, mixed, hyperthermic, and shallow (Cherioni series), and typical torripsamments, mixed, hyperthermic (Rositas series). The following are descriptions of the two main soil series at the Project site (GSEP, 2009a)

Cherioni Series

The Cherioni series consists of very shallow and somewhat excessively drained soils that formed in slope alluvium on volcanic bedrock. Cherioni soils are on fan terraces or hills and have slopes of 0 to 70 percent. Cherioni soils somewhat excessively drained; have medium to rapid runoff; and moderate permeability. The soils are often used for livestock grazing. Vegetation commonly found associated with these soils includes creosotebush, paloverde, saguaro, cholla, ocotillo, triangleleaf bursage, and ratany (GSEP, 2009a).

Rositas Series

The Rositas series consists of very deep, somewhat excessively drained soils formed in sandy eolian material. Rositas soils are on dunes and sand sheets. Slopes range from 0 to 30 percent with hummocky or dune micro relief. Mean annual precipitation is about four inches and the mean annual air temperature is about 72 ºF. The soils are reported

to be somewhat excessively drained; have negligible to low runoff; and rapid permeability (GSEP, 2009a). Rositas soils are used for rangeland and wildlife habitat. Present vegetation is creosotebush, white bursage, desert buckwheat, and mesquite.

Soil and Water Figure 2 shows the soils present at the Project site using the NRCS.

Geology

The Project site is situated within the central portion of Chuckwalla Valley, an east-southeast trending valley in California's Mojave Desert Geomorphic Province. The Mojave Desert Geomorphic Province is a wedge-shaped interior region separated from the Sierra Nevada and Basin and Range Provinces to the northwest by the Garlock Fault and its eastward extensions, and is bounded to the southwest by the Transverse Range and Colorado Desert Provinces, the San Andreas Fault, and its southern extensions. The Mojave Desert Geomorphic Province is characterized by northwest-southeast as well as east-west trending structures and mountain ranges, separated by desert valleys and plains with many enclosed drainages and playas.

Regional & Local Geology

The region has a complex geologic history that includes sedimentation, volcanic activity, folding, faulting, uplift, and erosion. The project area is underlain by Holocene to Miocene basin fill deposits (Stone, 2006). These deposits include younger alluvium, older (Pleistocene) alluvium, the Pliocene Bouse Formation, and the Miocene Fanglomerate. The uppermost alluvium in the basin consists of Holocene to Pleistocene alluvial fan, valley axial (fluvial), playa (dry lake), and Aeolian (wind blown) deposits. **Soil and Water Figure 3** presents the surficial geology of the Project site.

Quaternary Alluvium

Quaternary alluvial fill in the basin consists of Holocene to Pleistocene alluvial fan and valley axial (fluvial or stream) deposits, as well as lacustrine (lake) and playa (ephemeral lake) deposits (CDWR, 2004). These deposits consist of gravel, sand, silt, and clay (CDWR, 1963). In general, coarser alluvial fan deposits are expected near the valley edges and grade into finer distal fan deposits that interfinger with fine-grained lacustrine and playa deposits near the center of the basin. These deposits are typically heterogeneous. Valley axial drainages tend to be more uniform and continuous, and contain a greater proportion of sand and fine gravel. Portions of the basin are also occupied by aeolian (wind blown) sand deposits, but the identified aeolian deposits occur at the ground surface and are of limited thickness. The Quaternary sediments include the Pleistocene-age Pinto Formation, which consists of coarse fanglomerate (cemented, consolidated, or semiconsolidated alluvial fan gravels) containing boulders and lacustrine clay with some interbedded basalt (CDWR, 2004).

Pliocene Bouse Formation

The Pliocene Bouse Formation underlies the Quaternary sediments. The Bouse Formation includes a marine to brackish-water estuarine sequence deposited in an arm of the proto-Gulf of California (Stone, 2006; Wilson and Owen-Joyce, 1994). This formation has alternatively been interpreted as, or may include, lacustrine sediments deposited in a closed, brackish basin (Stone, 2006). The Bouse Formation is widely

reported in the Colorado Valley and tributary basins in southeastern California and descriptions of this formation come from occurrences outside of Chuckwalla Valley. It is reported to be composed of a basal limestone (marl) overlain by interbedded clay, silt, sand, and tufa. The top of the Bouse Formation is relatively flat-lying with a reported dip of approximately 2 degrees south of Cibola (Metzger and others, 1973).

Miocene Fanglomerate

The Bouse Formation is unconformably underlain by a fanglomerate composed chiefly of angular to subrounded and poorly sorted partially to fully cemented pebbles with a sandy matrix (Metzger and others, 1973). The Fanglomerate is likely Miocene-age; however, it may in part be Pliocene-age (Metzger and others, 1973). The Fanglomerate represents composite alluvial fans built from the mountains towards the valley and the debris of the Fanglomerate likely represents a stage in the wearing-down of the mountains following the pronounced structural activity that produced the basin and range topography in the area (Metzger and others, 1973). Bedding surfaces generally dip from the mountains towards the basin. The Fanglomerate reportedly dips between 2 and 17 degrees near the mountains due to structural warping (Metzger and others, 1973). The amount of tilting indicates a general decrease in structural movements since its deposition (Metzger and others, 1973).

Bedrock

Bedrock beneath the Project site consists of metamorphic and igneous intrusive rocks of pre-Tertiary age that form the basement complex (CDWR, 1963), including Proterozoic schist and gneiss, Paleozoic sedimentary rocks, and Mesozoic sedimentary and metavolcanic rock sequences (Stone, 2006). In some areas of the Chuckwalla Valley, volcanic rocks of Tertiary age overlie the basement complex (CDWR, 1963). The bedrock topography in the study area, as interpreted by modeling of Bouger gravity data obtained from USGS and interpreted by Worley-Parsons (2009b), is illustrated in **Soil and Water Figure 4**.

Mapped Geologic Units at the Project Site

The Project site lies on a broad, relatively flat, sloping surface underlain by alluvial deposits derived from the Palen Mountains to the north and the McCoy Mountains to the east. These alluvial deposits have created two distinct landform types and several discernable landform ages. The deposits immediately adjacent to the mountains have formed alluvial fans from multiple identifiable sources, and multiple fan surfaces have coalesced into a single bajada surface that wraps around each of these mountain fronts. Between the bajada surfaces from each mountain chain is a broad valley axial drainage that extends southward between the mountains and drains to the Ford Dry Lake playa, located about 1 mile south of the Project site. The Project site itself is relatively flat and generally slopes from north to south with elevations of approximately 400 to 370 feet msl. It is occupied by a community of low creosote and bursage scrub vegetation.

Three lines of evidence have been used to describe the shallow geological conditions underlying the Project site. First, geophysical investigations conducted at the Project site indicate the electrical conductivity of the underlying sediments (an indicator of the amount of fine-grained sediment and salinity of the groundwater) is consistent and similar across the Project site area. Second, seismic refraction profiling suggests the

shallow alluvium has similar properties across the Project site. Third, site-specific subsurface investigations demonstrated the Project site is underlain by alluvium consisting of interbedded and intermixed dense sand and gravel, and hard silt and clay to a depth of approximately 245 to 275 feet below ground surface (bgs), which is approximately 125 feet msl. These sediments are heterogeneous both laterally and vertically, although the valley axial alluvium beneath the eastern portion of the Project site may contain cleaner sands than sediments underlying the bajada surfaces, and laterally may be more homogenous.

Groundwater occurs within the shallow alluvium at a depth of approximately 70 to 90 feet bgs. Beneath the alluvium, the Pliocene Bouse Formation is estimated to extend to approximately 2,000 feet bgs (approximately -1,500 feet msl), and is generally richer in fine-grained sediments than the overlying alluvium. The Miocene fanglomerate is inferred to underlie the alluvium at this depth and is estimated to extend to approximately 2,900 feet bgs (-2,400 feet msl).

A map presenting the surficial geology in the Project site area is presented as **Soil and Water Figure 5**. In developing this map, alluvial sediment units established by the USGS (Stone, 2006) have been adopted, with modifications, as summarized in **Soil and Water Table 6**, and described in greater detail below.

Soil and Water Table 6
Mapped Surficial Geologic Units

Map Unit	Inferred Age	Descriptive Name
Qyva	Post-Holocene	Younger Valley Axial Alluvial Deposits
Qyma	Post-Holocene	Younger Mixed Alluvial and Aeolian Deposits
Qyaf	Late Holocene	Younger Alluvial Fan Deposits
Qiaf	Mid-Holocene	Intermediate Alluvial Fan Deposits
Qoaf	Late Pleistocene	Older Alluvial Fan Deposits

Younger Valley Axial Alluvial Deposits (*Qyva*). Alluvial deposits in the valley axial drainage that underlie the majority of the eastern part of the Project site are characterized by a north-south trending fabric aerial photographs and possess a generally subdued bar and swale topography at ground level. These deposits represent the distal end of a northeast to southwest-trending valley axial drainage which lies between the Palen and McCoy Mountains and terminates at Ford Dry Lake. Very few small washes are continuous across the eastern part of the Project site.

The valley axial deposit surfaces display local incipient desert pavement development, and no carbonate accumulation in the soil. Surface morphology is a subdued bar and swale morphology generally lacking water erosional features and indicative of a depositional surface. Evidence of competing wind erosion, including lag deposits and small mounds next to bushes, was also noted; however, the dominant processes appear to be alluvial. The morphology and lack of soil development are consistent with depositional surfaces that are at most a few hundred years old, and suggest a prograding alluvial apron.

Subsurface stratification observed in the top 12 to 18 inches of these deposits consists of silty sand deposits in the downslope portions of the Project site, which is consistent

with the formation of silt crusts after sheet floods. Also observed were cross-bedded silty sand beds about 8 to 10 cm thick and massive silty sand with gravel just upslope of the Project site. The recurrence interval of floods leaving these deposits is not known. Floods reaching Ford Dry Lake and filling the lakebed are reported to occur about once every 10 years. If each of these beds represents 10 years of accumulation, they would be indicative of deposition rates of 1 meter (m)/1,000 years in the downslope portions of the Project site and up to 10 times that in the upslope portions of the Project site. However, beneath the upslope portions of the Project site that are closer to the fan intersection points, the locus of deposition would be more likely to change from one flood event to the next, so the deposition rates are probably less.

Younger Mixed Alluvial and Aeolian Deposits (*Qyma*). Between the Project site and Ford Dry Lake, the alluvial fan and valley axial alluvium deposits described above grade into a mixture of deposits consisting of distal alluvial deposits, sand and silt sheet flood deposits, and interspersed aeolian sand sheets and local small coppice dunes. These deposits are generally located south of the Project site boundaries, but underlie much of the alignment of the off-site linears associated with the Project.

Younger Alluvial Fan Deposits (*Qyaf*). Similar to the Palen Mountains, the downslope extent of the Pleistocene-age, relict alluvial fan surfaces at the foot of the McCoy Mountains appear to mark the same type of intersection point on the fans in this area. However, the aerial photographs of this area suggest the bajada surface downslope of the McCoy Mountains has a more pronounced bar and swale topography, is generally lighter in color, and has more developed (or preserved) distributary channel development extending to the lower reaches of this surface. In addition, the presumed ancient shoreline feature that trends across the Qiaf surfaces downslope of the Palen Mountains (see description below) is not discernible across these fans, and appears to have been covered by deposition during the late Holocene. The Qyaf deposits consist of silty sands and gravelly silty sands, with generally finer-grained gravel than the upslope deposits.

Intermediate Alluvial Fan Deposits (*Qiaf*). The downslope extent of the Pleistocene terraces at the foot of the Palen Mountains marks the “intersection point” of the fans in this area. Downslope of these points, the incised (and confined) washes emerge from an erosional setting and transition into a depositional mode with fan lobes, subdued bar and swale topography, and shallow distributary washes, all of which are consistent with a distal fan environment. These lower fan deposits exhibit a darker color than the adjacent valley axial (Qyva), aeolian (Qyma), or playa (not mapped) deposits.

Desert pavement is present, but its development is not as extensive, and the individual clasts that comprise the pavement do not exhibit the same degree of desert varnish development as the upslope, and older, alluvial fan surfaces. The intermediate fan deposits consist of silty sands and gravelly silty sands, with generally finer-grained gravel than the upslope deposits.

A linear feature visible on an aerial photograph is discernible in **Soil and Water Figure 5** (marked as Ancient Shoreline) based on a change from a rougher, lighter-colored and more dissected surface (on its north side) to a darker, smoother surface (on its south side). This lineament extends across the bajada surface in an east-west direction

approximately along the 400 foot msl elevation contour. The photo lineament disappears in the lighter-colored valley axial deposits that underlie the majority of the eastern portion of the Project site. To the west of the Project site, where the 400 foot contour trends southward across the valley floor, the lineament also disappears. However, similar features can be observed at approximately the same elevation on the south side of Chuckwalla Valley (*i.e.,* south of I-10), and on the south flank of the McCoy Mountains (north of I-10).

A plausible explanation for this feature consistent with the above observations is the preservation of an ancient shoreline developed during a pluvial lake highstand of Ford Dry Lake. The potential validity of this interpretation will be further investigated during future reconnaissance and reported to Energy Commission. Shoreline features related to pluvial lake highstands are widely reported elsewhere in the southwestern United States, where they record the influence of wetter climates during the last glacial Maximum of the latest Pleistocene (approximately 17,000 to 10,000 years before present [BP]), as well as Holocene glacial oscillations approximately 8,300 years BP (early Holocene), 6,400 years BP (mid-Holocene), and 4,000 years BP (early Neoglacial) (Castiglia and Fawcett, 2006; Enzel et al., 1989; Briggs, 2003; and Wells, McFadden and Dohrenwend, 1986). More recent standing lakes were reported for short periods in some arid basins in the Mojave Desert during cooler, wetter intervals approximately 200 and 600 years BP, and during particularly wet periods in recorded history, such as 1916 to 1917, 1938 to 1939, and 1969. Based on the moderate degree of desert pavement development on these fan surfaces and slight to moderate desert varnish development on the pebble surfaces, it is estimated the lake highstand theorized to be responsible for this relict shoreline feature would have occurred during the mid-Holocene, at least 4,000 years ago (Elvidge and Iverson, 1983).

If the presumed ancient shoreline can be verified, this would suggest the intermediate alluvial fan deposit surfaces at the Project site have been in a state of relative equilibrium (undergoing little erosion or sedimentation) for the last 4,000 years.

Older Alluvial Fan Deposits (*Qoaf*). The upper and middle alluvial fan surfaces, located north of, and upslope from, the western portion of the Project site, consist of coarse to medium grained sandy gravels and gravelly sands and are extensively dissected by deep washes that are up to 1/4 mile wide and over 50 feet deep in the proximal fan areas. Between these incised washes, the remnant alluvial fan surfaces are covered by well-developed desert pavement with nearly 100 percent stone cover, dark brown to nearly black desert varnish, and carbonate deposition on the lower sides of the clasts. The desert pavement development is consistent with a Pleistocene surface age and these remnant fan surfaces were mapped as late Pleistocene by Stone (2006). These remnant fan surfaces extend largely unbroken (between the incised washes) into the upslope portions of the western parcel of the Project site and northwestern-most corner of the eastern parcel.

Regional Tectonic Setting

The Mojave Desert comprises an area bounded by the seismically active Salton Trough to the west and southwest, and the Garlock Fault to the north. To the east and southeast it is bounded by the Sonoran Desert subprovince, a relatively stable tectonic

region located in southeastern California, southwestern Arizona, southern Nevada, and northern Mexico (Balderman, et al., 1978). Chuckwalla Valley is located in the eastern Mojave Desert province in an area that is relatively stable tectonically. Faults in the area occur primarily in Tertiary and pre-Tertiary strata and are related to compressional tectonism along a convergent Andean and island arc margin in the Mesozoic, and extensional detachment and block faulting during Tertiary time. No faults of Quaternary age are known to exist near the Project site.

Local Faulting

The Project site lies within the eastern part of Riverside County in a part of California considered to be not very seismically active. Although there are several bedrock faults off-site in the mountains surrounding Chuckwalla Valley, these do not exhibit recent activity and are presumed to be Tertiary or pre-Tertiary in age (Stone, 2006). In addition, gravity anomalies suggest the presence of several subsurface faults beneath Chuckwalla Valley in the vicinity of the project area (Stone, 2006; Rotstein, et al., 1976). The gravity anomalies reflect abrupt changes in basement elevation strongly suggestive of dip-slip movements. In addition, some of these faults may have undergone right-lateral strike slip movements. These faults are presumed Tertiary and likely inactive with very low chance of earthquakes.

Geomorphology

The Project Site lies on a broad, relatively flat, southward sloping surface dominantly underlain by alluvial deposits derived from the Palen Mountains to the north and the McCoy Mountains to the east. The alluvial deposits have created two distinct landform types and several discernable landform ages. The deposits immediately adjacent to the mountains have formed alluvial fans from multiple identifiable sources, and multiple fan surfaces have coalesced into a single bajada surface that wraps around each of these mountain fronts. Between the bajada surfaces from each mountain chain is a broad valley-axial drainage that extends southward between the mountains and drains to the Ford Dry Lake playa, located about 1 mile south of the Site. The Site itself is relatively flat and generally slopes from north to south with elevations of approximately 400 to 370 feet msl (WPAR, 2010).

The ground surface in this area slopes very gently to the southwest, toward Ford Dry Lake, at inclinations of approximately 1/2 percent. Landforms include alluvial and sand plains, local coppice dunes, and local subdued bar and swale topography associated with sheet flood deposits. East of Ford Dry Lake, the off-site linears cross the distal portions of a valley axial drainage that enters Ford Dry Lake from the east. The ground surface in this area slopes westward at less than 1/2 percent and the alluvial and the aeolian plain in this area includes similar landforms as described above (WPAR, 2010).

The proposed development exists within the Mojave Desert Geomorphic Province. Geomorphic provinces are naturally defined geologic areas with a distinct landscape or landform resulting primarily from their predominant underlying geologic structure. The southeast portion of this province, where the Project site is located, is physiographically part of the Sonoran Desert, which includes the lower Colorado River region of southeastern California and extends into southern Arizona. The Mojave Desert Geomorphic Province exists within the larger Basin and Range Geomorphic Province

(BRGP), with which it shares a strikingly similar geologic history and resulting geomorphology. For the purposes of this site evaluation, the use of the term BRGP will include the Mojave Desert Geomorphic Province. The geomorphology of the BRGP is dominated by mountains and valleys produced during dramatic tectonic extension in the western and southwestern United States primarily during the mid to late Tertiary (Nelson, 1981; Armstrong, 1982; Rehrig, 1982; Hamilton, 1982; Anderson, 1988; Wernicke, 1992).

The Project site exists within the distal fan portion of a series of alluvial fans and bajadas flanking the east side of the Palen Mountains to the north and northwest of the Project site, and the southwestern side of the McCoy Mountains to the northeast (Plate 1). The piedmont bajadas merge within an approximately northward trending axial valley between the Palen and McCoy Mountains (referred to herein as the Palen-McCoy Valley) that terminates in Ford Dry Lake. Topographically, the area of the proposed Project solar array and linear facilities are relatively flat, with an approximately 0.3 degree southwest slope and exhibits surficial sediments composed of silty sands with lesser amounts of fine grained gravel. The Project site exhibits relatively thin alluvium, relict dune and current drainage deposits overlying older alluvium across most of the site above an elevation of 377 feet msl (See report in Appendix A). Below an elevation of approximate 377 feet msl, the thin layer of alluvium, relict dune and current drainage deposits overly latest Pleistocene lacustrine deposits.

The aerial extent of aeolian activity is moderately less than during past regional dune aggradational events. This can be seen on **Soil and Water Figure 6**, where unit Qsr (relict dune fields) extends beyond the northern boundary of the primary sand migration corridor from Palen Lake through the Ford Dry Lake area, and south of the Project solar arrays. In addition, considerable near surface Qsr deposits are identified within interdune regions of mapped aeolian sand migration corridors (mapped unit Qsad on **Soil and Water Figure 6**). For the most part, the same sand migration corridors that were active during past dune aggradational events within the Chuckwalla Valley region are still the primary pathways of sand migration.

Active aeolian sand migration in the Project site vicinity occurs within existing sand migration corridors located south of the Project site and linears (the PDL-Chuckwalla Valley Axis Sand Corridor), and east of the Project site and Ford Dry Lake (the Palen-McCoy Valley Sand Corridor). The vast majority of sand moving within the Palen-McCoy Valley Sand Corridor passes east of the proposed solar array, and a relatively minor component migrates within the easternmost portion of the proposed solar array (see WPAR, 2010 - Plate 14 — Photos A, B, and C).

The aeolian sand migration within the eastern-most area of the proposed Project solar array has two sources. These include sand derived from the local small ephemeral washes within the footprint of the proposed facility soon after they flow, and from southward migrating sand moving down the Palen-McCoy Valley Sand Corridor. Based on field mapping, aerial photograph evaluation and evidence that the onsite drainages flow infrequently (estimated to be approximately every 20 years and likely associated with relatively large El Nino events) the aeolian sand derived from the onsite drainages represents a very small component of the total aeolian sand within the Palen-McCoy Valley Sand Corridor system. In addition, the amount of wind-blown sand passing

through the eastern-most portion of the proposed Project solar array represents a very minor component to the total aeolian sand migrating in the Palen-McCoy Valley Sand Corridor. Based on the existing data, it is likely that the component of aeolian sand migrating through, or derived in, the eastern-most portion of the Project solar array site is less than 5 percent of the total wind blown sand migrating within the Palen-McCoy Valley Sand Corridor system.

Based on the existing data, the following conclusions may be made about the relative contribution of various aeolian sand sources and about sand migration in the region of the Project:

- The majority of the region of the proposed solar arrays is not located within aeolian sand migrating corridors and thus will not block wind blown sand within the Ford Dry Lake dune system.
- The southern and eastern-most regions of the proposed solar arrays are within the outer envelope of an aeolian sand migrating corridor but these regions experience a relatively minor magnitude of wind blown sand migration.
- The washes and surface areas within the proposed solar arrays and linears represent a very minor source of aeolian sand. Thus, proposed grading and development will not remove a significant source of aeolian sand and adversely affect mapped areas of active aeolian deposits.
- The PDL-Chuckwalla Valley Axis Sand Corridor is a major source of wind blown sand for the dune system located south of I-10. Thus, most of the aeolian migrating sand from the Palen Lake-Chuckwalla valley axis does not reach the Project.
- Ford Dry Lake proper is a minor to moderate source of aeolian sand for the region of the Project linears.
- The aeolian sand corridor along the eastern side of the Palen-McCoy Valley (**Soil and Water Figure 6**) is a major aeolian sand source feeding the dune system east of the solar array and linears. Over 95 percent of the migrating aeolian sand in the Palen-McCoy Valley sand corridor migrates east of the proposed Project. Thus, less than 5 percent of the migrating aeolian sand is estimated to be derived from the area within the proposed solar arrays.
- Local washes located along the rim of Ford Dry Lake proper represent a very minor source of aeolian sand to the regions bounding the linears and south of the solar arrays.

Hydrogeology

Groundwater Basins

The site is located within the CVGB (CDWR Basin No. 7-5), which has a surface area of 940 mi^2 (2,435 km^2) underlying Chuckwalla Valley (CDWR, 2004). The CVGB is an unadjudicated groundwater basin and owners of property overlying the basin have the right to pump groundwater from the basin for reasonable and beneficial use, provided that the water rights were never severed or reserved. In addition, groundwater production in the basin is not managed by an entity and no groundwater management plan has been submitted to the California Department of Water Resources.

The site location in the basin is shown on **Soil and Water Figure 7**. The CVGB is bounded by the consolidated rocks of the surrounding mountains. Three water-bearing Quaternary- and Tertiary-age sedimentary units overly non-water bearing bedrock in the CVGB (CDWR, 2004; DWR, 1963). DWR reports the maximum thickness of these deposits as about 1,200 feet in the CVGB (CDWR 1979); however, modeling of Bouger gravity data obtained from USGS suggest greater depths to bedrock exist in some parts of the basin (See **Soil and Water Figure 4**).

The CVGB is bounded upgradient by two other groundwater basins that include the eastern part of the Orocopia Valley (CDWR Basin No. 7-31) and Pinto Valley (CDWR Basin No. 7-6) groundwater basins and downgradient by the Palo Verde Mesa (CDWR Basin No. 7-5) Groundwater basin. A brief overview of the adjoining basins follows:

Eastern Orocopia Valley (7-31)

This basin underlies Orocopia Valley, northeast of the Salton Sea, in central Riverside County. It is bounded by impermeable rocks of the Cottonwood and Eagle Mountains on the north and of the Orocopia and Chocolate Mountains on the south (see **Soil and Water Figure 7)**. The basin is bounded by a section of the San Andreas fault zone and semi-permeable rocks of the Mecca Hills on the west and by a bedrock constriction on the east. The western portion of the valley drains westward toward the Salton Sea, but the eastern part drains eastward into Hayfield (dry) Lake and Chuckwalla Valley. Average annual precipitation ranges to 4 inches (CDWR, 2003).

Pinto Valley (7-6)

This groundwater basin underlies Pinto Valley in northern Riverside County (see **Soil and Water Figure 7)**. It is bounded by nonwater-bearing rocks of the Coxcomb Mountains on the east and northwest, the Pinto Mountains on the north, of the Eagle Mountains on the south, and the Hexie Mountains on the west (Bishop 1963; Jennings 1967). The valley is drained eastward by the Fried Liver, Smoketree, and Porcupine Washes (Jennings 1967). Average annual precipitation ranges to 6 inches (CDWR, 2003).

Palo Verde Mesa (7-39)

This basin underlies Parker Valley in eastern Riverside County (see **Soil and Water Figure 7)**. The basin is bounded by nonwater-bearing rocks of the Big Maria and Little Maria Mountains on the north, the McCoy and Mule Mountains on the west, the Palo Verde Valley on the east, and of the Palo Verde Mountains on the south (CDWR 1979; Jennings 1967). The northwest boundary and parts of the western boundary are drainage divides (Metzger 1973; Jennings 1967). The valley is drained by McCoy Wash to the Colorado River. Average annual precipitation ranges to 6 inches (CDWR, 2003).

Groundwater Inflow/Outflow

Natural groundwater recharge to the CVGB includes recharge from precipitation and subsurface inflow from the Pinto Valley Groundwater Basin to the northwest and the Orocopia Valley Groundwater Basin to the Southwest (CDWR, 2004; Eagle Crest, 2009). Underflow from the Cadiz Valley Groundwater Basin has also been hypothesized by DWR (2004); however, recent work has reportedly confirmed that the Cadiz Valley

Groundwater Basin does not contribute inflow to the CVGB (BV and WCC, 1998). CVGB also shares a boundary with the Ward Valley Groundwater Basin, but groundwater is not reported to flow across this boundary (Bedinger, et al., 1989). Other sources of recharge to the basin include agricultural return flow and return flow from treated wastewater disposal.

Recharge from Precipitation

In this part of California, almost all moisture from rain is lost through evaporation or evapotranspiration and runoff occurs principally during intense thunderstorms (RWQCB, 2006). Most recharge from precipitation occurs when runoff from the surrounding mountains exits bedrock canyons and flows across the coarse sediments deposited in the proximal portions of the alluvial fans that ring Chuckwalla Valley. To a lesser extent, recharge occurs from infrequent precipitation or runoff on the valley floor (CDWR, 2004). The area of the Chuckwalla Valley watershed encompasses Chuckwalla Valley (601,543 acres) and the surrounding bedrock mountains (258,825 acres), for a total area of approximately 860,368 acres. Available estimates of recharge in CVGB are variable and in some cases based on incomplete or incorrect data. DWR has not published an estimated recharge rate for the basin (CDWR, 2004). In 1986, Woodward Clyde calculated recharge from precipitation for the Chuckwalla Valley watershed to be 29,530 acre feet per year (afy) (Woodward Clyde, 1986). This equates to an average recharge rate of approximately 0.036 feet per year (0.4 inches). Woodward Clyde reported this number as approximately 12.8 percent of an average annual precipitation of 3.39 inches per year across the watershed; however, this was the average annual precipitation in Blythe at the time, and does not consider that the orographic effect of the surrounding mountains which results in precipitation rates of over 6 inches per year in the higher elevation portions of the watershed (Hely and Peck, 1964). In 1992, the average recharge to CVGB was reportedly estimated by BLM and the County of Riverside to be 5,540 to 5,600 afy based upon an assumed 10 percent infiltration of precipitation (Eagle Crest, 2009); however, this number evidently considered only a portion of the watershed as it would equate to an average annual precipitation depth of only about 1 inch per year across the watershed. Recent studies have demonstrated recharge rates for nearby desert basins ranging from approximately 3 to 5 percent of the total incident precipitation on the basin catchment area (Whitt and Jonker, 1998). A review of recharge studies in the arid southwest performed by USGS (2007b) cited a wide range of recharge rates, but rates in similar basins ranged from about 3 to 7 percent.

For this study, recharge from precipitation was estimated by overlaying isohyetal maps prepared by Hely and Peck on the Chuckwalla watershed boundaries and calculating the volume of average annual precipitation for each of four precipitation zones for the valley and bedrock portions of the watershed. Recharge was then estimated as 3, 5 and 7 percent of total incident precipitation and a reasonable lower bound recharge estimate was adopted. The calculated average annual precipitation volume for the CVGB watershed is 286,250 acre feet over an area of 822,259 acres. Recharge for the CVGB is estimated as a fraction of 3, 5 and 7 percent of total incident precipitation is therefore calculated to be 8,588, 14,313 and 20,038 afy, respectively.

An analysis of infiltration and runoff rates for the CVGB is provided in **Soil and Water Table 7.**

Based on the above analysis, approximately 36 percent of precipitation in the watershed falls on the bedrock areas that ring the watershed. This is significant because precipitation that falls on the valley floor is not expected to contribute consistently to recharge. Studies published by USGS report approximately 7 to 8 percent of precipitation falling on bedrock mountains in other arid basins goes to mountain front recharge (USGS, 2007).

This would amount to approximately 3 percent of the total precipitation that falls on the Chuckwalla Valley watershed. In the absence of more detailed study, 3 percent of total precipitation falling on the Chuckwalla Valley watershed (8,588 afy) is used as a reasonable lower bound estimate of recharge to the CVGB.

Subsurface Inflow

Underflow from the Pinto Valley Groundwater Basin has been calculated to be 3,173 afy (GeoPentech, 2003, Eagle Crest Energy Company, 2009). Inflow from the Orocopia Valley Groundwater Basin has been estimated to be 1,700 afy (LCA, 1981). CH2M Hill (1996) estimated the combined subsurface inflow from both basins to be 6,700 afy. However, recent studies by GeoPentech reportedly indicate that subsurface inflow from Orocopia Valley Groundwater Basin may be as low as several hundred afy. Therefore a combined subsurface inflow rate of 3,500 afy was assumed for both basins for water budget purposes.

Wastewater Return Flow

Chuckwalla State Prison was constructed approximately 7 miles southwest of the project site in 1988, and Ironwood State Prison became operational in 1994. The prisons use an unlined pond to dispose of treated wastewater, and a large percentage of this discharge is reported to infiltrate into the subsurface and recharge the CVGB. For the years 1998 through 2001, the California Department of Water Resources-Department of Planning and Local Assistance (CDWR-DPLA) reported that deep percolation of applied urban water in the Chuckwalla Planning Area (assumed to be wastewater return flow) was 500 to 800 afy (CDWR-DPLA, 2007).

Soil and Water Table 7
Estimated Runoff and Infiltration in Chuckwalla Valley Groundwater Basin

Layer (1)	Area (acres)	Mean Annual Precipitation (inches) (2)	Total Volume of Rainwater from Mean Annual Precipitation (AF)	Runoff Curve Classification (2)	Runoff Curve Number (2)	Runoff (%of Precipitation)	Total Annual Volume of Infiltration – Hely & Peck (AF)	Total Annual Volume of Infiltration (AF) based on 3% (3)	Total Annual Volume of Infiltration (AF) based on 5% (3)	Total Annual Volume of Infiltration (AF) based on 7% (3)
unit1-cw	30,303	5	12,626	Alluvium, Steep Slope	74	3.50%	442	379	631	884
	211,498	4	70,499	Alluvium, Flat Slope	69	2.00%	1,410	2,115	3,525	4,935
	41,073	3.5	11,980	Alluvium, Steep Slope	74	3.50%	419	359	599	839
	12,077	4	4,026	Alluvium, Steep Slope	74	3.50%	141	121	201	282
	910	4	303	Alluvium, Steep Slope	74	3.50%	11	9	15	21
	194	4	65	Alluvium, Steep Slope	74	3.50%	2	2	3	5
	81,233	5	33,847	Alluvium, Steep Slope	74	3.50%	1,185	1,015	1,692	2,369
bedrockchuckwalla	32,001	5	13,334	Mountains	93	29.10%	3,880	400	667	933
	21,456	5	8,940	Mountains	93	29.10%	2,602	268	447	626
	11,050	5	4,604	Mountains	93	29.10%	1,340	138	230	322
	109	5	46	Mountains	93	29.10%	13	1	2	3
	9,246	4	3,082	Mountains	93	29.10%	897	92	154	216
	10,042	4	3,347	Mountains	93	29.10%	974	100	167	234
	282	4	94	Mountains	93	29.10%	27	3	5	7
	3,480	4	1,160	Mountains	93	29.10%	338	35	58	81
	275	4	92	Mountains	93	29.10%	27	3	5	6
	90	4	30	Mountains	93	29.10%	9	1	2	2
	398	4	133	Mountains	93	29.10%	39	4	7	9
	316	4	105	Mountains	93	29.10%	31	3	5	7
	39,340	5	16,392	Mountains	93	29.10%	4,770	492	820	1,147
	194	5	81	Mountains	93	29.10%	24	2	4	6
unit3-cw	28,973	3	7,243	Alluvium, Flat Slope	69	2.00%	145	217	362	507
unit2-cw	198,558	3	49,640	Alluvium, Steep Slope	74	3.50%	1,737	1,489	2,482	3,475
bedrockchuckwalla	89,161	6	44,581	Mountains	93	29.10%	12,973	1,337	2,229	3,121
TOTALS	**822,259**	**---**	**286,250**		**---**	**---**	**33,436**	**8,588**	**14,313**	**20,038**

Notes:
(1) See Figure DR-S&W-179-1 in Solar Millennium, 2010a.
(2) From Hely & Peck, 1964. Based on a percent of Total Volume of Rainwater from Mean Annual Precipitation (Column 4).

Source: Derived from Solar Millennium 2010a.

According to authorities at the State prison complex (Lanahan, 2009), they indicated that approximately 600 afy of treated effluent recharges the basin. Recently published water budget information for the Eagle Crest Pumped Storage Project (Eagle Crest, 2009), indicates 795 afy of treated effluent are recharged by the prisons. An additional

source of wastewater return flow in the basin is approximately 36 afy from the Lake Tamarisk development near Desert Center (Eagle Crest, 2009).

Irrigation Return Flow

The amount of applied irrigation water that returns to recharge a groundwater basin depends on the soil, crop type, amount and method of irrigation, and climatic factors. Woodward Clyde (1986) reported an irrigation efficiency of 60 percent (return flow of 40 percent) for jojoba crops in Chuckwalla Valley. DWR-DPLA reported an irrigation efficiency of 72 percent (return flow of 28 percent) for subtropical crops in the Palen Detailed Analysis Unit (DAU) of the Chuckwalla Planning Area (CDWR-DPLA, 2007). In its water budget calculations for the Chuckwalla Planning Area in support of California Water Plan updates, DWR-DPLA calculated an irrigation return flow of approximately 9 to 11 percent for 1998, 2000 and 2001, respectively. A 10 percent return flow is a reasonable factor for deep percolation from irrigation in the basin, and was applied to the assumed agricultural and landscape water demand in the basin for the purposes of a water budget. Current pumpage associated with activities associated with irrigation return flow is estimated to be approximately 7,700 afy in the CVGB that includes 6,400 afy for agriculture, 215 afy for aquaculture pumping, and 1,090 afy for Tamarisk Lake (Worley-Parsons (2010). Return flows are calculated using the 10 percent or approximately 800 afy and included in Soil and Water Table-6.

Groundwater Demand/Outflow

Groundwater provides the only available water resource in Chuckwalla Valley. Designated and potential beneficial uses of groundwater in the basin include domestic, municipal, agricultural and industrial use (RWQCB, 2006). As such, groundwater demand is a significant contributor to basin outflow. Other sources of basin outflow include subsurface discharge to the Palo Verde Mesa Groundwater Basin, and evapotranspiration at Palen Lake.

Groundwater Demand

Current and historical groundwater pumpage in CVGB includes agricultural water demand, pumping for Chuckwalla and Ironwood State Prisons, pumping for the Tamarisk Lake development and golf course, domestic pumping, and a minor amount of pumping by Southern California Gas Company. In addition, historical pumpage included water supply for the Kaiser Corporation Eagle Mountain Mine. With the exception of pumping for Chuckwalla Valley and Ironwood State Prisons, most of the current groundwater pumping in the basin occurs in the western portion of the basin, near the town of Desert Center. Current pumpage is estimated to be approximately 7,756 afy in the western CVGB and 2,605 afy in the eastern basin WPAR, 2010 – Table 3-4). Agricultural production is limited to the western portion of the basin (Eagle Crest, 2009; DWR-DPLA, 2007 and 2009), with the exception of a relatively limited amount of acreage that is associated with the state prisons.

Subsurface Outflow

Subsurface outflow to Palo Verde Mesa Groundwater Basin was estimated by Metzger (1973) to be 400 afy. This calculation was based on a cross sectional profile of the boundary between the two basins derived using geophysical methods and regional data

regarding groundwater gradients and hydraulic conductivity. Woodward Clyde (1986) revised this estimate based on the results of pump testing at Chuckwalla State Prison and calculated the basin outflow to be 870 afy. Engineering Science (1990) updated this estimate to 1,162 afy, presumably as a result of return flow from prison wastewater disposal; however, the rationale for this adjustment was not provided. Using more recent gravity data, Wilson and Owens-Joyce (1994) found that the area through which discharge occurs is significantly more limited than previously thought due to the presence of a buried bedrock ridge. As a result, the most recent available water budget for the basin has adopted an outflow rate of 400 afy (Eagle Crest, 2009). For purposes of this analysis, staff has adopted the 400 afy as being representative of subsurface outflow from the CVGB.

Palen Lake Evapotranspiration

Regional groundwater flow and discharge mapping performed by USGS (Bedinger, et al., 1989) did not identify Palen Lake as an area where groundwater discharges at the ground surface. Nevertheless, groundwater elevation contour mapping suggests that groundwater may occur near the ground surface beneath approximately the northwestern 25 percent of Palen Lake. It is therefore possible that a portion of Palen Lake is operating as a wet playa. Groundwater levels beneath the southeastern portions of Palen Lake, and a small ancillary playa located approximately one mile southeast of Palen Lake, were reported by Steinemann (1979) as being 20 to 30 feet below ground level, suggesting that Palen Lake would be a dry playa at various times.

Review of aerial photography indicates what appears to be a relatively small area of dissected salt pan near the northern and western sides of the playa. Because the salt pan is dissected, it is not clear whether salt deposition is actively occurring or whether this material is residual deposition from surface water evaporation. Immediately northwest of Palen Lake, between Palen Lake and Desert Center-Rice Road, Pleistocene lake bed deposits crop out at the ground surface in the form of dissected, mesa-like prominences that are 5 to 10 feet high (CDWR, 1963). These deposits are capped with a layer of caliche and locally support scattered mesquite trees. There does not appear to be any other evidence of shallow groundwater or evapotranspiration visible in aerial photography.

Groundwater elevation contour mapping (Steinemann, 1989) suggests that groundwater may occur near the ground surface beneath approximately the northwestern 25 percent of Palen Lake. A well located approximately two miles north of Palen Lake is reported to be completed to a depth of 501 feet below the ground surface and has a ground surface elevation of 500 feet msl (WPAR, 2009a). A screened interval for the well is not reported. Groundwater levels in this well were reported to be approximately 20 to 25 feet below the ground surface (bgs) between 1932 and 1984. Given that the surface elevation at Palen Lake two miles to the south is approximately 460 feet msl, or 40 feet lower, it appears possible that groundwater levels are very close to the ground surface beneath the northern portion of the playa. In addition, DWR (1963) identified the presence of mesquite trees on low mesa-like promontories of Pleistocene lacustrine sediments at the northwest margin of Palen Lake playa, also suggesting the possible presence of relatively shallow groundwater. These data suggest it is possible that an area in the northern portion of Palen Lake is discharging groundwater by evaporation as

a wet playa. Groundwater levels beneath the southeastern portions of Palen Lake, and a small ancillary playa located approximately one mile southeast of Palen Lake, are 20 to 30 feet below ground level (Steinemann, 1989), indicating these are dry playa areas.

Review of aerial photography indicates an approximately 700-acre area of dissected salt pan in the northwest portion of the playa (Worley-Parsons, 2010). This feature is surrounded by an additional approximately 1,300 acres that show evidence of more limited surface salt accumulation. The extent of this area is visible in aerial imagery from November 2005, and was generally confirmed by a reconnaissance performed on December 10 and 30, 2009. Review of the historical progression aerial imagery (Worley-Parsons 2010**)** indicates no or limited salt accumulation in this area from 1996 through 2002, light salt accumulation in March of 2005, and the currently observed salt pan area in November 2005. This suggests that salt pan accumulation in the playa is episodic; however, seasonal, intermittent accumulation cannot be ruled out. Historical precipitation records indicate that 2005 rainfall in Blythe was approximately twice the long term annual average, with 5.10 inches occurring in January and February 2005 (WRCC, 2009), just before the March 2005 aerial photograph was taken. These storm events would be expected to have resulted in the accumulation of runoff in Palen Lake, and consequently in dissolution and re-crystallization of salt deposits during evaporation of surface water, and by wetting and subsequent drying of salt containing playa sediments. As such, these rainfall events are likely responsible for at least a portion of the observed salt accumulation; however, groundwater discharge by evaporation at the ground surface could also be responsible.

During a December 10, 2009 site visit by Worley-Parsons (2010), conditions at the northwestern edge of the playa were investigated. Intermittent salt deposits were observed to be located both in low lying areas and on the tops of low, dissected, mesa-like promontories of Pleistocene lacustrine sediments approximately three feet high that extend into the playa. Deposition of salt by groundwater evaporation at the surface would be expected to occur on the sides as well as the top of these promontories. The occurrence of salt deposits on the top, but not on the sides, suggests that these deposits are the result of salt dissolution from layers with elevated salt content and reposition as soil moisture evaporates at the ground surface. The shallow soil beneath the salt deposits was observed to be wetted to a depth of approximately three inches from a recent rain event, but underlying soil to depths of approximately one foot were observed to be generally dry. As such, evidence of salt deposition by evapotranspiration at the playa surface was not observed in this area during Worley-Parsons' reconnaissance (Worley-Parsons 2010).

Mesquite trees were observed in the area north of the playa, but wetland species or other species indicative of or dependant on shallow groundwater were not observed. Mesquite trees are typically thought to be associated with "shallow" groundwater; however, the term shallow should be understood in a relative sense—the depth to groundwater utilized by mesquite trees may be several tens of feet below the ground surface. This would be too deep to support groundwater discharge at the ground surface. Thus, the presence of mesquite is not necessarily indicative of discharging playas.

In December 2009, Worley-Parsons advanced two hand auger borings to approximately 10 feet bgs beneath the salt pan area in the northwest portion of the playa. The moisture content of the soil was observed to increase with depth in both borings, and free groundwater was encountered at a depth of approximately 8 feet below the playa salt pan surface in one of the borings. Subsurface soil encountered consisted of alternating layers clay/silt mixtures and sandy sediments. A depth of 2 to 3 meters is generally the maximum depth of free water documented beneath discharging playas. This suggests that groundwater could be shallow enough to discharge at the surface by capillary rise and evaporation to occur at least some of the time (Worley-Parsons, 2010).

Based on the above data, salt accumulation at Palen Lake is likely the result of dissolution and recrystallization of existing salt deposits during times of surface water inflow, as well as limited episodic and possibly seasonal or intermittent groundwater discharge. The rate of groundwater discharge in a wet playa is dependent on the depth to groundwater and magnitude of upward vertical gradients, the ability of subsurface materials to facilitate capillary rise, climatic conditions, and the presence and extent of free water, wetlands and salt pans on the playa surface (Tyler, 2005; Allen and Sharike, 2003). In general, groundwater discharge rates are highest when groundwater is shallow, temperatures are high, and when open water or wetlands are exposed at the playa surface.

Increased depth to groundwater, lower temperatures, the presence of coarse grained material that inhibits capillary rise, and the presence of salt pan (which increases albedo) tends to decrease groundwater discharge rates. Based on these factors, discharge of groundwater at Palen Lake appears to be limited based on the depth to groundwater (including absence of vegetation that indicates consistent shallow groundwater), the presence of coarse grained layers that limit capillary rise and the apparent intermittent or episodic nature of discharge.

Groundwater discharge rates were estimated based on reported groundwater discharge rates at other playas, the area of identified salt accumulation, and the evident episodic or intermittent nature of salt accumulation. Measured evapotranspiration rates at Franklin Lake Playa were used to form a basis for this estimate (Czarnecki, 1997). Franklin Lake Playa is a well developed and extensively characterized wet playa in the Death Valley area (USGS, 2007b). Evapotranspiration rates at Franklin Lake Playa are calculated to be 38 to 41 cm/year (1.3 to 1.4 feet/year) based on the Energy-Balance Eddy-Correlation method, which is reported to be the most reliable method by the USGS. WorleyParsons (WPAR, 2010a) suggested that these rates would be a conservative measure of evapotranspiration for active wet playa areas at Palen Lake for the following reasons:

- Franklin Lake Playa is a terminal playa, which is the terminal discharge point of the local groundwater flow system; whereas, Palen Lake is a bypass playa, with most groundwater flowing laterally past the playa.
- Franklin Lake Playa includes extensive groundwater discharge features (e.g., saltpan, puffy ground and halophyte wetlands) that are generally less developed or lacking at Palen Lake, indicating less groundwater discharge would be expected at Palen Lake.

- Evapotranspiration rates at wet playas are temperature dependent, with maximum rates occurring during the summer months. Franklin Lake Playa occurs in Death Valley, where mean annual and summer high temperatures typically exceed those at Palen Lake.
- The available data suggest that groundwater discharge, if it is occurring at Palen Lake, is episodic or intermittent; whereas groundwater discharge at Franklin Lake Playa occurs throughout the year.

The total area of potential groundwater discharge at Palen Lake is estimated to be approximately 2,000 acres, with salt pan occupying approximately 700 acres of this total. Based on a groundwater discharge rate that is approximately half that at Franklin Lake Playa, and is estimated to occur for three months every year, the total discharge rate would be approximately 0.175 feet of water per year. Over an area of 2,000 acres, this equates to approximately 350 afy. (WorleyParsons, 2010a)

Groundwater Budget

The perennial yield (the maximum quantity of water that can be annually withdrawn from a groundwater basin over a long period of time [during which water supply conditions approximate average conditions] without developing an overdraft condition.- CDWR, 1998) of CVGB was estimated to be between 10,000 and 20,000 afy (Hanson, 1992). A perennial yield of 12,200 afy was adopted in the EIS for the Eagle Crest Landfill project in 1992 (BLM and County of Riverside, 1992); however, the amount of recharge from precipitation used to derive this number appears to be based on recharge to only a portion of the basin, so the perennial yield may be underestimated.

A comprehensive water budget was compiled based on published literature, water budget information collected by the DWR for updates to the California Water Plan, information obtained from the California State Prison Authority, and the analysis of basin inflow and outflow discussed in the previous two sections. This information is summarized in **Soil and Water Table 8**, below.

Soil and Water Table 8
Groundwater Budget (afy)

Budget Components	Totals
Inflow	
Recharge from Precipitation	8,588
Underflow from Pinto Valley and Orocopia Valley Groundwater Basins	3,500
Irrigation Return Flow	800
Wastewater Return Flow	831
Total Inflow	13,719
Outflow	
Groundwater Extraction	-10,361
Underflow to Palo Verde Mesa Groundwater Basin	-400
Evapotranspiration at Palen Dry lake	-350
Total Outflow	-11,111
Budget Balance (Net Inflow)	2,608

The analysis suggests that the CVGB is in positive balance (inflow exceeds outflow) by approximately 2,600 afy under average conditions.

Water Bearing Units

The following water-bearing formations have been identified in the CVGB. The extent and relationship of these formations is presented in hydrostratigraphic cross sections A-A' and B-B' included as **Soil and Water Figures 8** and **9.** The location of the cross section is shown on **Soil and Water Figure 10**.

Quaternary Alluvium

Quaternary alluvial fill in the basin consists of Holocene to Pleistocene alluvial fan and fluvial (stream) deposits, as well as lacustrine (lake) and playa (ephemeral lake) deposits (CDWR, 2004). These deposits consist of gravel, sand, silt and clay (CDWR, 1963). In general, coarser alluvial fan deposits are expected near the valley edges and grade into finer distal fan deposits that interfinger with fine grained lacustrine and playa deposits near the center of the basin. These deposits are typically heterogeneous. Valley axial drainages tend to be more uniform and continuous, and contain a greater proportion of sand and fine gravel. Portions of the basin are also occupied by aeolian (wind blown) sand deposits, but the identified aeolian deposits occur at the ground surface and are of limited thickness. Therefore, they are not believed to be an important water bearing unit.

The majority of the Project site is underlain by a relatively thin veneer of active valley axial alluvial sediments that is in equilibrium (neither eroding or aggrading) and underlain at shallow depth by older alluvium with buried soil horizons (WorleyParsons, 2009b). A seismic shear wave profile investigation indicates that shear wave velocities are highest in a layer that occurs at about 20 to 30 feet below ground surface (bgs), which is consistent with the presence of carbonate cementation (JRA, 2009). Portions of the basin are also occupied by aeolian (wind blown) sand deposits, and these sediments increase in prevalence near Ford Dry lake and the area southeast of the Project site (DWR, 1963; WorleyParsons, 2009b). The identified aeolian deposits occur at the ground surface and are of limited thickness. The Quaternary sediments include the Pleistocene-age Pinto Formation, which consists of coarse fanglomerate (cemented, consolidated or semi-consolidated alluvial fan gravels) containing boulders and lacustrine clay with some interbedded basalt (DWR, 2004).

Pliocene Bouse Formation

The Pliocene Bouse Formation underlies the Quaternary sediments. The Bouse Formation includes a marine to brackish-water estuarine sequence deposited in an arm of the proto-Gulf of California (Metzger, 1968; Wilson and Owen-Joyce, 1994). This formation has alternatively been interpreted as, or may include, lacustrine sediments deposited in a closed, brackish basin (Stone, 2006). The Bouse Formation is widely reported in the Colorado Valley and tributary basins in southeastern California and descriptions of this formation come from occurrences outside of Chuckwalla Valley. It is reported to be composed of a basal limestone (marl) overlain by interbedded clay, silt, sand, and tufa. The top of the Bouse Formation is relatively flat lying with a reported dip of approximately 2 degrees south of Cibola (Metzger and others, 1973). The Bouse Formation in the CVGB is estimated to extend to approximately 2,200 feet bgs

(approximately -1,800 feet msl) beneath the site based on geophysical modeling (see WPAR, 2010 Figure 5). These unconsolidated to semi-consolidated sediments are reported to yield several hundred gallons per minute (gpm) to wells perforated in coarse grained units (Wilson and Owen-Joyce, 1994).

Miocene Fanglomerate

The Bouse Formation is unconformably underlain by a fanglomerate composed chiefly of angular to subrounded and poorly sorted partially to fully cemented pebbles with a sandy matrix (Metzger and others, 1973). The Fanglomerate is likely Miocene-age; however, it may in part be Pliocene-age (Metzger and others, 1973). The Fanglomerate represents composite alluvial fans built from the mountains towards the valley and the debris of the Fanglomerate likely represent a stage in the wearing down of the mountains following the pronounced structural activity that produced the basin and range topography in the area (Metzger and others, 1973). Bedding surfaces generally dip from the mountains towards the basin. The Fanglomerate reportedly dips between 2 and 17 degrees near the mountains due to structural warping (Metzger and others, 1973). The amount of tilting indicates a general decrease in structural movements since its deposition (Metzger and others, 1973). The Fanglomerate is estimated to extend to approximately 3,000 feet bgs (-2,600 feet msl) beneath the site based on geophysical modeling by Worley-Parsons (WPAR, 2009).

Bedrock

Bedrock beneath the site consists of metamorphic and igneous intrusive rocks of pre-Tertiary age that form the basement complex (CDWR, 1963). In some areas of the basin, volcanic rocks of Tertiary age overlie the basement complex (CDWR, 1963). These rocks are considered nonwater bearing. The bedrock topography in the study area as interpreted by modeling of Bouger gravity data obtained from USGS is illustrated in **Soil and Water Figure 4** The methods used to model the bedrock topography are discussed in more detail in Genesis Solar Energy Project Application for Certification Appendix D (Worley-Parsons, 2009).

Groundwater Occurrence and Movement

In general, groundwater flow in the basin is south-southeastward (**Soil and Water Figure 7**). Groundwater flow is directed southward from the basin's boundary with the Cadiz Valley Basin and east-southeastward from its boundary with the Pinto Valley Basin, toward the eastern basin boundary where it flows into the adjacent Palo Verde Mesa Basin (Steinemann, 1989). The groundwater gradient is the steepest in the western half of the basin and is nearly flat in the central portion of the basin (CDWR, 1963). Near Ford Dry Lake and east of Ford Dry Lake the gradient becomes steeper as groundwater approaches the narrows in the southeast portion of the basin (Steinemann, 1989; DWR 1963).

Groundwater levels exceed 500 feet msl in the western portions of the basin and fall to less than 275 feet msl near the eastern end of the basin in the narrows between the Mule and McCoy Mountains (Steinemann, 1989). Near Palen Lake, groundwater occurs near the ground surface, resulting in groundwater discharge by evapotranspiration at the land surface. Near Ford Dry Lake, groundwater is reported at depths of 50 feet below ground surface. Beneath the Project site, groundwater occurs at depths of

approximately 70-90 feet bgs (approximately 400 feet msl) based on site-specific investigation (WPAR, 2009a). **Soil and Water Figures 11 and 12** present groundwater level contours for 1963 and 1992, respectively.

The DWR reports that groundwater levels in the basin are generally stable (CDWR, 2004). **Soil and Water Figure 13** shows hydrographs for selected wells within the Chuckwalla Valley from 1950 to 2009. The wells selected to present the hydrograph data were chosen to present the most complete set of historic water level elevation data across the Chuckwalla Valley. The hydrographs show that the water level has been generally stable over the last 40 years in the eastern part of the basin. The hydrograph for well 7/20-18H1 in the eastern part of the basin shows a decrease in water level elevation occurred between 1985 and 1990. This well is associated with the Chuckwalla and Ironwood Prisons and the decline in water level is likely due to increased water use at the prisons. The hydrograph for well Township7S Range 18E-14H1 shows a slight (approximately 20 foot) increase in the water level between 1983 and 1992. This well and the three other wells at this location are associated with agriculture activities and the water level increase is likely due to the fallowing of the land.

Aquifer Characteristics

The basin fill sediments within the CVGB include three aquifers: the alluvium, the Bouse Formation, and the Fanglomerate. Groundwater in the alluvium likely occurs under unconfined conditions but could locally be semi-confined. Groundwater in the Bouse Formation and the Fanglomerate was reported to be under semi-confined to confined conditions based on stratigraphic data and storativity values derived from aquifer pumping tests at the GSEP (Worley-Parsons, 2010). However, the continuity of confining layers across the basin has not been established and may not be present as you progress toward the alluvial source areas away from the Ford Dry Lake area. **Soil and Water Table 9** summarizes the reported and estimated aquifer properties for these aquifers based on data from specific capacity tests and aquifer pumping tests performed on wells in the CVGB.

Groundwater Quality

Groundwater quality varies markedly in the basin. Groundwater in the western portion of the basin near Desert Center generally contains lower concentrations of total dissolved solids (TDS) than groundwater in the eastern, downgradient portion of the basin near Ford Dry Lake (Steinemann, 1989). Groundwater to the south and west of Palen Lake is typically sodium chloride to sodium sulfate-chloride in character (DWR, 2004). The detected concentrations of TDS in the basin ranges from 274 milligrams per liter (mg/L) to 8,150 mg/L with an average concentration of 2,100 mg/L (Steinemann, 1989). In general, the groundwater in the basin has concentrations of sulfate, chloride, fluoride, and dissolved solids too high for domestic use and concentrations of sodium, boron and dissolved solids too high for irrigation use (DWR, 1975). Several of the wells sampled in the basin contain high levels of fluoride and boron.

Reported water quality of samples collected from wells at the Site is presented in **Soil and Water Table 10**. This table indicates that water quality varies laterally and vertically in the area. Generally, water quality improves vertically with depth and laterally to the

south. Vertically, TDS concentrations are generally highest in the alluvium followed by the Bouse Formation and finally by the Fanglomerate.

Soil and Water Table 9
Aquifer Characteristics

Geologic Unit	Well ID	Well Depth	Specific Capacity (gpm/ft)	Transmissivity (gpd/ft)	Hydraulic Conductivity (ft day)	Storativity	Basis
Alluvium (Western Basin)	OW-2	---		224,400	100	0.05	Aquifer test near Desert Center (Eagle Crest Energy Company, 2009)
	CW-1 TO CW-4			56,000	50	0.05	Aquifer test of Eagle Mountain Iron Mine wells (Eagle Crest Energy Company, 2009)
				1,100-16,000	19.6-42	10^2-10^4	Aquifer test conducted for the PSPP
	Average			**74,000**	**53**	**0.05**	---
Bouse Formation (Eastern Basin)	TW-1	50		21,542	3 to 16		Aquifer test and lab analysis conducted for the GSEP Solar project
	3	957	5	10,000	4		Specific Capacity Test
	26	1,000	1.5	3,000	1		Specific Capacity Test
	29	985	1.6	3,200	1		Specific Capacity Test
	43	830	35	70,000			Specific Capacity Test
	Average			21,500	12 to 14		---
Bouse Formation/ Fanglomerate (Eastern Basin)	33	1,200	14.8	29,600	8	---	Specific Capacity Test
	34	1,200	26.7	53,400	14	---	Specific Capacity Test
	35	1,200	51.6	103,200	28	---	Specific Capacity Test
	36	1,200	15.6	31,200	8	---	Specific Capacity Test
	37	1,050	12.9	25,806	11	0.0002	Aquifer test conducted at State prison
	39	1,139	11.1	22,222	13	---	Specific Capacity Test
	40	1,200	10.3	20,600	5	---	Specific Capacity Test
	42	1,100	19.7	39,444	15	---	Specific Capacity Test
	Average			40,684	13	0.0002	---
Fanglomerate	14	982	2.6	5,200	14		Specific Capacity Test

Notes:
Sources include WCC, 1986; Eagle Crest, 2009; Worley-Parsons, 2009, Solar Millennium, 2010a.
Transmissivity from Specific Capacity Tests calculation by multiplying value by 2,000. for confined aquifers and by 1,500 for unconfined aquifers (Driscoll, 1986).

Soil and Water Table 10
Analytical Results for On-Site Groundwater Samples

Analyte / Well ID		TW-1	TW-1	TW-1	TW-1	OBS-2
Sample Collection Date		6/5/2009	7/9/2009	7/13/2009	7/16/2009	6/17/2009
Sample Depth (feet bgs) (1)		Whole Well	Whole Well	Whole Well	Whole Well	800
pH	pH units	7.9@23°C (2)	7.9@19°C	7.9@20°C	7.8@19°C	7.8@21°C
Total Hardness (calc as $CaCO_3$)	mg/L (3)	570	540	490	500	220
Specific Conductance (at 25°C)	µS/cm (4)	19,000	19,000	18,000	18,000	8,800
Total Dissolved Solids @ 180°C (TDS)	mg/L	9,500	10,000	9,500	8,900	5,000
Calcium	mg/L	160	-- (5)	--	--	66
Magnesium	mg/L	38	--	--	--	14
Sodium	mg/L	4,500	4,000	3,600	3,600	1,500
Potassium	mg/L	30	27	24	25	12
Bicarbonate Alkalinity (As $CaCO_3$)	mg/L	--	--	--	96	--
Carbonate Alkalinity (As $CaCO_3$)	mg/L	--	--	--	ND<10 (6)	--
Hydroxide Alkalinity (As $CaCO_3$)	mg/L	--	--	--	ND<10	--
Total Alkalinity (As $CaCO_3$ at pH 4.5)	mg/L	97	83	81	96	150
Chloride	mg/L	5,600	5,300	6,400	4,700	2,300
Sulfate as SO_4	mg/L	1,500	1,400	1,800	1,200	810
Fluoride	mg/L	4.6	6.2	4.6	4.7	1.1
Silica	mg/L	--	--	--	22	19
Dissolved Silica	mg/L	--	--	--	20	15
Sulfide	mg/L			--	ND<0.10	--
Nitrate (NO_3) – N	mg/L	ND<0.25	--	--	ND<0.25	0.5
Nitrite (NO_2) – N	mg/L	ND<0.63	ND<0.25	0.28	ND<0.50	ND<0.25
Total Phosphorus	mg/L	--	--	--	ND<0.10	--
Total Cyanide	mg/L	--	--	--	ND<0.005	--
Antimony	mg/L	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005
Arsenic	mg/L	0.024	0.023	0.027	--	0.0092
Barium	mg/L	0.03	0.028	0.027	0.028	0.033
Beryllium	mg/L	ND<0.004	ND<0.004	ND<0.004	ND<0.004	ND<0.004
Cadmium	mg/L	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005
Chromium	mg/L	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005
Cobalt	mg/L	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005
Copper	mg/L	ND<0.010	ND<0.010	ND<0.010	ND<0.010	ND<0.010
Iron	mg/L	1.4	--	--	--	0.46
Lead	mg/L	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005
Lithium	mg/L	--	--	--	1.4	--
Manganese	mg/L	0.065	--	--	--	0.029
Mercury	mg/L	ND<0.001	ND<0.001	ND<0.001	ND<0.001	ND<0.001
Molybdenum	mg/L	0.44	0.43	0.4	0.37	0.24
Nickel	mg/L	ND<0.010	ND<0.010	ND<0.010	ND<0.010	ND<0.010
Selenium	mg/L	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005
Silver	mg/L	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005
Thallium	mg/L	ND<0.002	ND<0.002	ND<0.002	ND<0.002	ND<0.002
Vanadium	mg/L	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005
Zinc	mg/L	ND<0.10	ND<0.10	ND<0.10	ND<0.10	ND<0.10

Notes:

1) bgs = below ground surface
2) °C = Celsius
3) mg/L = milligrams per liter
4) µS/cm - microsiemens per centimeter
5) -- = not analyzed
6) ND<0.10 = not detected above the noted laboratory reporting limit.

SOURCE: Derived from WPAR, 2009b.

Calculated TDS concentrations from borehole geophysical logging indicate TDS concentrations as high as 30,500 mg/L within finer grained units (silt and clay) in the alluvium decreasing to less than 5,000 mg/L TDS in more transmissive sediments in the Bouse Formation at depths of 800 to 900 feet bgs (see AFC Appendix D). Laterally, TDS concentrations in groundwater decrease south and southeast of the Site within all three water bearing units in the basin, and are lowest in the are south of I-10, as referenced in **Soil and Water Figure 14.**

Groundwater Wells in Proximity to the Proposed Project

An inventory of groundwater wells in the area was compiled from published literature, review of data from the National Water Information System (NWIS), and by obtaining well completion records from the DWR for wells registered in the eastern Chuckwalla Valley Groundwater Basin. A total of 50 wells were identified, the majority of which were reported by Worley-Parsons (2010) as abandoned or disused. Information regarding the completion depths, construction details, and status of these wells, to the extent available, is presented in **Soil and Water Table 11** and shown in **Soil and Water Figure 7.**

Surface Water Hydrology

The site is located within the Colorado River Basin, within the Chuckwalla Valley Drainage Basin. There are no perennial streams in Chuckwalla Valley. Chuckwalla Valley is an internally drained basin, and all surface water flows to Palen Dry Lake in the western portion of the valley and Ford Dry Lake in the eastern portion of the valley. Palen Dry Lake is a “wet playa” with significant shallow groundwater discharge at the ground surface by evaporation; whereas, Ford Dry Lake is a “dry playa,” with groundwater occurring well below the ground surface. Palen Dry Lake is located in the central portion of Chuckwalla Valley about 11 miles west of the proposed plant location at the site.

The only perennial surface water resources in the eastern portion of Chuckwalla Valley are McCoy Spring, at the foot of the McCoy Mountains approximately 6.5 miles northeast of the site and 7.5 miles northeast of the proposed well field, and Chuckwalla Spring, approximately 15 miles south of the site at the foot of the Chuckwalla Mountains.

Off-site storm water flows impacting the project site are from a large watershed area to the north of the site which covers approximately 91,627 acres. The upstream extents of the contributing watersheds extend into the Palen Mountains. The extents of the watershed impacting the project were delineated utilizing existing USGS digital elevation model data and are shown on **Soil and Water Figure 15** which was taken directly from the preliminary Drainage Erosion and Sediment Control Plan (DESCP)(GSEP 2009a).

Soil and Water 11
Inventory of Wells in the Eastern Chuckwalla Valley Groundwater Basin

Well ID	State Well Number	Other Name	Owner	Installation Date	Use/Status	Well Casing Diameter (inches)	Approximate Ground Surface Elevation (feet msl) (1)	Well Depth (feet bgs) (2)	Screened Interval (feet bgs)	Geologic Unit
OBS-1	N/A (3)	Shallow Observation Well	Genesis Solar, LLC	5/9/2009	Monitoring Well	5	883	155	100 to 150	Alluvium
OBS-2-270 (4)	N/A	Nested Observation Well	Genesis Solar, LLC	7/2/2009	Monitoring Well	N/A	883	270	265 to 275	Bouse Formation
OBS-2-315 (4)	N/A	Nested Observation Well	Genesis Solar, LLC	7/2/2009	Monitoring Well	N/A	883	315	304 to 327	Bouse Formation
OBS-2-370 (4)	N/A	Nested Observation Well	Genesis Solar, LLC	7/2/2009	Monitoring Well	N/A	883	370	359 to 374	Bouse Formation
OBS-2-400 (4)	N/A	Nested Observation Well	Genesis Solar, LLC	7/2/2009	Monitoring Well	N/A	883	400	387 to 418	Bouse Formation
TW-1	N/A	Test Well	Genesis Solar, LLC	5/22/2009	Monitoring Well	5	883	555	340 to 564	Bouse Formation
1	5S/20E-16M1	McCoy Spring and DWR-17	N/A	N/A	Unused	N/A	889	N/A	N/A	N/A
2	6S/18E-36E1	N/A	CA Jojoba Research and Development	12/18/1981	Irrigation	10 to 6	424	940	250 to 290; 770 to 810	Alluvium/Bouse Formation
3	6S/18E-29	Siddall Well	Agra Energy Corp.	2/26/1982	Irrigation	20 to 8	498	957	560 to 940	Bouse Formation
4	6S/19E-19J1	N/A	N/A	N/A	Unused	12	354	N/A	N/A	N/A
5	6S/19E-25P1	N/A	N/A	N/A	Unused	10	360	85.7	N/A	Alluvium
6	6S/19E-25R1	N/A	N/A	N/A	Destroyed	10	360	61.9	N/A	Alluvium
7	6S/19E-25	NOS 1A, 1B, 1C	USGS (5)	N/A	Exploratory Borehole	N/A	358	N/A	N/A	N/A
8	6S/19E-26Z1	N/A	N/A	N/A	Destroyed	N/A	N/A	N/A	N/A	N/A
9	6S/19E-28R1	N/A	N/A	N/A	Unused	N/A	354	N/A	N/A	N/A
10	6S/19E-29E1	N/A	N/A	N/A	Destroyed/ Collapsed	6	377	N/A/19.7 (6)	N/A	N/A
11	6S/19E-30H1	N/A	N/A	N/A	Destroyed	6	370	28.7	N/A	Alluvium
12	6S/19E-31Z1	N/A	N/A	N/A	Destroyed	N/A	N/A	N/A	N/A	N/A
13	6S/19E-32	N/A	Jacado Agri Corp.	6/27/1982	Destroyed (g)	22 to 18 to 12	392	732	307 to 327; 365 to 732	Bouse Formation
14	6S/19E-32	N/A	Lorne Froats	5/1/1991	Domestic/ Irrigation/ Dust Control	12 to 10	392	982/450 (6)	890 to 940	Fanglomerate
15	6S/19E-32K1	N/A		N/A	N/A	12.5	390.2	N/A/526 (6)	N/A	Bouse Formation
16	6S/19E-32K2	N/A		N/A	N/A	10.5	390	--/297 (6)	N/A	Bouse Formation
17	6S/19E-33A1	Hopkins Well and DWR-33X1	N/A	1911	Destroyed	12 to 8	361	1200/267 (f)	1,175 to 1,200	Fanglomerate
18	6S/19E-34	N/A	So Cal Gas	4/29/1989	Anode	1	368	400	200 to 400	Alluvium/Bouse Formation
19	6S/19E-34	N/A	So Cal Gas	7/15/1981	Other	N/A	369	274	0 to 274	Alluvium/Bouse Formation
20	6S/19E-36A1	N/A	N/A	N/A	Destroyed	10	365	64.8	N/A	Alluvium
21	6S/20E-30Z1	Ford Well	N/A	N/A	Stock; Destroyed	10	N/A	N/A	N/A	N/A
22	6S/20E-33L1	N/A	N/A	N/A	Destroyed (g)	N/A	387.60	1,197	N/A	Bouse Formation
23	6S/20E-33C1	N/A	N/A	N/A	Monitoring	10	392.10	400.00	N/A	Bouse Formation
24	6S/20E-33	N/A	Sol Cal Gas	4/29/1989	Andoe	1	397.00	435	235 to 435	Alluvium/Bouse Formation
25	6S/20E-33	N/A	Sol Cal Gas	7/20/1981	Other	N/A	397	278	0 to 278	Alluvium/Bouse Formation
26	7S/18E-14F1	N/A	U.S. AgriResearch	12/26/1982	Irrigation	16 to 10	562.58	1,000/952 (6)	410 to 630; 750 to 770;	Alluvium/Bouse Formation

Soil and Water 11
Inventory of Wells in the Eastern Chuckwalla Valley Groundwater Basin

Well ID	State Well Number	Other Name	Owner	Installation Date	Use/Status	Well Casing Diameter (inches)	Approximate Ground Surface Elevation (feet msl) (1)	Well Depth (feet bgs) (2)	Screened Interval (feet bgs)	Geologic Unit
			and Development						810 to 870	
27	7S/18E-11N1	N/A	N/A	N/A	Unused	16	555	486.4	N/A	Bouse Formation
28	7S/18E-11R1	N/A	N/A	N/A	Unused	16	520	779.4	N/A	Bouse Formation
29	7S/18E-14H1	N/A	U.S. AgriResearch and Development	1/16/1983	Irrigation	10	545.91	985/950 (6)	420 to 460; 500 to 520; 540 to 580; 620-820; 840-990	Bouse Formation
30	7S/18E-14H1	N/A	N/A	N/A	Destroyed	6	546	123.9	N/A	Alluvium
31	7S/19E-4R1	Teaque Well	N/A	N/A	Unused	12	423.89	242.2	N/A	Alluvium
32	7S/20E-4R1	Vada McBride	N/A	N/A	Unused	16	418.00	315.7	N/A	Bouse Formation
33	7S/20E-16M1	N/A	CA Department of Corrections	N/A	N/A	30 to 16	456.02	1,200	690 to 1190	Bouse Formation/ Fanglomerate
34	7S/20E-17L1	WP-4	CA Department of Corrections	9/8/1992	Public Water Supply	24	458.30	1,200	690 to 1190	Bouse Formation/ Fanglomerate
35	7S/20E-17K1	N/A	CA Department of Corrections	12/20/1989	N/A	30 to 16	456.48	1,200	690 to 1190	Bouse Formation/ Fanglomerate
36	7S/20E-17G1	N/A	CA Department of Corrections	12/30/1987	Industrial	30 to 16 to 10	443.54	1,200	690 to 1190	Bouse Formation/ Fanglomerate
37	7S/20E-17C1	78	N/A	1981	Irrigation	14 to 10	433.09	1,050	750 to 1,050	Bouse Formation/ Fanglomerate
38	7/20E-17C2	observation well 1	CA Department of Corrections	6/20/1986	Monitoring	1 1/4	433	1,040	795 to 815 and 995 to 1,015	Bouse Formation/ Fanglomerate
39	7S/20E-18H1	59/observation well 2/Vada McBride	N/A	1959	Irrigation	15 to 12	442.94	1,139	853 to 1,083	Bouse Formation/ Fanglomerate
40	7S/20E-18K1	WP-6	CA Department of Corrections	11/4/1992	Public Water Supply	15 to 10	449.40	1,200	690 to 1,200	Bouse Formation/ Fanglomerate
41	7S/20E-18R1	WP-5	CA Department of Corrections	10/24/1992	Public Water Supply	13.5 to 10	453.60	1,160	N/A	Fanglomerate
42	7S/20E-20B1	79/observation well 3	N/A	6/4/1905	Irrigation	16 to 12	470.00	1,100	738 to 1,100	Bouse Formation/ Fanglomerate
43	7S/20E-28C1	7S/20E-28F1/80	Jojoba Inc.	3/15/1982	Irrigation	10 to 8	505.60	830	510 to 600 and 680 to 780	Bouse Formation
44	7S/20E-28C2	N/A	Jojoba Southwest	11/30/1989	Irrigation	16 to 12	505.30	1,100	700 to 1,100	Bouse Formation/ Fanglomerate
45	7S/20E-28	N/A	Chuckawalla Jojoba inc Great American Securities	6/6/1989	Test Hole/Abandoned	N/A	505	825	N/A	N/A
46	7S/20E-27L1	N/A	N/A	N/A	Destroyed	8	517.00	53.6	N/A	Alluvium
47	8S/20E-10N2	60	N/A	1984	N/A	4	621	872	500 to 580; 620 to 640; 710 to 850	Bouse Formation
48	4S/16E-32M1	N/A	N/A	N/A	N/A	N/A	548	N/A	N/A	N/A
49	4/S17E-6C1	N/A	N/A	N/A	N/A	N/A	500	N/A	N/A	N/A
50	6S/17E-3M1	N/A	N/A	N/A	N/A	N/A	566	818	N/A	Bouse Formation
51	5S/17E19Q1	N/A	N/A	N/A	N/A	N/A	538	760	N/A	N/A
52	5S/16E-7M1	N/A	N/A	N/A	N/A	N/A	603.67	648	N/A	N/A
53	5S/16E-7P1	N/A	N/A	N/A	N/A	N/A	598	347	N/A	N/A
54	8S/20E-28N1	N/A	N/A	N/A	N/A	N/A	654.5	500	N/A	Bouse Formation

Notes:

1) - msl = above mean sea level
2) -bgs = below ground surface
3) N/A = information not available or unknown
4) Nested pressure transducer buried in place.
5) USGS-NWIS = United States Geological Survey - National Water Information System (USGS-NWIS) website at http://nwis.waterdata.usgs.gov/ca/nwis/gwlevels
6) 1,000/952 = reported well depth/measured well depth. Well depth was measured by WorleyParsons or Azca Drilling.
7) Well could not be located by WorleyParsons. Reported as destroyed.

SOURCE:WPAR, 2009b.

The overall offsite watershed impacting the project has been divided into three distinct sub-basins in the DESCP for the purpose of designing and sizing engineered channels to collect flow and convey it around and through the Project site. However, the boundaries of the sub-basins are not well defined and are subject to change depending on the magnate of the flow event and the propensity for the small drainages to migrate in response to erosion and sediment deposition. Peak discharges for each sub-basin were calculated using the Bently Pondpack software package and generally followed the guidelines presented in the *Riverside County Flood Control and Water Conservation District Hydrology Manual.* The results of the peak discharge analysis are summarized in **Soil and Water Table 12*.***

A comparison was made between the discharge data provided as part of the Conceptual Drainage Study and discharges obtained using the USGS Regional Regression Equation for the region. The purpose of the comparison was to provide some insight into the reasonableness of the calculated discharges when compared to some other regionally accepted methodology. The discharges presented in the Concept Drainage Study (GSEP 2009a) were significantly lower than those calculated using the regional regression equations. The subject area is likely significantly flatter with much more dispersed flow than the “average” watershed used in the derivation of the regional regression equation, which could account for lower discharges for the larger watersheds. Overall, the reported discharges appear to fulfill the purpose of design given the site specific watershed conditions.

Soil and Water Table 12
Summary of Offsite Peak Discharges

Sub-basin ID	Sub-basin Area (Sq. Mi.)	Q100 (cfs) (HEC-HMS)	Q100 (cfs) (Regression)*
1	27.9	4070	11,476
2	17.2	2203	8,140
3	98.1	10,022	28,022

Dry Washes

There are no perennial streams in Chuckwalla Valley and a vast majority of the time, the area is dry and devoid of any surface flow anywhere. Water runoff occurs only in response to infrequent intense rain storms. Much of the area is subject to inundation either by sheet flow or weakly-expressed braided ephemeral surface water flow. The entire area drains to Palen and Ford Dry Lakes, but runoff from most of the basin generally does not reach these dry lakes. During large rainfall events, Ford Dry Lake and Palen Dry Lake will retain water in shallow ponds for days or weeks. This occurs on average approximately once every 20 years (RCFCWCD, 2009). There are no named ephemeral washes within the Project site, however, a few ephemeral washes are located upslope of the Project site or traverse the southeastern part of the proposed off-

site linear alignment. The Project site itself is located in an area where washes disperse into a subdued bar and swale morphology, with widely dispersed swales that are small, only a few inches deep and do not have defined banks (Worley Parsons, 2009b).

There are numerous small dry washes which traverse the site which have no or poorly developed banks. These channels are typically very subtle, with a width of 2 to 8 feet and a depth of 3 to 9 inches. These features are poorly expressed and can be difficult to discern on aerial photography. Many of these channels do not reach the dry lake but fade out on the vegetated sand dune surface. The conveyance capacity of these washes is limited and runoff during moderate to large events will break out of these features and be conveyed across the terrain as shallow sheet flow.

Springs, Seeps and Playa Lakes

A comprehensive review was conducted to identify potential springs, seeps and surface water discharges that may be present in the central and eastern portions of Chuckwalla Valley (the area that may be affected by drawdown from project pumping). Sources reviewed included published reports and maps by the United States Geological Survey and California Department of Water Resources, maps published by the Bureau of Land Management, and contact with BLM personnel. The only springs, seeps or surface discharges identified are McCoy Spring (at the foot of the McCoy Mountains approximately 6.5 miles northeast of the Project site and 7.5 miles northeast of the proposed well field), and Chuckwalla Spring (approximately 15 miles south of the site, which is actually located outside the valley a short distance in the Chuckwalla Mountains) (BLM, 2002 and 2009b; DWR, 1963; RWQCB, 2006; Stone and Pelka, 1989; and USGS, 1983a, 1983b). McCoy Spring and Chuckwalla Spring are perennial springs; however, there is no information available regarding the discharge quantity for these springs. Published water quality data for McCoy Spring is included in DWR, 1963.

McCoy Spring is located at an elevation of 889 feet msl at the outlet of a bedrock canyon near the toe of the western slope of the McCoy Mountains, and includes a cistern and seeps. Based on the close proximity of bedrock outcrops to the spring and seeps, the spring likely represents baseflow discharge from the McCoy Mountains. As such, it would not have a direct hydraulic connection to the aquifers in the Chuckwalla Valley Groundwater Basin, which occur in the basin fill materials to the west of McCoy Spring.

Storm Water Flow

Storm water flow across and adjacent to the project occurs in a network of shallow and poorly expressed alluvial channels, and during larger events, as widespread sheetflow. The applicant completed existing conditions FLO-2D modeling on the project to provide information regarding the extents, depths, and velocities of surface flow across the project during the 100-year event as well as for more frequent storm events. The results of the analysis confirm the presence of general widespread and shallow sheet flooding across the site and do not provide resolution on the distribution of flow in individual washes due to a lack of detailed topographic data and the fact that the washes are so poorly expressed.

Surface and Groundwater Beneficial Uses

The Basin Plan for the CRBRWQCB establishes water quality objectives, including narrative and numerical standards that protect the beneficial uses of surface and ground waters in the region. The Basin Plan describes implementation plans and other control measures designed to ensure compliance with statewide plans and policies and provides comprehensive water quality planning.

Beneficial water uses are of two types – consumptive and non-consumptive. Consumptive uses are those normally associated with people's activities, primarily municipal, industrial and irrigation uses that consume water and cause corresponding reduction and/or depletion of water supply. Non-consumptive uses include swimming, boating, waterskiing, fishing, and other uses that do not significantly deplete water supplies.

1. Past or Historical Beneficial Uses
    a. Historical beneficial uses of water within the Colorado River Basin Region have largely been associated with irrigated agriculture and mining. Industrial use of water has become increasingly important in the Region, particularly in the agricultural areas.

2. Present Beneficial Uses
    a. Agricultural use is the predominant beneficial use of water in the Colorado River Basin Region, with the major irrigated acreage being located in the Coachella, Imperial and Palo Verde Valleys. The second in quantity of usage is the use of water for municipal and industrial purposes. The third major category of beneficial use, recreational use of surface waters, represents another important segment of the Region's economy.

3. Sources of Drinking Water Policy
    a. All surface and ground waters are considered to be suitable, or potentially suitable, for municipal or domestic water supply with the exception of:
        i. Surface and ground waters where: the TDS exceed 3,000 mg/L, and it is not reasonably expected by the Regional Board to supply a public water system, or
        ii. There is contamination, either by natural process or by human activity, that cannot be treated for domestic use using either Management Practices or best economically achievable treatment practices, or
        iii. The water source does not provide sufficient water to supply a single well capable of producing an average, sustained yield of 200 gallons per day.

Existing uses of waters from springs in the Colorado River Basin include the Box Spring, Crystal Spring, Old Woman Spring, Cove Spring, Mitchell Caverns Spring, Bonanza Spring, Agua Caliente Spring, Kleinfelter Spring, Von Trigger Spring, Malpais Spring, and Sunflower Spring. Based on a review of available information include the USGS NWIS database, USGS quadrangle maps and data provided by the BLM, none

of these springs are within the area that would be influenced by the project. Existing uses of water from springs in the Colorado River Basin include Bousic Spring, Veale Spring, Nett Spring, Gordon Spring, and Arctic Canyon Spring. None of these springs are within the area that would be influenced by the project.

Water quality objectives are established for the reasonable protection of beneficial uses of water or the prevention of nuisance within a specific area.

1) **General Surface Water Objectives** (CRBRWQCB)

   a. Aesthetic Qualities - All waters shall be free from substance attributable to wastewater of domestic or industrial origin or other discharges which adversely affect beneficial uses not limited to: setting to form objectionable deposits; floating as debris, scum, grease, oil, wax, or other matter that may cause nuisances; and producing objectionable color, odor, taste, or turbidity.

   b. Tainting Substances – Waters shall be free of unnatural materials which individually or in combination produce undesirable flavors in the edible portions of aquatic organisms.

   c. Toxicity – All waters shall be maintained free of toxic substances in concentrations which are toxic to, or which produce detrimental physiological responses in human, plant, animal, or indigenous aquatic life. Compliance with this objective will be determined by use of indicator organisms, analyses of species diversity, population density, growth anomalies, 96-hour bioassay or bioassays of appropriate duration or other appropriate methods as specified by the CRBRWQCB. Effluent limits based upon bioassays of effluent will be prescribed where appropriate, additional numerical receiving water objectives for specific toxicants will be established as sufficient data to become available, and source control of toxic substances will be encouraged. The survival of aquatic life in surface waters subjected to a waste discharge or other controllable water quality factors, shall not be less than that for the same water body in areas unaffected by the waste discharge, or other control water which is consistent with the requirements for “experimental water” as described in Standards Methods for the Examination of Water and Wastewater.

   d. Temperature – temperature shall not be altered.

   e. pH – shall range from 6.0 to 9.0

   f. Dissolved Oxygen – shall not be reduced below the following minimum levels at any time: warm – 5.0 mg/L, cold – 8.0 mg/L, and warm and cold – 8.0mg/L

   g. Total Dissolved Solids – discharges of wastes or wastewater shall not increase the total dissolved solids content of receiving waters, unless it can be demonstrated to the satisfaction of the Regional Board that such an increase in total dissolved solids does not adversely affect beneficial uses.

   h. Bacteria – The geometric mean of the indicated bacterial densities should not exceed one or the other of the following: E. coli – 630 colonies (col) per 100 ml and enterococci – 165 col per 100 ml. Nor shall any sample exceed one other

following maximum allowable: E.coli 2000 col per 100 ml and enterococci 500 col per 100 ml.

Any discharge, except from agricultural, shall not cause concentration of total dissolved solids in surface waters to exceed the following limits:

TDS (mg/L)	Annual Average	Maximum
• Coachella Valley Drains	2000	2500
• Palo Verde Valley Drains	2000	2500

2) **General Groundwater Objectives**: Establishment of numerical objectives for groundwater involves complex considerations and it is acknowledged that the quality of groundwater varies significantly throughout the CVGB and varies with depth. It is the CRBRWQCB's goal to maintain the existing quality of non-degraded groundwater basins and to minimize the quantities of contaminants reaching any groundwater basin.

   a. Groundwater designated for domestic or municipal supply shall not contain taste or odor producing substances

   b. Groundwater designated for domestic or municipal supply shall not contain coliform organisms in excess of limits specified in the regulations.

   c. Groundwater designated for domestic or municipal supply shall not contain concentrations of chemical constituents in excess of the limits specified in California Code of Regulations, Title 22 regulations.

   d. Discharges of water softeners regeneration brines, other mineralized wastes, and toxic wastes to disposal facilities which ultimately discharge in areas where such waste can percolate to ground waters useable for domestic and municipal purposes, are prohibited.

Wastewater reclamation and reuse is encouraged, however, such use must meet applicable water quality standards.

C.9.4.2 ASSESSMENT OF DIRECT AND INDIRECT IMPACTS AND DISCUSSION OF MITIGATION

The direct potential effects of the Project on local water resources are those associated with using groundwater for construction (specifically for demands during site grading) and with the plant's operational process water demand. No surface water will be used, though Project construction and operation may have an effect on the ephemeral washes traversing the site, or springs and wet playas.

Potential impacts on water resources during construction and operation include soil erosion, geomorphology, groundwater basin balance, groundwater levels, groundwater quality, surface water hydrology, and surface water quality impacts.

Soil Erosion

Erosion is the displacement of solids (soil, mud, rock, and other particles) by wind, water, or ice and by downward or down-slope movement in response to gravity. Due to generally flat terrain, the Project site is not prone to significant mass wasting (gravity-driven erosion and non-fluvial sediment transport).

Environmental impacts associated with the construction and operations of the Project are discussed in the following sections. Significance criteria were developed based on California CEQA Guidelines and evaluated using accepted methodologies and professional judgment. Impacts would be considered significant if:

- Substantially increased wind or water-induced soil erosion occurred as a result of Project construction or operation;
- Substantially increased sedimentation occurred in areas adjacent to construction areas;
- Construction activities were to occur in areas of high erosion susceptibility and the disturbed areas were left exposed and not properly stabilized; or
- Prime Farmlands, Farmlands of Statewide Importance, or Unique Farmland were lost as a result of erosion.

Grading of the Project site will result in a less than one percent slope downward from the north to the south of the site. Earthwork associated with the Project will include excavation for foundations and underground systems, and the total earth movement that will occur is approximately 1,000,000 cubic yards. Cut and fill will be balanced on site and there will be no need to either import or export earthen material.

The vast majority of the Project grading and excavation will occur on the Project site with only minor grading and excavation needed for the transmission line (at the locations of the monopoles) as well as the gas pipeline and access road. Known onsite soil types that will be affected by Project grading and excavation are listed in Section C.9.4.1. The wind erosion hazard is moderate to high. During construction, the area within the plant site fence line (1,800 acres) will be disturbed. There also will be small, localized disturbance at the specific locations where transmission structures will be installed.

During construction, the surface of the disturbed areas will be devoid of vegetation and there will be the highest potential for erosion, as well as associated effects including soil loss and increased sediment yields downstream from disturbed areas. With implementation of BMPs such as straw bales, silt fences, and limiting exposed areas as detailed in the DESCP and SWPPP (see Condition of Certification **SOIL&WATER-1** and **2**, erosion is expected to be mitigated to a less than significant level. Site grading will be balanced on site; there will be no import or export of fill material. The Project is not located on farmland or in areas where agricultural protection legislation is applicable; therefore, there will be no impacts to agricultural soils at or near the Project site.

Construction and Operation

Wind Erosion

The potential for soil loss by wind erosion was estimated using the Wind Erosion Prediction System for pre-development (undisturbed), during construction, and operational conditions.

The area of the Project site and Project-related off-site linears has a moderate to high potential for wind and water erosion. The Wind Erosion Prediction System (WEPS) model was used to estimate soil loss due to wind erosion. Wind erosion rates at this project are an order of magnitude higher than soil erosion by rainfall runoff at this location due to the relatively low annual rainfall amount and the presence of fine, sandy soils. The results are presented in **Soil and Water Table 13** presented below.

Soil and Water Table 13
Estimate of Soil Loss by Wind Erosion Using
Wind Erosion Prediction System (WEPS)(1) Model

Description	Acres(2)	Predicted Soil Loss (tons per acre per year)	Wind Erosion Soil Loss (Tons per year)
No Project	1,800	72.88	131,184
On-Site Project Construction (no BMPs)	1,800	27.82	50,076
On-Site Project Construction (with BMPs)	1,800	1.25	2,250
Off-Site Linear Construction (with BMPs)	61	0.63	11
Project Operation (with BMPs)	1,650	1.25	2,063

Notes:
(1) Wind Erosion Soil losses (tons/acre/year) are estimated using WEPS software (NRCS, 2008). The soil characteristics were estimated using WEPS soil profiles corresponding to the mapped soil unit. Estimates of annual soil losses use the WEPS soil loss times the affected area. Off site linear construction will take less than one year.
(2) Project Acreages based on the assumption that 100 percent of the project site will be graded. Off-site area acreages are based on project disturbance table for acreage outside the project footprint.
WEPS Assumptions:
Climate and wind data from Blythe, CA.
BMPs for the project site include fencing the area and applying dust palliatives at least annually. BMPs for the off site linears do not include fencing the area.
Source: WPAR, 2009.

Under current conditions, these processes are in relative equilibrium with ongoing depositional processes and soil loss is estimated at approximately 72.88 tons per acre per year or 131,184 tons for the proposed project area of 1,800 acres (WPAR, 2009). Construction without implementation of BMPs would result in a potential for soil loss of about 50,000 tons; however, the implementation of BMPs is expected to reduce water and wind erosion of soils during construction to less than 2,250 tons. Based on the conceptual grading plan (WPAR, 2009; see Appendix A) for the Project site, construction will require cut and fill activities on the Project site, but import/export of earthen materials to and from the Project site will not be required.

Roads and paved areas will be kept free of dust, dirt and visible soil materials. Materials will be kept on site to implement temporary control measures during the operational life of the Project.

Impacts of project operations on the proposed rerouted desert washes are discussed in Section C.2, Biological Resources. As discussed in Air Quality, Section C.1, by its nature, a solar thermal project must keep dust to a minimum, as a film on the collectors of the solar array will reduce their efficiency for power production. Dust control will be achieved by a combination of soil stabilizers, water from the collector washing and waste cooling water, and compaction of the driving surface over time. Therefore, operational controls designed to control dust are expected to reduce the overall soil erosion in the area. Therefore, potential construction and operational-related impacts to onsite soils would be confined to the Project site and related off-site linears. With implementation of BMPs as detailed in the DESCP and SWPPP (see Condition of Certification **SOIL&WATER-1** and **2**, erosion is expected to be mitigated to a less than significant level.

Water Erosion

For potential soil loss associated with water erosion, it was assumed that100 percent of the project site would be graded. Those estimates are detailed in **Soil and Water Table 14**.

To address the management of sediment transport, erosion, and sedimentation during operation, the project design will incorporate diversion berms, channels, and detention basins, as discussed in Section C.9.11 *Conditions of Certification/Mitigation Measures.* Dirt roads and exposed surfaces will be periodically treated with dust palliatives as needed to reduce wind erosion. Construction and maintenance of the proposed drainage and sediment management system at the Project site is expected to reduce water and wind erosion at, and downstream of, the Project site to less than significant levels.

Soil and Water Table 14
Estimate of Soil Loss by Water Erosion Using Revised Universal Soil Loss Equation (RUSLE2)[1]

Feature (acreage)[2]	Activity	Duration (months)[3]	Soil Loss (tons) w/o BMPs	Soil Loss (tons) with BMPs	Soil Loss (tons/yr) No Project
Project Site (1,800 acres total graded)	Grading Construction	6 9	441.0 1,396.5	6.93 21.95	1.53 ---
Roads 15.76 acres)	Grading Construction	3			
Transmission lines (9.18 acres for construction;0.05 acres for pole footprints	Grading Construction	2 4	0.0041 1.499	0.000064 0.0236	0.00043 ---
Natural Gas Pipeline (36.36 acres for construction; 2.91 acres for trench)	Grading Construction	2 3	0.238 4.454	0.0037 0.0699	0.00247 ---
Project Soil Loss Estimates (Construction)	All activities listed above		1,845.63	29.00	1.16
Project Annual Soil Loss Estimate (Operation (1,650 acres exposed soil)		12		12.71	

Notes:
[1] Water Erosion Soil losses (tons/acre/year) are estimated using RUSLE2 software. (NRCS, 2002) The soil characteristics were estimated using RUSLE2 soil profiles corresponding to the mapped soil unit. Estimates of actual soil losses use the RUSLE2 soil loss times the duration and affected area. The No Project Alternative estimate does not have a specific duration, and loss is given in tons/year.
[2] Project Acreages based on the assumption that 100 percent of the project site will be graded. Off-site area acreages are based on project disturbance table for acreage outside the project footprint.
[3] Duration of activities based upon assumptions in the Plan of Development (Genesis Solar, LLC, 2009)
RUSLE2 Assumptions:
100-ft slope length, 2 percent slope
Construction and Grading soil losses assume the following inputs: Management - bare ground; Contouring - None, rows up and down hill; Diversion/terracing - None; Strips and Barriers - None.
Construction and Grading with BMP and Annual Operational soil losses assume the following inputs: Management – Silt fence; Contouring - Perfect, no row grade; Diversion/terracing - None; Strips and Barriers- 2 fences, 1 at end of slope.
No Project soil losses assume the following inputs: Management - Dense grass, not harvested; Contouring -None, rows up and down hill; Diversion/terracing - None; Strips and Barriers - None.
Source: WPAR, 2009.

Mitigation

Construction and operation of the Project could result in significant impacts related to water erosion of soils. Implementation of BMPs and condition of certification would reduce the impacts to insignificant. Implementation of Conditions of Certification **SOIL&WATER-1** and **-2**, and **SOIL&WATER-8** through **-13** described in detail in Section C.9.11, *Proposed Conditions of Certification/Mitigation Measures,* below, would ensure there would be no potential for impacts to soils related to water erosion.

Geomorphology

The GSEP involves a series of solar arrays within a roughly 1,800 acre rectangular shaped parcel and linears (access road, gas line, transmission lines) involving approximately 90 acres. The method of construction is important in assessing the potential impact to geomorphological conditions associated with the solar arrays and linears. Solar array construction will involve mass grading that will require drainage to be intercepted up-gradient and routed around the arrays to the down-gradient side of the facility to continue flow. Construction of the linears will involve placement of an underground gas line, electric transmission line towers and an access road. The

underground gas lines finish grade will be close to exiting ground surface contours and thus have a minimal affect on aeolian systems. The overhead transmission lines will have a minimal effect on aeolian systems and only in areas of the proposed tower foundations. The current design for the proposed access road involves a low relief road close to existing contours that will not adversely affect aeolian sand migration but may require some special design considerations where it crosses existing drainages.

Impacts to the Qal

The Qal is a relatively stable surface, with little evidence of active sand transport. The presence of the gravel with desert pavement and varnish is evidence that this surface is also stable from a fluvial perspective (i.e. that the small channels, while potentially prone to lateral migration and avulsion across the stable surface, do not tend to cut vertically into the surface. From a geomorphic perspective, construction of the project on the Qal area should have relatively little off site impact. Because there is little sediment transport occurring on this surface construction of the proposed project does not appear likely to disrupt the movement of sediment to habitat areas elsewhere. No mitigation is required or proposed.

Impacts to the Qsr

The Qsr is a relatively stable surface, with little evidence of active sand transport. The presence of the soil horizons is evidence that this surface is also stable from a fluvial perspective (i.e. that the small channels, while laterally active, do not tend to downcut or fill vertically). From a geomorphic perspective construction of the project on the Qal area should have relatively little off site impact. Because there is little sediment transport occurring on this surface construction of the proposed project does not appear likely to disrupt the movement of sediment to habitat areas elsewhere. No mitigation is required or proposed.

Impacts to the Qsad/Chuckwalla Wind Transport Corridor

The western array avoids the Chuckwalla sand transport corridor as mapped by Dr. Kenney (WPAR, 2010). The eastern array intrudes into the corridor by approximately 1,600 feet at a point where the corridor is 24,000 feet wide. This intrusion represents about 7 percent of the Chuckwalla sand corridor width. This part of the corridor does not appear to be the most active with regard to sediment transport rates (based on the amount of sand in storage on the ground, evidence for sand transport from ripples and coppice dunes etc) so the reduction in sediment transport capacity is not considered a significant impact. Based on the degree of intrusion into the corridor and the length of the intrusion it was estimated that an area of 157 acres of vegetated sand dune (Qsad) downwind of the intrusion that might be expected to experience moderate impacts from loss of sand due to the project site (see Soil and Water Appendix A - Figure 17).

It is recommended that the project minimize encroachment of the main footprint into the Qsad/sand transport corridor.

Impacts to the Palen-McCoy Wind Transport Corridor

The eastern solar array intrudes into the Palen-McCoy corridor by approximately 2,800 feet at a point where the corridor is 15,000 feet wide (cutting off 19% of the corridor).

Although the project cuts off a large area of corridor, there is good evidence to suggest that most sand transport takes place east of this zone (outside the project footprint, though within the area crossed by the laterals). Plates 14 and 15 of the Worley Parsons report (WPAR, 2010) show field conditions in the impacted area (WPAR, 2010-Plate 14) and further east (WPAR, 2010-Plate 15), providing evidence of much greater rates of sand transport to the east of the project footprint. In the absence of quantitative data and conservatively assuming that the rate of sediment transport is half as much in the outer corridor as it is in the inner corridor the intrusion probably represents less than a 10% reduction in sand transport. Based on the photos it is feasible that the true rate of sediment transport in the impacted area may be an order of magnitude less than this. However, although the magnitude of impact to the entire wind transport corridor is relatively low, the area of off-site impacts immediately downwind of the project is large: the lee area downwind of the project that is likely to experience sand depletion is 309 acres (see Appendix A-Figure 17). Since there are 13 acres of overlap from both wind shadows, the combined area impacted by intrusions into both corridors is 453 acres. This area would be expected to experience deflation (loss of sand from the existing vegetated dunes over time) and armoring (coarsening of the sand and gravel as fine sand is eroded by the wind).

Impacts to the Qsa

The Qsa is the active area of sand dunes supplied by wind and water transport from the Palen – McCoy Valley sand corridor. This corridor supplies significant sand dune habitat downwind. This area is crossed by the laterals near Wiley Wells Rest Stop.

The main project footprint should avoid this area completely since large scale obstruction of this unit would be hard or impossible to mitigate for. The project should be able to avoid or minimize impacts created by the laterals within this zone by avoiding creation of barriers to wind and water transport as indicated in Condition of Certification/Mitigation Measures described in **SOIL&WATER-1**. Most wind-borne transport of sand occurs within 3 feet of the ground, so infrastructure should be constructed flush with the surrounding ground surface and without ground level obstructions. Power pylons should not pose a significant problem due to their small surface area at ground level. Water and gas pipelines should be buried below ground. Road surfaces should be flush with the ground surface. There should not be drainage ditches running perpendicular to the wind direction (approximately north-south in the northern section of the lateral route, shifting to west-east in the southern area).

Groundwater Basin Balance

There is concern that the amount of groundwater used for both construction and operations would place the groundwater basin into overdraft. Groundwater overdraft is “the condition of a groundwater basin in which the amount of water withdrawn by pumping exceeds the amount of water that recharges the basin over a period of years during which water supply conditions approximate average conditions.” (CDWR, 1998).

As previously indicated, the CVGB is an unmanaged groundwater basin where overlying property owners withdraw groundwater for beneficial use. Typically this use has been for municipal and domestic, agricultural and industrial purposes. For purposes of impact analysis, it is assumed that any withdrawals that exceed the average natural

recharge and exceeds a significant percentage of the total amount of groundwater in storage would be a significant impact. The following discussion presents an analysis of the potential for overdraft to occur.

Construction and Operations

The project has proposed to utilize underlying groundwater to supply project water needs during construction. There is a concern that the water demand of the project will exceed the groundwater basin budget and lead to overdraft conditions.

A comparison was made between the average annual basin budget with the anticipated project water production requirements. **Soil and Water Table 15** presents the anticipated projects water requirements along with the average annual basin budget for the 37-month construction period. Currently, the CVGB balance is positive by approximately 2,608 afy whereby inflow (approximately 13,719 afy) to the basin is slightly greater than estimated outflows (approximately 11,111 afy) to the basin. Approximately 400 afy of the outflow is attributed to subsurface outflow to the adjacent Palo Verde Mesa Groundwater Basin.

It is anticipated that groundwater extraction during construction (~616 to 1,368 afy) and operation (~1,644 afy) will not significantly impact the CVGB balance as the 1,368 afy during construction and the 1,644 afy during operations would not exceed the positive yearly balance of 2,608 afy.

Soil and Water Table 15
Estimated Change to Chuckwalla Valley Groundwater Basin Budget (Average Year Conditions)

Project Component	Years	Annual Basin Budget Balance	Project Requirements (afy)	Net Budget Balance (afy)
Construction	1	2,608	1,368	1,240
	2	2,608	616	1,992
	3	2,608	616	1,992
Operations	4-33	2,608	1,644	964
Note: See **Soil and Water Table 8** for Groundwater Basin Budget				

Construction and operation of the Project would have an impact on basin balance in the CVGB. The impacts are considered insignificant, due to the fact that project pumping does not exceed net average recharge to the basin.

The project's pumping could also have an effect on the adjacent Palo Verde Mesa Groundwater Basin by inducing flows from the Colorado River. Given the location of the Project and the anticipated annual Project water requirements, staff anticipates that the project may have a significant impact on the adjacent (Palo Verde Mesa) groundwater basin. We note that future water use in the CVGB may be governed by impending regulations being formulated by the USBR. These are discussed in the section addressing LORS, below.

The Applicant did not provide an analysis of the proportion of water originating from storage, from natural recharge and/or the Colorado River underflow. However, water in

the Colorado River is fully appropriated and according to a 2006 U.S. Supreme Court Decision issued in Arizona v. California (2006) 547 U.S. 150, 126 S.Ct. 1543 "[c]onsumptive use from the mainstream [of the Colorado River] within a State shall include all consumptive uses of water of the mainstream, including water drawn from the mainstream by underground pumping." The mainstream was indicated as "the mainstream of the Colorado River downstream from Lee's Ferry within the United States, including the reservoirs thereon." The Supreme Court went on to state that the State of California is enjoined "from diverting or purporting to authorize the diversion of water from the mainstream the diversion of which has not been authorized by the United States for use in the respective States; provided, however, that no party named in this Article and no other user of water in said States shall divert or purport to authorize the diversion of water from the mainstream the diversion of which has not been authorized by the United States for its particular use."

The U.S. Geological Survey has indicated that the PVMGB and the CVGB lie within a basin tributary to the Colorado River and that wells drawing groundwater within those groundwater basins could be considered to be withdrawing water from the Colorado River Aquifer (Wilson et al., 1994). Consequently, the Project has the potential to divert Colorado River water without any entitlement to the water, and all groundwater production at the site could be considered Colorado River water. The Project owner will be required to implement **SOIL&WATER-15** to replace the quantity of water contributed by the Colorado River from the Project's proposed groundwater extraction. Staff understands that the foregoing conclusion is based on a simplified methodology for calculating contribution of water from the Colorado River from the Project's proposed groundwater extraction. The Project applicant could choose to implement **SOIL&WATER-19** Condition of Certification specified in Section C.9.11, *Proposed Conditions of Certification/Mitigation Measures,* below and conduct a refined analysis of the quantity of water contributed by the Colorado River from Project groundwater extraction. This analysis may be used to estimate the volume of water that must be replaced in accordance with Condition of Certification **SOIL&WATER-15.** We also note that future water use in the CVGB and PVMGB may be governed by impending regulations being formulated by the USBR. These are discussed in the section addressing LORS, below (Section C.9.9.1).

Implementation of the Condition of Certification **SOIL&WATER-15** specified in Section C.9.11, *Proposed Conditions of Certification/Mitigation Measures,* below, is anticipated to reduce the potential for impacts from water drawn from the Colorado River through groundwater pumping to below the level of significance.

Groundwater Levels

The project has the potential to lower groundwater levels as a result of water production during both construction and operations. The lowering of groundwater levels could have a significant impact if the lowering of the groundwater levels: 1) impacts existing water wells in the basin; 2) lowers the water table in areas where deep-rooted phreatophytes are prevalent (see Section C.2 for impacts related to biological resources, 3) affects surface water features including springs and/or 4) induces permanent ground subsidence.

Drawdown imposed by a well on another nearby pumping well can have adverse affects on the performance of that well and is referred to as interference drawdown or well interference. Specific potential adverse affects evaluated in this study include the following:

- Interference drawdown can result in the water level of an aquifer being drawn down below the screen of the well (i.e., the well goes dry);
- Interference drawdown can result in the water level of an aquifer being drawn down to a point where the affected well's capacity to pump water is decreased and the well can no longer produce the amount of water that is needed for a particular use, or the well is at risk of becoming damaged and unusable over time due to exposure of the well's screen above the water table and resulting corrosion;
- Interference drawdown can result in the water level in the affected well being drawn down to near the intake of the well's pump, requiring lowering of the pump intake in order for the well to remain operational; and/or
- Interference drawdown can cause a decrease in groundwater level in the affected well such that the well and pump can continue to operate and produce adequate amounts of water, but pumping must occur at either greater frequency or duration, and/or water must be lifted to a greater height, resulting in greater operational and maintenance costs.

The extent and type of well interference experienced by an affected well is dependant on hydrogeologic conditions in the aquifer as well as the characteristics of the affected well. These include the following:

- The amount of interference drawdown that is applied (which varies with the distance of the impacted well from the Project well(s);
- The depth and screened interval of the affected well;
- The thickness of saturated sediments penetrated by the affected well;
- Local variations in the transmissivity of the saturated sediments in which the affected well is completed, if any;
- The condition and efficiency of the affected well;
- The affected well's pump specifications, including its rating curve, the depth at which the pump intake is set, and the resulting pumping water level in the well during operation; and
- The minimum required water production rate of the well.

Phreatophyte trees such as Mesquite, Ironwood or Palo Verde have deep root systems that can extend tens of feet below the ground surface to the underlying water table. In addition, wet playas can harbor halophyte plant communities that depend on a shallow water table for their moisture. Lowering of the water table below the root depth of these plants could result in stress or death. If this impact affects sensitive species, it is significant and requires mitigation. There is additional discussion of this issue in the Biological Resources section of this SA/DEIS.

Ground subsidence can occur as a result of water level decline in aquifer systems. When the fluid pressure in an aquifer is reduced as a result of changes in the groundwater level, a shift in the balance of support for the overlying materials causes the "skeleton" of the aquifer system to deform slightly. Reversible deformation occurs in all aquifer systems as a result of the cyclical rise and fall of groundwater levels associated with short and longer term climatic cycles. Permanent ground subsidence can occur when pore water pressures in the aquifer fall below their lowest historical point, and the particles in the aquifer skeleton are permanently rearranged and compressed. Soils particularly susceptible to such consolidation and subsidence include compressible clays in a confined aquifer system. This type of deformation is most prevalent when confined alluvial aquifer systems are overdrafted.

Construction and Operation

Preliminary investigations conducted at the GSEP site suggest that the aquifer proposed for development is under confined to semi-confined conditions and is separated in part from the shallow alluvial groundwater system by low permeability sediments. For purposes of analysis of impacts to water levels, a numerical model was developed by Worley-Parsons (WPAR, 2010) that separated the impacts between two water-bearing zones, the shallow alluvial zone (referred to as Layer 1), and the deeper Bouse Formation (referred to as Layer 11 and Layer 12). Correspondingly, impacts to these layers varied due to the assumption that the confining layers are laterally continuous and maintain hydraulic separation away from the proposed pumping wells.

The maximum predicted water table (Layer 1) drawdown associated with the Project is approximately 0.3 feet in the area of the pumping well, and the area where drawdown exceeds 0.25 foot is limited to within approximately 2.5 to 3.5 miles of the Project wells (see **Soil and Water Figure 16**).
The maximum predicted drawdown in the Bouse Formation (Layer 12) associated with the Project is approximately 10 feet in the area of the pumping well, and the area where drawdown exceeds 1 foot is limited to within approximately 7 to 10 miles of the Project wells (see **Soil and Water Figure 17**).

Based on the general geology of the Chuckwalla Valley, the Riverside County General Plan Safety Element designates basin fill sediments in the valley as being susceptible to subsidence (Riverside County, 2008). However, the Applicant (2009a) indicated in the AFC that during a recent period when groundwater demand was at a maximum and estimated to exceed 48,000 afy, the valley did not experience any subsidence. The applicant's supposition that no subsidence will be caused by the project is based upon historical response of the CVGB to groundwater level declines that took place in the western portion of the basin and may not be applicable beneath the GSEP located in the eastern portion of CVGB. The potential for significant subsidence associated with the pumping of groundwater for the Project is considered low. However, due to the uncertainty related to conditions at the GSEP site, staff recommends that a monitoring program be implemented to assess long term changes that may occur as a result of groundwater pumping in the area.

The nearest potential wetland or halophyte communities would be near Palen Lake. BLM has identified an ironwood woodland community approximately 5 miles north of the

Project site. Predicted water table drawdowns beneath this woodland are in the range of 0.05 to 0.2 feet. Section C.2, Biological Resources describes potential impacts to vegetation that may be dependent on shallow groundwater table conditions.

Given the current understanding of the hydrogeology of the Quaternary Alluvium, the Bouse Formation and the Fanglomerate, as well as the current understanding concerning existing wells that may be affected by Project-induced drawdown, it is unlikely that groundwater pumping for the Project would cause any nearby wells to go dry or be severely impaired or rendered unusable by declining groundwater levels. Staff has proposed Conditions of certification to ensure that any significant impacts that do occur are mitigated.

Mitigation

Groundwater levels near the Project's water supply wells will decline during the Project pumping. Local decline of groundwater levels within the cone of depression could affect nearby wells. While preliminary studies and calculations have been made to assess the potential for impact, the quantification of the impact is considered an estimation and will not be able to be accurately quantified until actual long-term groundwater production occurs. Implementation of Conditions of Certification **SOIL&WATER-3** through **SOIL&WATER-5**, provided in Section C.9.11, *Proposed Conditions of Certification/Mitigation Measures,* below, are expected to minimize impacts to groundwater levels below the level of significance.

The applicant will be required to implement Condition of Certification **SOIL&WATER-17** that requires a Subsidence Monitoring and Action Plan to assess and mitigate potential effects of non-elastic subsidence associated with groundwater extraction in the vicinity of the proposed production wells.

Mitigation for potential impacts to groundwater-dependent vegetations is discussed in the Biological Resources section of this SA/DEIS.

Groundwater Quality

Construction and Operation

There is a potential that significant groundwater quality impacts could occur during construction if contaminated or hazardous materials used during construction were to be released and migrate to the groundwater table. Given the distance to the groundwater table (70-90 feet bgs) and the proposed implementation of a hazardous material management plan during construction (see Section C.4, Hazardous Materials Management), staff expects impacts to groundwater quality to be below the level of significance.

There is a potential that Project extraction of groundwater may induce vertical flow of high saline groundwater from beneath Ford Dry Lake to lower aquifers being used for water production located beneath the site. Slight lateral transport of high TDS groundwater may occur as a result of the project and the vertical transport of high saline groundwater downward may slightly increase TDS concentrations in some limited areas. Under State Water Resources Control Board (SWRCB) Resolution 88-63, the

brackish water underlying the Project site that exceeds TDS concentrations of 3,000 mg/L or 250 mg/L chloride would not be considered a potential source of drinking water; and would be suitable only for potential industrial use.

The impact upon water quality due to project pumping was completed by simulating transport of chloride in groundwater using the MT3D transport model. Groundwater velocity data output from the groundwater flow model impact assessment was utilized by the MT3D transport model for this assessment. Chloride was selected as the preferred solute, as it is conservative (e.g. does not undergo chemical reactions or attenuation) and is a dominant anion in groundwater in the Project area for which significant baseline analytical data is available for the lower aquifers being used for water production. In addition, chloride can be directly related to TDS concentration with a reasonable degree of accuracy. Chloride concentrations in groundwater in the eastern portion of the basin are approximately 38 percent of the TDS concentration (WPAR, 2010a).

The water quality impact model was run for a period of 33 years to simulate the expected duration of project operations and the modeled concentrations of chloride in groundwater extracted from the well were recorded. Chloride in the model will migrate with the groundwater that is being extracted, and increases in chloride concentrations imply vertical or lateral migration of high chloride, and hence high TDS groundwater into lower concentration areas, thus potentially degrading water quality (WPAR, 2010a).

During the 33-year pumping simulation, chloride concentrations are projected to decrease slightly, from a baseline concentration of approximately 1,600 mg/L to approximately 1,470 mg/L at the end of the simulation. This is a decrease of approximately 8 percent and is likely due to the dilution of groundwater in the project area by lower TDS groundwater drawn in from the north and east of the Project site.

However, due to the uncertainty associated with the amount of information available concerning shallow groundwater quality, continuity of confining layers and on vertical migration, implementation of Conditions of Certification **SOIL&WATER-3** through **SOIL&WATER-5** and **SOIL&WATER -20**, provided in Section C.9.11, *Proposed Conditions of Certification/Mitigation Measures,* below, are expected to minimize impacts to groundwater quality below the level of significance.

With regard to the operation of the Land Treatment Unit (LTU) on the project site, the material that will be placed in the LTU consists of soil that is impacted with Therminol® VP1 HTF as a result of minor leaks or spills (see Section C.4 Hazardous Materials Management) that occur during the course of daily operational or maintenance activities. The LTU will cover an area of approximately 600 feet by 725 feet, including the staging area, and will cater to both 125 MW units. The LTU will be constructed with a prepared base consisting of two feet of compacted, low permeability, lime treated material and be surrounded on all sides by a minimum two foot high compacted earthen berm with slopes of approximately 3:1 (horizontal:vertical) that will serve as a protective barrier to the downward movement of contaminants from the LTU. Moreover, should any contaminants escape the LTU, the water table is approximately 70-90 feet beneath the LTU.

At ambient temperatures, HTF is a highly viscous material (crystallizes at ~54°F) that is virtually insoluble in water (solubility of ~25 mg/L [WPAR, 2009]). Operation of an LTU is not expected to impact surface water or groundwater quality beneath the site. The LTU will be surrounded on all four sides by berms that will protect the LTU from surface water flow. Because of the viscous and insoluble nature of HTF, it is not likely to mobilize from the soil downwards to the water table (approximately 70-90 feet bgs). Compliance with the requirements of CCR Title 23, Division 3, Chapter 15 and Title 27, Section 2000 et seq. and Title 23, Section 2510 et seq and Condition of Certification **SOIL&WATER-6** would minimize potential impacts to groundwater quality to below the level of significance.

In summary, because of the viscosity of HTF at ambient temperatures, the insolubility of HTF, the depth of the water table, and the placement of protective berms around the LTU, it is expected that surface water and groundwater quality beneath the site will not be impacted by LTU operation.

Each 125 MW unit will have three double-lined evaporation ponds. Each pond will have a nominal surface area of eight acres resulting in a total of 24 acres of evaporation ponds for each unit or a total of 48 acres of ponds for both 125 MW units. The ponds will be designed and permitted as Class II Surface Impoundments in accordance with CRBWQCB requirements, as well as the requirements of the California Integrated Waste Management Board (CIWMB). Multiple ponds are planned to allow plant operations to continue in the event that a pond needs to be taken out of service for some reason, *e.g.,* needed maintenance. Each pond will have enough surface area so the evaporation rate exceeds the cooling tower blowdown rate at maximum design conditions and annual average conditions.

The average pond depth is eight feet and residual precipitated solids will be removed approximately every seven years to maintain a solids-depth no greater than approximately three feet for operational and safety purposes. The precipitated solids will be sampled and analyzed to meet the characterization requirements of the receiving disposal facility. The characteristics of the precipitated solids will determine the transportation and disposal methodology. It is anticipated the pond solids and other non-hazardous wastes would be classified as Class II Designated Waste, a non-hazardous industrial waste. Genesis Solar, LLC will test the pond solids using appropriate test methods in advance of removal from the evaporation ponds to confirm this determination; however, preliminary data estimates show the material will be non-hazardous. Approximately 6,150 tons of evaporative residue will be accumulated yearly, which equates to approximately 50,000 tons of evaporative residue being removed during each cleanout and a total estimated amount of 214,500 tons over 30 years.

The pond liner system will consist of a 60 mil high density polyethylene (HDPE) primary liner and a secondary 40 mil HDPE liner. Between the liners is a synthetic drainage geonet and collection piping that is used as part of the leachate collection and removal system (LCRS), which will be directed back to the pond. There will be a hard surface protective layer on top of the 60 mil HPDE which will consist of a non-woven geotextile, a one foot thick granular fill/free draining material, and a one foot thick hard surface such as roller-compacted concrete. The hard surface provides protection against accidental damage to the HDPE from falling objects, varying climatic conditions, and

worker activities during cleanout and maintenance. Monitoring of the evaporation ponds will be required to detect the presence of liquid and/or constituents of concern. Based on the experience of the existing SEGS plants, it is expected the constituents of concern for this monitoring will include chloride, sodium, sulfate, TDS, biphenyl, diphenyl oxide, potassium, selenium, and phosphate. Due to the aforementioned construction and operational procedures of the surface impoundments along with Condition of Certification **SOIL&WATER-20**, groundwater quality is not anticipated to be affected as a result of disposal of this waste stream and impacts to groundwater quality would be below the level of significance.

Additional requirements for mitigation of potential groundwater quality impacts will also be included as a part of the waste discharge requirements for the surface impoundment that would be included in Condition of Certification **SOIL&WATER-6.** These requirements will be included in the Supplemental Staff Assessment after all relevant information is reviewed by the CRBRWQCB and staff.

The use and application of septic fields is an established practice as a method of wastewater treatment. The closest septic field to a privately owned parcel of land is in excess of ½ mile. The septic system will have no effect on the surface water in or around the Project site. The septic system will be installed approximately 5-6 feet deep. In addition, the Riverside County Department of Environmental Health has a Technical Guidance manual for Onsite Wastewater Treatment Systems and this requires a setback of 100 feet between this type of system and the nearest groundwater well. It is assumed that individual septic systems and leach fields are planned for each of the two power blocks in support of the Project's administrative, warehouse, and control room and facilities. The proposed septic systems and leach fields for the various facilities are hydraulically up-gradient approximately 3 miles from the nearest offsite well. Therefore, operation of the septic systems and leach fields from these areas are not expected to impact groundwater quality at the nearest offsite wells.

The septic system and leach fields for the Project will be constructed in accordance with the requirements of Riverside County:

1. Ordinance 650.5 (amending Ordinance 650, which regulates the discharge of sewage in unincorporated areas of the County of Riverside and incorporates by reference Ordinance 725),

2. Title 15 Section 15.24.010 (the Uniform Plumbing Code) Appendix K for Private Sewage Disposal – General and Disposal Fields, and

3. Title 8 Section 8.124.030 (Approval and Construction Permit for Sewage Discharge) and Section 8.124.050 (Operation Permit for Sewage Disposal).

Soil and Water Table 16 lists septic system and leach field minimum setbacks as required by the County of Riverside and the Project setbacks for the GSEP site.

Soil and Water Table 16
Sanitary Facility Set-Backs Requirements

County of Riverside Requirement	Minimum Set Back	Project Set Back	Reference
Minimum Distance Between Groundwater and Leach Lines	5 feet	175 feet	Riverside County Ordinance 650.5 (& OWTS Guidance Manual)
Minimum Horizontal Distance From Water Supply Wells	50 feet	250 feet	2007 California Plumbing Code (adopted by Reference as Riverside County Title 15, Chapter 15)

Source: Derived from AECOM (2009) and WPAR, 2010a..

Mitigation

Groundwater quality in the vicinity of the project site could be impacted as a result of the operation of the LTU, surface impoundments and septic fields. Preliminary studies and calculations have been made to assess the potential for impact. These studies suggest that there is a low potential to impact groundwater quality in the vicinity of the project site. Due to the uncertainty associated with the potential to impact groundwater quality and the regulatory requirements for operation of the LTU, surface impoundments as well as stormwater and potentially septic system operations, staff recommends implementation of specific monitoring and mitigation requirements.

Implementation of Conditions of Certification **SOIL&WATER-5** through **SOIL&WATER-7** and **SOIL&WATER-20** are anticipated to minimize impacts below a level of significance. Additional requirements for mitigation of potential groundwater quality impacts will also be included as a part of the waste discharge requirements for the LTU and surface impoundment that would be included in Condition of Certification **SOIL&WATER-6.** These requirements will be included in the Supplemental Staff Assessment after all relevant information is reviewed by the CRBRWQCB and staff. These measures are provided in detail in Section C.9.11, *Proposed Conditions of Certification/Mitigation Measures,* below.

Surface Water Hydrology

The impacts of the Project on the local surface water hydrology are directly related to proposed onsite grading and the construction and operation of a network of engineered collector/conveyance channels designed for the purpose of protecting the Project from flooding. The Project will change both the extent and physical characteristics of the existing floodplain within the Project site and downstream of the Project site. A change in sediment transport and depositional characteristics at and downstream of the Project site will also occur.

The Concept Drainage Study (GSEP 2009a) provides a summary of discharges at the downstream property boundary which compares existing total outflow at the project boundary with post-development outflows at the project boundary. The post-development discharges from the Project watersheds are significantly higher than existing conditions as shown on **Soil and Water Table 17.** This is to be expected given the change to surface conditions, including soil compaction and a more efficient drainage system. The study indicates that the increase in discharge is to be mitigated by the use of detention basins located at each of the solar fields. These basins would be

sized and designed to operate in a manner as to reduce the post-development discharges to pre-development conditions.

The use of detention basins can be of concern as they tend to allow for the deposition of sediment leaving the discharged flow in a sediment deficient condition. This situation can favor downstream erosion as the more concentrated flows balance their sediment load. The Conceptual Grading Plans (GSEP 2010a) for the project do provide for erosion control downstream of the outlet in the form of an engineered energy dissipater and downstream riprap splashpad comprised of 6" rock. The proposed splashpad is not compatible with the wildlife traversability requirements for the project and the design will need to be modified during the formal construction plan process. The velocity and depth of flow off of the energy dissipater structure will need to be reviewed within the context of allowable non-erosive velocities based on site specific soil conditions.

Soil and Water Table 17
Summary of Existing and Proposed Peak Flow Rates at Downstream Project Boundary

Sub-basin ID	Existing Q_{100}	Developed Q_{100}
1	4070	1156
2	2203	4086
3	10,022	2006
A (onsite)	519	1295
B (onsite)	419	1127

Engineered drainage channels will be constructed along the project boundary wherever the potential for the interception of offsite surface flows exists. These channels will intercept offsite flows and convey them around and through the project for discharge along the southern project boundary. Onsite flows would be discharged directly into detention basins via a series of smaller internal swales and channels. The conceptual layout of the drainage system is provided on **Soil and Water Figure 18** as well as on Sheets 1 through 7 of the Conceptual Grading Plans (GSEP 2010a). Discharge of flow along the downstream project boundary would be through the use flow dispersion structures in the form of pipes and weirs. The intent of these structures is to reduce flow velocities and allow flow to be released/spread out in a manner that mimics existing sheet flow conditions downstream of the project.

Releasing flow back to native ground in a manner similar to existing conditions is of concern for two primary reasons. The first is that flow collected from a large area and discharged in a more concentrated area may result in the potential for increased erosion. The second potential concern is that the significant change in flow patterns may essentially "dry-up" discreet areas downstream of the project potentially resulting in a significant impact to the existing biological resources beyond the project boundary. This issue is discussed further in Section C.2 – Biological Resources.

Alteration of Drainage Patterns

Construction and Operation

Onsite Drainage

All existing washes and floodplains within the Project boundary will be completely eliminated by the grading of approximately 1,800 acres to provide the flat, uniform and vegetation-free topography required for the construction and operation of the solar mirror array. The existing natural drainage system will be replaced with a system of constructed swales and channels designed to collect and convey onsite flows to designated points of discharge from the project. Onsite stormwater from the Project will be discharged offsite through constructed detention basins which will provide for attenuation of increased discharges due to site development. The impact to onsite drainage patterns will be significant.

Offsite Drainage

The Project will not impact the existing natural drainage system upstream of the Project boundary as there are no plans for any diversions, basins, dams or other surface water controls beyond the upstream limits of the Project. However, there is the potential for erosion of offsite areas upstream due to the formation of headcuts which could migrate laterally from the engineered channels if they are not stabilized and protected.

Physical modifications to the natural drainage system downstream of the Project boundary are not proposed. However, there will be changes to both the existing drainage patterns and sediment transport characteristics as the result of the concentration and diversion of flows upstream of the project, and the subsequent release of those flows at discreet locations on the downstream side of the project. Certain downstream areas will receive more flow than under existing conditions, while other areas may no longer receive any surface flow beyond what may be the result of direct precipitation. The release of concentrated flows at the proposed dispersion structures may have the potential for increased erosion.

The assessment of the impacts to the existing surface flow patterns requires a detailed analysis utilizing FLO-2D or a similar model to clearly delineate the pre- and post-project conditions. Information obtained from such an analysis is critical to assess the extent and adequacy of the proposed flood control measures on the northern eastern project boundaries as well as along the downstream project boundary where flow is released from the engineered channels onto existing ground. The applicant completed FLO-2D modeling for existing conditions and provided the results of that analysis in a Technical Memorandum. The modeling confirmed extensive sheet flow conditions along the entire upstream project boundary. The applicant also provided preliminary FLO-2D modeling for proposed conditions to demonstrate how flow will be released from the downstream project boundary back onto native ground. A conceptual diagram showing flow patterns downstream of the project site is provided on **Soil and Water Figure 19.** The design for the outlet structures from the downstream engineered channel will allow for flexibility for where flow is released and how much is released at discreet locations.

Mitigation

Implementation of Condition of Certification **SOIL&WATER-10** and **SOIL&WATER-11**, (described in detail in Section C.9.11, *Proposed Conditions of Certification/ Mitigation Measures,* below) is anticipated to minimize impacts related to surface drainage associated with construction and operation of the Project to below the level of significance. Implementation of Conditions of Certification **SOIL&WATER-8** and **SOIL&WATER-9** will ensure that adequate studies and data are provided to assess the that **SOIL&WATER-10** and **SOIL&WATER-11** have been implemented within the context of site specific conditions.

Flood Hazards

Construction

The Project will be protected from flooding from offsite sources through the construction of engineered channels along upstream project boundaries. These channels will capture and convey up to the 100-year flow through and around the Project and discharge it along the southern project boundary. The Concept Drainage Study (GSEP 2009a) and Conceptual Grading Plans (GSEP 2010a) for the project provide information on the layout and geometry of the proposed channels as well as the design discharges for each reach. Cross-sections for each channel were also provided which show how the channels will tie into existing grade and into the proposed facility. Given the extremely flat nature of the site, there do not appear to be any major grading related issues that would favor erosion, such as large cut slopes to accommodate a terraced project design. Channel profiles and flow analyses to determine flow depth and velocity were not provided in support of this impact analysis. In general, the preliminary plans were incomplete with regard to fully providing a sound drainage concept.

A summary of the proposed channel geometry and hydraulic characteristics as provided in the Concept Drainage Study (GSEP 2009a) and Conceptual Grading Plans (GSEP 2010a) is provided in **Soil and Water Table 18**. Hydraulic data were not provided for the 10-year flow, which is usually used to demonstrate reasonable channel velocities. However, the 100-year hydraulic data does indicate that most channel reaches do meet, or likely meet, established and reasonable guidelines for allowable channel velocities. Special consideration will need to be given in those sections that do not meet these guidelines for the 10-year flow event.

Soil and Water Table 18
Summary of Proposed Collector and Conveyance Channel Hydraulic Characteristics

Channel ID	Design Discharge (cfs)	Approximate Length (ft)	Bottom Width (ft)	Channel Depth (ft)	Side Slopes (H:V)	100-Year Velocity Range (ft/s)
A	1,156	7,500	20'-43'	3' to 4'	3:1	4.5 to 5.1
B	4,086	8,000	31'-150'	3' to 4'	3:1	5.6 to 9.6
C	2,006	3,800	20' to 45'	3' to 4'	3:1	3.0 to 3.7
B/C	,6092	5,000	150' to 156'	4' to 5'	3:1	5.7 to 7.2
D	2,600	7,500	24' to 91'	3' to 6'	3:1	5.5 to 9.6
E	254	1,300	20'	3'	3:1	3.2 to 8.6
D/E	2,854	3,500	95'	5'	3:1	5.7

The Conceptual Grading Plan provided in the DESCP (GSEP 2009a) provides typical channel sections for the proposed collector and conveyance channels. These details show fully armored slopes utilizing gabions or riprap. These materials are not consistent with project requirements for traversability by wildlife and should not be utilized. Soil cement is the preferred method of channel stabilization. The typical sections in the Conceptual Grading Plan (GSEP 2009a) show 3:1 slopes are predominate for the larger channels. Experience has shown that anything steeper than approximately a 4:1 slope is impractical for a "slope paving" type of construction. At steeper slopes, the soil cement is difficult to place and compact within industry accepted specifications, especially in channels which are more than a few feet deep. The other option is to construct the soil cement in lifts which significantly increases material quantities and most likely construction time.

Operation

During operation, the proposed collector and conveyance channel along the west project boundary will be exposed to incoming side flows along most of its extent. These inflows could include concentrated runoff at the more defined drainages, shallow sheet flow, and smaller more localized flows. All of these elements have the ability to cause significant erosion of unprotected channel banks as well as to create headcutting which will extend roughly perpendicular from the outer channel bank into the adjacent floodplain. These headcut features have the potential to achieve the same depth as the main collector channel and can extend upstream for several hundred feet over time due to numerous smaller flow events, or can occur very quickly from a single large event depending on the magnitude of flow at a given location. Significant impacts to areas beyond the project boundaries can occur due to these erosional features. Appropriate bank stabilization measures must be implemented to ensure that headcutting is prevented at all locations where flow enters the engineered channels.

Operation of the proposed channels and erosion mitigation measures will require significant inspection and maintenance over the life of the facility to ensure that the channels are operating as intended and that potential and observed erosion issues are addressed promptly to minimize damage to the facility and areas beyond the Project boundary. Relatively small problems and erosional features which develop during smaller more frequent event can become the focal point for problems during larger

events. The applicant has prepared a Draft Channel Maintenance Plan which addresses some of the potential issues associated with long term operation of the channels. However, the plan does not adequately address the issue of the collection of offsite flows or the use of soil cement along areas subject to inflows from offsite watersheds. The monitoring and mitigation of erosion to offsite areas caused by the presence and operation of the proposed collector and conveyance channels must explicitly addressed in the document.

Channel Maintenance Program

The applicant shall develop and implement a Channel Maintenance Program that provides a framework for routine channel maintenance projects and ensures compliance with conditions of certification in a feasible and environmentally-sensitive manner. The Channel Maintenance Program would be a process document prepared by the project owner, which would be reviewed and approved by the both BLM's Authorized Officer and the CPM. Staff is requiring as part of Condition of Certification **SOIL&WATER-13** that the Channel Maintenance Program provide long-term guidance to the applicant to implement routine channel maintenance projects and comply with GSEP's related biological (see Section C.2, Biological Resources) and flood protection (**SOIL&WATER-1, SOIL&WATER-2,** and **SOIL&WATER-12**) conditions of certification. Condition of Certification **SOIL&WATER-13** requires that the applicant will implement the measures identified in the program. The main goals of the Channel Maintenance Program would be to maintain the diversion channels to meet its original design to provide flood protection, protect offsite areas form erosion, support GSEP mitigation, protect wildlife habitat and movement/migration, and maintain groundwater recharge. Compliance with Condition of Certification **SOIL&WATER-13** would reduce the impacts below the level of significance.

Mitigation

Implementation of Conditions of Certification **SOIL&WATER-9** through **SOIL&WATER-13**, described in detail in Section C.9.11, *Proposed Conditions of Certification/Mitigation Measures,* below, is anticipated to minimize impacts related to flood hazards and erosion associated with construction and operation of the Project to below the level of significance. They will also provide the basic information to assist both the AO and the CPM to adequately review and assess the appropriateness of the proposed design within the context of the site specific conditions.

Surface Water Quality

Project storm water may encounter soil or chemicals deleterious to aquatic and terrestrial plant and wildlife. The Project Applicant proposes to implement BMPs for managing potentially harmful storm water and protect water quality. Potentially significant water quality impacts could occur during operations if contaminated or hazardous materials used during operations were to contact storm water and drain offsite. The Project would alter natural storm water drainages and use BMPs to reduce potentially significant impacts related to concentrated drainage and ensuing soil erosion and sediment transport offsite. Recognizing these potential impacts, the applicant has prepared a draft industrial SWPPP required by the general waste discharge requirements for industrial activity.

Construction

Potential threats to surface water quality related to construction on the project site as well as linear features and would include: potential increases in sediment loads to adjacent streams and washes; accidental spills of hydrocarbon fuels and greases associated with construction equipment. Implementation of Conditions of Certification **SOIL&WATER-1** and **SOIL&WATER-2** (found in Section C.9.11, *Proposed Conditions of Certification/Mitigation Measures,* below) would reduce potential water quality impacts to insignificant.

Operation

Potential threats to surface water quality related to operations include: potential increases in sediment loads to adjacent washes; accidental spills of hydrocarbon fuels and greases (including HTF fluid) associated with operations equipment, and accidental releases from HTF treatment area and the surface impoundments that includes wastewater from the pre-treatment and RO reject water.

Mitigation

Implementation of Condition of Certification **SOIL&WATER-1**, **SOIL&WATER-2**, **SOIL&WATER-12**, and **SOIL&WATER-13** (described in detail in Section C.9.11, *Proposed Conditions of Certification/Mitigation Measures,* below), is anticipated to reduce impacts to surface water quality to below the level of significance associated with construction and operation of the Project. Additional requirements for mitigation of potential surface water quality impacts will also be included as a part of the waste discharge requirements for the LTU and surface impoundment that would be included in Condition of Certification **SOIL&WATER-6.** These requirements will be included in the Supplemental Staff Assessment after all relevant information is reviewed by the CRBRWQCB and staff.

C.9.4.3 CEQA LEVEL OF SIGNIFICANCE

Section 15064.7 of the CEQA Guidelines encourages each public agency to “develop and publish thresholds of significance that the agency uses in the determination of the significance of environmental effects.” The section continues to define a significance threshold as being an “identifiable quantitative, qualitative, or performance level of a particular environmental effect, non-compliance with which means the effect will normally be determined to be significant by the agency and compliance with which means the effect will normally be determined to be less than significant.”

The Energy Commission, in its role as CEQA lead agency for the Project, has not developed or published significance thresholds related to soil and water resources. In the absence of Energy Commission-specified significance thresholds, the analysis of the significance of potential environmental effects related to soil and water resources contained herein is made based on the criteria specified in Appendix G of the CEQA Guidelines, as identified in Section C.9.3, Methodology and Thresholds for Determining Environmental Consequences, above.

C.9.5 REDUCED ACREAGE ALTERNATIVE

The Reduced Acreage Alternative (RAA) would essentially be Unit 1 of the proposed project, including a 125 MW solar facility located within the boundaries of the proposed project as defined by the Applicant. This alternative is analyzed for two major reasons: (1) it eliminates about 50 percent of the proposed project area so all impacts are reduced, and (2) by eliminating the eastern solar field, it would reduce the water required for wet cooling by 50 percent. The boundaries of the Reduced Acreage Alternative are shown in **Alternatives Figure 1**.

C.9.5.1 SETTING AND EXISTING CONDITIONS

This alternative is located entirely within the boundaries of the proposed project. It simply eliminates effects to the eastern 125 MW solar field and relocates the gas yard approximately 1.75 miles northwest of its present location. As a result, the environmental setting consists of the western portion of the proposed project, as well as the area affected by the linear project components.

C.9.5.2 ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

Soil Erosion

Soil erosion at the RAA Project site could be impacted as a result of the construction and operation of the RAA Project. Impacts related to soil erosion from wind and surface water are anticipated to be similar to those associated with the proposed Project.

The RAA Project construction activities would disturb site soils at the site and along the linear facilities route(s). It is at the time of this disturbance that there would be the highest potential for erosion, as well as associated effects including soil loss and increased sediment yields downstream from disturbed areas. It is expected that BMPs would be utilized to minimize the impacts of soil erosion during construction to less than significant.

Geomorphology

The Reduced Acreage Alternative (shown in Appendix A-Figure 25) was assessed for its potential geomorphic impacts. The alternative removes the proposed eastern solar array from the project. Since the main geomorphic impacts identified in this report are associated with the eastern solar array this alternative would have lower impacts, with no impact on the Chuckwalla and Palen-McCoy sand corridors or on the eastern wash complex. No mitigation is required or proposed.

Groundwater Basin Balance

Groundwater basin balance in the vicinity of the RAA Project site could be impacted as a result of the construction and operational water use. The potential impact would be approximately 50 percent less than the proposed Project as the RAA uses approximately 50 percent less water than the proposed Project.

As previously stated, the Project has the potential to indirectly impact flow in the Colorado River by inducing underflow into the PVMGB. Implementation of the Condition of Certification **SOIL&WATER-15** specified in Section C.9.11, *Proposed Conditions of Certification/Mitigation Measures,* below, is anticipated to reduce the potential for impacts from water drawn from the Colorado River through groundwater pumping to below the level of significance.

Groundwater Levels

Groundwater levels in the vicinity of the RAA Project site could be impacted as a result of the construction and operational water use. The potential impact is expected to be approximately 50 percent less than the proposed Project as the RAA would use approximately 50 percent less water than the proposed Project.
Groundwater levels near the Project's water supply wells will decline during the Project pumping. Local decline of groundwater levels within the cone of depression could affect nearby wells. While preliminary studies and calculations have been made to assess the potential for impact, the quantification of the impact is considered an estimation and will not be able to be accurately quantified until actual long-term groundwater production occurs. Implementation of Conditions of Certification **SOIL&WATER-3** through **SOIL&WATER-5**, provided in Section C.9.11, *Proposed Conditions of Certification/Mitigation Measures,* below, are expected to minimize impacts to groundwater levels below the level of significance.

The applicant will be required to implement Condition of Certification **SOIL&WATER-17** that requires a Subsidence Monitoring and Action Plan to assess and mitigate potential effects of non-elastic subsidence associated with groundwater extraction in the vicinity of the proposed production wells.

Mitigation for potential impacts to groundwater-dependent vegetations is discussed in the Biological Resources section of this SA/DEIS.

Groundwater Quality

Groundwater quality in the vicinity of the RAA Project site could be impacted as a result of the operation of the LTU, surface impoundments, and septic fields. The potential impact would be similar as for the proposed Project. Implementation of Conditions of Certification **SOIL&WATER-5** through **SOIL&WATER-7** and **SOIL&WATER-20**, provided in Section C.9.11, *Proposed Conditions of Certification/Mitigation Measures,* below, are expected to minimize impacts to groundwater levels below the level of significance.

Surface Water Hydrology

The impacts and mitigation measures of the RAA Project would be similar to the proposed project, except proportionately smaller in scale with regards to overall natural area lost to mass grading. All existing washes within the smaller developed portion of the site would be eliminated by onsite grading and replaced with a system of engineered swales and channels. Mitigation of potential erosion and headcutting in the engineered channels would still be required as would a careful design along the downstream project boundary to ensure the diverted flows are released in a manner which does not increase offsite erosion. However, the overall volume of offsite flow that

would need to be collected and conveyed around the project would be significantly less due to reduced footprint, and impacts to the floodplain downstream would also be proportionately reduced.

Surface Water Quality

Surface water quality in the vicinity of the RAA Project site could be impacted as a result of surface grading. In addition, potentially significant water quality impacts could occur during operations if contaminated or hazardous materials used during operations were to contact storm water and drain offsite. Moreover, the RAA would alter natural storm water drainages and significantly impact surface water quality.

C.9.5.3 CEQA LEVEL OF SIGNFICANCE

Section 15064.7 of the CEQA Guidelines encourages each public agency to "develop and publish thresholds of significance that the agency uses in the determination of the significance of environmental effects." The section continues to define a significance threshold as being an "identifiable quantitative, qualitative, or performance level of a particular environmental effect, non-compliance with which means the effect will normally be determined to be significant by the agency and compliance with which means the effect will normally be determined to be less than significant."

The Energy Commission, in its role as CEQA lead agency for the Project, has not developed or published significance thresholds related to soil and water resources. In the absence of Energy Commission-specified significance thresholds, the analysis of the significance of potential environmental effects related to soil and water resources contained herein is made based on the criteria specified in Section C.9.3, Methodology and Thresholds for Determining Environmental Consequences, above.

C.9.6 DRY COOLING ALTERNATIVE

A project may result in a significant adverse cumulative impact where its effects are cis section identifies the potential impacts of using air-cooled condenser (ACC) systems rather than the cooling towers proposed by NextEra for the GSEP. It is assumed that the ACC system would be located where the cooling towers are currently proposed for each of the two 125 MW power block, as illustrated in **Alternatives Figure 2** (see Section B.3).

Approximately 18 fans would be required for each ACC for the two solar fields. The 18 fans would operate when the ambient temperature is above 50 degrees Fahrenheit. When the temperature is below 50 degrees Fahrenheit, only 10 of the fans would be used (GSEP 2009f). The ACC described in the GSEP cooling study would have a length of approximately 279 feet, a width of approximately 127 feet, and a height of 98 feet (GSEP 2009f). However, based on the ACC preliminary designs for nearby solar thermal projects in similar ambient temperatures, an additional 11,690 square feet could be required for siting of the ACCs up to 120 feet in height. In addition to the ACC and fans, NextEra would use a small Wet Surface Air Cooler when needed to provide auxiliary cooling during extremely hot days (GSEP 2009f). This alternative is analyzed because it would reduce the amount of water required for steam turbine cooling from

822 acre-feet per year (AFY) to 66 AFY. This reduction in water use would reduce impacts to water and biological resources.

C.9.6.2 SETTING AND EXISTING CONDITIONS

This alternative is located entirely within the boundaries of the proposed project. It simply eliminates the use of wet-cooling towers and incorporated the use of air-cooled condensers (ACC) in the same location. As a result, the environmental setting would be the same as for the proposed project.

C.9.6.3 ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

Wet-cooling maximizes power plant fuel efficiency by providing a continuous source of effective cooling for the plant's steam condensers. Dry cooling will typically provide less effective cooling of the condensers, reducing the efficiency of the steam cycle portion of the power plant, and thus the overall fuel efficiency of the facility.

The FSA for the Beacon Solar Energy Project (08-AFC-2; BSEP 2009) showed that annual average fuel efficiency would be reduced 5-7 percent compared to a wet cooling system. The GSEP applicant stated that use of dry cooling would result in a 7.4 percent decrease in total annual net MWh compared with a wet cooling system (GSEP 2009a). In order to counter the reduction in generation that would result from dry cooling, the Beacon Solar Energy Project applicant proposed expanding the solar field by 12 percent.

The GSEP applicant states that the proposed project has been optimized for the land available, and therefore solar field expansion infeasible (GSEP 2009a). However, the power block and solar arrays would occupy approximately 1,360 acres of the 1,800-acre site. Evaporation ponds, access roads, administration buildings, and other support facilities would require a portion of the 1,800-acre site, and there is also remaining open space (GSEP 2009a). Additionally, use of dry-cooling would require smaller evaporation ponds opening up additional land for solar field expansion. A 12 percent increase in the solar field would require approximately an additional 150 acres. While it is uncertain whether the entire 150 acres is available for use and would comply with the engineering requirements for GSEP, it is clear from the site plan that there is some available land immediately adjacent to existing solar trough rows and this land could be used to offset all or a portion of the efficiency loss due to the use of dry-cooling.

Soil Resources

Because the ACC system would not require any additional ground disturbance other than what would be required for the proposed GSEP with the use of wet-cooled towers, impacts to soil resources from use of the Dry-Cooling Alternative would be expected to be similar as for the proposed project. Erosion impacts would be expected to be similar; however, the ACC system would potentially require some increase in truck traffic and related erosion due to the larger size of the system.

Water Resources

The Dry Cooling Alternative would reduce operation use of water from 822 AFY to approximately 66 AFY per 125 MW power block (GSEP 2009f). The Dry Cooling Alternative would include a Wet Surface Air Cooler to provide auxiliary cooling during extremely hot days.

A comparison was made between the average annual basin budget balance with the anticipated project water production requirements. **Soil and Water Table 19** presents the anticipated projects water requirements along with the average annual basin budget balance for the 37-month construction period. Currently, the CVGB balance is positive by approximately 2,608 afy whereby inflow (approximately 13,719 afy) to the basin is slightly greater than estimated outflows (approximately 11,111 afy) to the basin. Approximately 400 afy is attributed to subsurface outflow to the adjacent Palo Verde Mesa Groundwater Basin.

It is anticipated that groundwater extraction during construction (~616 to 1,368 afy) and operation (~132 afy) would not significantly impact the CVGB balance as the 1,368 afy during construction and the 132 afy during operations would not exceed the positive yearly balance of 2,608 afy.

Soil and Water Table 19
Estimated Change to Chuckwalla Valley Groundwater Basin Budget
(Average Year Conditions)

Project Component	Years	Annual Basin Budget Balance	Project Requirements (afy)	Net Budget Balance (afy)
Construction	1	2,608	1,368	1,240
	2	2,608	616	1,992
	3	2,608	616	1,992
Operations	4-33	2,608	132	2,476
Note: See **Soil and Water Table 8** for Groundwater Basin Budget				

Construction and operation of the Project would have an impact on basin balance in the CVGB. The impacts are considered insignificant, due to the fact that project pumping does not exceed net average recharge to the basin. The project's pumping could also have an effect on the adjacent Palo Verde Mesa Groundwater Basin (PVMGB) by inducing flows from the Colorado River into the PVMGB and as such those effects could be significant. Given the location of the Project, the anticipated annual Project water requirements, staff anticipates that the project may have a significant impact on adjacent (Palo Verde Mesa) groundwater basin.

The Applicant did not provide an analysis of the proportion of water originating from storage, from natural recharge and/or the Colorado River underflow. However, as previously stated water in the Colorado River is fully appropriated and any diversion of water from the Colorado River would be a significant impact. The U.S. Geological Survey has indicated that the PVMGB and the CVGB lies within a basin tributary to the Colorado River and that wells drawing groundwater could be considered to be withdrawing water from the Colorado River Aquifer (Wilson et al., 1994). Consequently, the Project has the potential to divert Colorado River water without any entitlement to

the water, and all groundwater production at the site would be considered Colorado River water. Staff understands that the foregoing conclusion is based on a simplified methodology for calculating contribution of water from the Colorado River from the Project's proposed groundwater extraction. The Project applicant could choose to implement **SOIL&WATER-19** Condition of Certification specified in Section C.9.11, *Proposed Conditions of Certification/Mitigation Measures,* below to conduct a refined analysis of the quantity of water contributed by the Colorado River from Project groundwater extraction. This analysis may also be used to estimate the volume of water that must be replaced in accordance with Condition of Certification **SOIL&WATER-15.**

We note that future water use in the CVGB may be governed by impending regulations being formulated by the USBR. These are discussed in the section addressing LORS, below. Waste discharge to the evaporation ponds using the ACC is approximately 50 percent of the wet cooling option (92 gpm compared with the annual average of 182 gpm for the proposed project using wet-cooling). As such, the applicant estimates that approximately one 12-acre evaporation pond would be required for each 125 MW power block (GSEP 2009f).

C.9.6.4 CEQA LEVEL OF SIGNFICANCE

Section 15064.7 of the CEQA Guidelines encourages each public agency to "develop and publish thresholds of significance that the agency uses in the determination of the significance of environmental effects." The section continues to define a significance threshold as being an "identifiable quantitative, qualitative, or performance level of a particular environmental effect, non-compliance with which means the effect will normally be determined to be significant by the agency and compliance with which means the effect will normally be determined to be less than significant."

The Energy Commission, in its role as CEQA lead agency for the Project, has not developed or published significance thresholds related to soil and water resources. In the absence of Energy Commission-specified significance thresholds, the analysis of the significance of potential environmental effects related to soil and water resources contained herein is made based on the criteria specified in Section C.9.3, Methodology and Thresholds for Determining Environmental Consequences, above.

C.9.7 NO PROJECT/NO ACTION ALTERNATIVES

C.9.7.1 NO PROJECT/NO ACTION ALTERNATIVE #1:

No Action on Genesis Solar Energy Project application and on CDCA land use plan amendment

Under this alternative, the proposed GSEP would not be approved by the Energy Commission and BLM and BLM would not amend the CDCA Plan. As a result, no solar energy project would be constructed on the project site and BLM would continue to manage the site consistent with the existing land use designation in the CDCA Land Use Plan of 1980, as amended.

Because there would be no amendment to the CDCA Plan and no solar project approved for the site under this alternative, it is expected that the site would continue to remain in its existing condition, with no new structures or facilities constructed or operated on the site. As a result, the impacts to soils and water from the construction and operation of the proposed project would not occur. However, the land on which the project is proposed would become available to other uses that are consistent with BLM's land use plan, including another solar project requiring a land use plan amendment. In addition, in the absence of this project, other renewable energy projects may be constructed to meet State and federal mandates, and those projects would have similar impacts in other locations.

C.9.7.2 NO PROJECT/NO ACTION ALTERNATIVE #2:

No Action on Genesis Solar Energy Project and amend the CDCA land use plan to make the area available for future solar development

Under this alternative, the proposed GSEP would not be approved by the Energy Commission and BLM and BLM would amend the CDCA Land Use Plan of 1980, as amended, to allow for other solar projects on the site. As a result, it is possible that another solar energy project could be constructed on the project site.
Because the CDCA Plan would be amended, it is possible that the site would be developed with the same or a different solar technology. As a result, impacts to soils and water would result from the construction and operation of the solar technology and resulting ground disturbance and would likely be similar to the impacts to soils and water from the proposed project, including erosion impacts and impacts to jurisdictional waters. Different solar technologies require different amounts of grading; however, it is expected that all solar technologies would require grading and maintenance. As such, this No Project/No Action Alternative could result in impacts to soils and water similar to the impacts under the proposed project.

C.9.7.3 NO PROJECT/NO ACTION ALTERNATIVE #3:

No Action on Genesis Solar Energy Project application and amend the CDCA land use plan to make the area unavailable for future solar development

Under this alternative, the proposed GSEP would not be approved by the Energy Commission and BLM and the BLM would amend the CDCA Plan to make the proposed site unavailable for future solar development. As a result, no solar energy project would be constructed on the project site and BLM would continue to manage the site consistent with the existing land use designation in the CDCA Land Use Plan of 1980, as amended.

Because the CDCA Plan would be amended to make the area unavailable for future solar development, it is expected that the site would continue to remain in its existing condition, with no new structures or facilities constructed or operated on the site and no soil erosion impacts or impacts to jurisdictional waters. As a result, this No Project/No Action Alternative would not result in the impacts to soils and water under the proposed project. However, in the absence of this project, other renewable energy projects may

be constructed to meet State and Federal mandates, and those projects would have similar impacts in other locations.

C.9.8 CUMULATIVE IMPACTS

A project may result in a significant adverse cumulative impact where its effects are cumulatively considerable. "Cumulatively considerable" means that the incremental effects of an individual project are significant when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects (California Code Regulation, Title 14, section 15130). NEPA states that cumulative effects can result from individually minor but collectively significant actions taking place over a period of time (40 CFR §1508.7).

Section B.3, Cumulative Scenario, provides detailed information on the potential cumulative solar and other development projects in the project area. Together, these projects comprise the cumulative scenario which forms the basis of the cumulative impact analysis for the proposed project. In summary, these projects are:

- Renewable energy projects on BLM, State, and private lands, as shown on **Cumulative Figure 1** and in **Cumulative Tables 1A and 1B.** Although not all of those projects are expected to complete the environmental review processes, or be funded and constructed, the list is indicative of the large number of renewable projects currently proposed in California.
- Foreseeable future projects in the immediate Chuckwalla Valley area, as shown on **Cumulative Impacts Figure 2, I-10 Corridor Existing and Future/Foreseeable Projects, and Cumulative Tables 2 and 3**. Table 2 presents existing projects in this area and Table 3 presents future foreseeable projects in the I-10 Corridor Area. Both tables indicate project name and project type, its location and its status.

These projects are defined within a geographic area that has been identified by the Energy Commission and BLM as covering an area large enough to provide a reasonable basis for evaluating cumulative impacts for all resource elements or environmental parameters. Most of these projects have, are, or will be required to undergo their own independent environmental review under CEQA and/or NEPA. Even if the cumulative projects described in Section B.3 have not yet completed the required environmental processes, they were considered in the cumulative impacts analyses in this SA/Draft EIS.

C.9.9 GEOGRAPHIC EXTENT

The geographic extent used as part of the cumulative impact assessment includes the CVGB. The extent of the basin is described in Section C.9.4.1. Setting and Existing Conditions.

C.9.9.2 EXISTING CUMULATIVE CONDITIONS

Section C.9.4.1, Setting and Existing Conditions describes the current conditions of the CVGB that would take into account existing cumulative conditions as they were known to occur.

C.9.9.3 FUTURE FORESEEABLE PROJECTS

Foreseeable Projects in the Project Area

Foreseeable projects that may impact the soil and water resources of the area were deemed to include only those projects located in the CVGB. **Soil and Water Table 20** lists the foreseeable projects and the anticipated water use associated with each of the projects.

Foreseeable Renewable Projects in the California Desert

All of the foreseeable projects were renewable projects and are listed in **Soil and Water Table 20**.

C.9.9.4 CONTRIBUTION OF THE PROJECT TO CUMULATIVE IMPACTS

Construction and Operation

The construction of the proposed Project is expected to result in short term adverse impacts related to construction activities. It is expected that some of the cumulative projects described above which are not yet built may be under construction the same time as the proposed Project. In addition, it is expected that some of the future and foreseeable projects described above may be operational at the same time as the proposed Project. As a result, there may be substantial long term cumulative impacts during operation of these projects related to soils and water resources.

There may be substantial short term and long-term impacts during construction and operations of those cumulative projects related to: soil erosion, geomorphology, basin balance, groundwater levels, groundwater quality, surface water hydrology and surface water quality, and they are discussed below.

Soil and Water Table 20
Foreseeable Projects and Anticipated Water Use

Project	Proponent	BLM Serial ID	Technology	Source	Use	WATER USE – RENEWABLE PROJECTS (afy)									References
						2011	2012	2013	2014	2015	2016	2017	2018	2019-2043	
Chuckwalla Solar I	Chuckwalla Solar I LLC	CACA 48808	Photovoltaic (200MW)	Chuckwalla Basin	Construction	20	20	10	--	--	--	--	--	--	Estimates
					Operation	--	5	7	10	10	10	10	10	10	
Eagle Mountain Soleil	enXco	CACA 49492	Photovoltaic (100MW)	Chuckwalla Basin	Construction	--	10	10	--	--	--	--	--	--	Estimates
					Operation	--	--	--	5	5	5	5	5	5	
Desert Lily Soleil	enXco	CACA 49494	Photovoltaic (100MW)	Chuckwalla Basin	Construction	--	20	20	--	--	--	--	--	--	Estimates
					Operation	--	--	--	5	5	5	5	5	5	
Desert Sunlight Solar Farm	First Solar	CACA 48649	Photovoltaic (550MW)	Chuckwalla Basin	Construction	27	27	27	--	--	--	--	--	--	Estimates
					Operation	--	--	--	4	4	4	4	4	4	
Eagle Mountain Pump Storage	Eagle Crest Energy Company, LLC	FERC 12509001	Pump – Storage (1276MW)	Chuckwalla Basin	Construction	--	308	308	8,066	8,066	8,066	8,066	--	--	Application to FERC
					Operation	--	--	--	--	--	--	--	2,688	1,763	
Genesis Solar Energy	Genesis Solar LLC	CACA 48880	Parabolic Trough (250MW)	Chuckwalla Basin	Construction	1,368	616	616	--	--	--	--	--	--	Application to Energy Commission
					Operation	--	--		1,644	1,644	1,644	1,644	1,644	1,644	
Mule Mountain Solar Project	Bullfrog Green Energy, LLC	CACA 49097	Photovoltaic (500MW)	Chuckwalla Basin	Construction	20	20	20	--	--	--	--	--	--	Estimates
					Operation	--	--	--	1	1	1	1	1	1	
Mule Mountain Soleil	enXco	CACA 49488	Photovoltaic (200MW)	Chuckwalla Basin	Construction	--	20	20	--	--	--	--	==	--	Estimates
					Operation	--	--		10	10	10	10	10	10	
Palen Solar Power	Palen Solar I, LLC	CACA 48810	Parabolic Trough (500MW)	Chuckwalla Basin	Construction	480	480	480	--	--	--	--	--	--	Application to Energy Commission
					Operation	--	--	--	303	303	303	303	303	303	
					Total	1,915	1,526	1,518	10,048	10,048	10,048	10,048	4,670	3,745	

Soil Erosion

Construction the proposed Project would result in both temporary changes at the Project site which could incrementally increase local soil erosion and storm water runoff during construction. The proposed Project would be expected to contribute only a small amount to the possible short term cumulative impacts related to soil erosion because the Project Applicant will be required to implement the mitigation measures defined in this analysis, which are expected to bring short term impacts below the level of significance.

Operation of the proposed Project would result in permanent changes at the Project site. These changes could incrementally increase local soil erosion and storm water runoff. The proposed Project would be expected to contribute only a small amount to these possible long term operational cumulative impacts because potential Project-related soil erosion and increased sedimentation resulting from storm water runoff are expected to be reduced to a level of insignificance through implementation of the conditions of certification/mitigation measures **SOIL&WATER-1, 2, 8, 9, 10, 11** and **13** specified in Section C.9.11, below.

Geomorphology

There is a concern that implementation of all of the reasonably foreseeable projects could have a cumulative impact on the regionally-significant geomorphic processes that transport sand downwind along the Chuckwalla Valley and to the Colorado River. Blocking or disrupting the sand transport corridors would impact various sites that provide habitat for biological resources such as the Mojave Fringe-Toed Lizard. See Section C.2 Biological Resources for further analysis of potential cumulative impacts related to geomorphic processes.

Groundwater Basin Balance

There is concern that the amount of groundwater used for both construction and operations would place the groundwater basin into overdraft. Groundwater overdraft is “the condition of a groundwater basin in which the amount of water withdrawn by pumping exceeds the amount of water that recharges the basin over a period of years during which water supply conditions approximate average conditions.” (CDWR, 1998).

For purposes of impact analysis, it is assumed that any withdrawals that exceed the average natural recharge and exceed a significant percentage of the total amount of groundwater in storage would be a significant impact. The following discussion presents an analysis of the potential for overdraft and significant depletion of groundwater in storage to occur.

A comparison was made between the average annual basin budget with the anticipated foreseeable projects cumulative construction and operation water production requirements. **Soil and Water Table 21** presents the anticipated projects water requirements (Years 2011-2043) along with the average annual basin budget. Currently, the CVGB balance is positive by approximately 2,608 afy whereby inflow (approximately 13,719 afy) to the basin is slightly greater than estimated outflows (approximately 11,111 afy) to the basin.

It is anticipated that groundwater extraction of foreseeable projects during construction of the GSEP would range from 1,915 afy in Year 2011 and peak at 10,048 afy in Years 2014 through 2017 which would exceed the basin balance in Years 2014 through 2017 by 7,440 afy. The CVGB would be in overdraft conditions commencing in Year 2014. It is anticipated that groundwater extraction during operations of reasonably foreseeable projects would be approximately 3,745 afy which would exceed the basin balance by 1,137 afy. The cumulative change in storage over the construction and operational period (33 years) would amount to approximately -57,000 af, which would equate to less than 0.5 percent of the total amount of the estimated total recoverable groundwater in storage (15,000,000 af).

Soil and Water Table 21
Estimated Change to Chuckwalla Valley Groundwater Basin Budget (Average Year Conditions)

Years	Annual Basin Budget Balance (1)	Cumulative Project Requirements (afy) (2)	Net Budget Balance (afy)	Cumulative Budget Balance (af)	Cumulative Positive/Deficit as a Percent of Total Recoverable Storage (3)
2011	2,608	1,915	693	693	0.005%
2012	2,608	1,526	1,082	1775	0.012%
2013	2,608	1,518	1,090	2865	0.019%
2014	2,608	10,048	-7,440	-4575	-0.031%
2015	2,608	10,048	-7,440	-12,015	-0.08%
2016	2,608	10,048	-7,440	-19,455	-0.13%
2017	2,608	10,048	-7,440	-26,895	-0.18%
2018	2,608	4,670	-2,062	-28,957	-0.19%
2019	2,608	4,670	-2,062	-30,094	-0.20%
2043	2,608	3,745	-1,137	-57,382	-0.383%

Notes:
(1) – See Soil and Water Table 8
(2) – See Soil and Water Table 20
(3) – Based on a total recoverable storage of 15,000,000 af.

However, the amount of water that is storage (estimated to be as much as 15,000,000 af) in the basin greatly exceeds the amount of cumulative overdraft (57,000 af). In light of these facts, the project's contribution to the cumulative impact to basin balance is less than cumulatively considerable.

Lastly, the I-10 corridor within the CVGB has been targeted for renewable energy projects that have not been identified or quantified as to amounts of water required for development. Given that perennial surface water sources are non-existent and the only available water source is groundwater, it is likely that these as yet unidentified projects could further develop the groundwater resources and exacerbate the cumulative overdraft conditions identified above. However, given the amount of total recoverable groundwater in storage (estimated at 15,000,000 af), the impact would be insignificant.

In addition, the cumulative impact analysis conducted by the GSEP suggested that during the course of operations for all reasonably foreseeable projects, the subsurface outflow from the CVGB into the PVMGB would decline from approximately 400 afy to approximately 81 afy in 2043 (see WPAR, 2009b Table 2). This could have an indirect significant impact on the Palo Verde Mesa Groundwater Basin by inducing underflow

from the Colorado River to the Palo Verde Mesa Groundwater Basin. Staff believes that inducing flow from the Colorado River into the Palo Verde Mesa Groundwater Basin is a significant impact.

Staff believes that the impact related to outflow could be fully mitigated, such that the project would not contribute to cumulative impacts. The measures, **SOIL&WATER-15** and **SOIL&WATER-19** are provided in detail in Section C.9.11, *Proposed Conditions of Certification/Mitigation Measures,* below.

Groundwater Levels

The regional model used by AECOM (2010a) is a two-dimensional superposition model developed using MODFLOW code (Harbaugh et al., 2000) for the Parker-Palo Verde-Cibola area, which includes the CVGB and the Project site. The model employed a simple vertical geometry and a large grid spacing to evaluate the impacts from groundwater pumping on the Colorado River.

The modeling results suggest (see **Soil and Water Figure 20**) that during the life of all the reasonably foreseeable projects, groundwater level declines of five feet or more would be located at a distance of approximately 4 miles from the proposed production wells at the Project site. The closest existing well is located at a distance of 3 miles. In addition, water level declines of 1 foot or more could be observed up to eight miles from the proposed production wells.

Staff notes that modeling conducted by the applicant indicated water level declines less than what is conservatively presented here. While preliminary studies and calculations have been made to assess the potential for impact, the quantification of the impact is considered an estimation and will not be able to be accurately quantified until actual long-term groundwater production occurs. Consequently, the potential impact to water levels in existing wells appears to be cumulatively significant. Implementation of Conditions of Certification **SOIL&WATER-3** through **SOIL&WATER-5** specified in Section C.9.11, *Proposed Conditions of Certification/Mitigation Measures,* below, is anticipated to mitigate the impacts to groundwater users (wells) to any impacted by lowering of the groundwater table. Impacts and proposed mitigation associated with biological dependent resources is discussed in Section C.2, Biological Resources***.**

Groundwater Quality

There is a potential that significant cumulative groundwater quality impacts could occur from the proposed Projects as listed on Soil and Water Table 20 during construction and operation if contaminated or hazardous materials used during construction and operations were to be released and migrate to the groundwater table.

The proposed Project would be expected to contribute only a small amount to the possible short-term cumulative impacts related to groundwater quality, given the distance to the groundwater table (70-90 feet bgs) over the CVGB and the proposed implementation of a hazardous material management plan as well as monitoring plans associated with operation of LTUs, surface impoundments, septic systems and other various operations. With implementation of the mitigation measures Conditions of Certification **SOIL&WATER-6** and **7** and **SOIL&WATER-20** specified in Section C.9.11,

Proposed Conditions of Certification/Mitigation Measures, below, cumulative impacts associated with the Project to groundwater quality are anticipated to be below the level of significance.

Surface Water Hydrology

The cumulative impacts of the proposed Projects as listed on Soil and Water Table 20 on the local surface water hydrology are directly related to proposed onsite grading and the potential construction and operation of a network of engineered collector/conveyance channels designed for the purpose of protecting the various projects from flooding. The proposed projects could change both the extent and physical characteristics of the existing floodplains within and downstream of each project site,. There is not enough information available on each site nor has a regional study been completed to define the extent of the cumulative effects of these projects on surface water within the watershed. However, it is assumed that each of these projects will be required to define their impacts and mitigate where required.

The proposed Project would be expected to contribute only a small amount to the possible short-term cumulative impacts related to surface water hydrology because the implementation of the mitigation measures specified in Section C.9.11, below, would reduce the project specific impacts below the level of significance.

Surface Water Quality

The cumulative impacts of the proposed foreseeable projects as listed on **Soil and Water Table 20** could have an impact on surface water quality. It is expected that stormwater generated on the various project sites may encounter soil or chemicals deleterious to aquatic and terrestrial plant and wildlife. It is expected that all of the projects would be required to implement BMPs for managing potentially harmful storm water and protect water quality. Implementation of the conditions of certification/mitigation measures **SOIL&WATER-1, 2, 8, 9, 10, 11** and **13** specified in Section C.9.11, below would reduce the project specific impacts below the level of significance. Potentially significant water quality impacts could occur during operations if contaminated or hazardous materials used during operations were to contact storm water and drain offsite. It is expected that all of the projects would have Hazardous Material Management Plans (see Section C.4, Hazardous Materials Management) to reduce impacts below the level of significance.

All of the proposed projects would alter natural storm water drainages and the expected use of BMPs would reduce potentially significant impacts related to concentrated drainage and ensuing soil erosion and sediment transport offsite. The proposed Project would be expected to contribute only a small amount to the possible short-term cumulative impacts related to surface water quality with implementation of the Conditions of Certification **SOIL&WATER-1, 2, 8, 9, 10, 11** and **13** specified in Section C.9.11, below would reduce the project specific impacts below the level of significance..

Closure and Decommissioning

The decommissioning of the proposed Project is expected to result in adverse impacts related to soils and water resources similar to construction impacts. It is unlikely that the construction or decommissioning of any of the cumulative projects would occur

concurrently with the decommissioning of this Project, because the decommissioning is not expected to occur for approximately 40 years. As a result, there may not be impacts related to soils and water resources during decommissioning of the proposed Project generated by the cumulative projects. The impacts of the decommissioning of the proposed Project would not be expected to contribute to cumulative impacts related to soils and water resources. To ensure there would be no impacts to soil and water resources during and after project decommissioning the applicant should be required to comply with Condition of Certification **SOIL&WATER–14.**

C.9.10 COMPLIANCE WITH LORS

Applicable Federal, State, and local LORS are summarized discussed in the following text. Non-applicable Federal and State LORS are also discussed to explain why they are not applicable.

C.9.10.1 FEDERAL

Clean Water Act (CWA) of 1977 (Including 1987 Amendments) Sections 401, 402 and 404

The primary objective of the CWA is to restore and maintain the chemical, physical, and biological integrity of the Nation's surface waters. Pollutants regulated under the CWA include "priority" pollutants, including various toxic pollutants; "conventional" pollutants, such as biochemical oxygen demand, total suspended solids, oil and grease, and pH; and "non-conventional" pollutants, including any pollutant not identified as either conventional or priority.

Clean Water Act Section 401

Section 401 of the CWA requires certification from the CRBRWQCB that the proposed project is in compliance with established water quality standards. Projects that have the potential to discharge pollutants are required to comply with established water quality objectives. These requirements include the implementation of BMPs during site grading activities and other activities associated with construction of the facility.

Section 401 provides the SWRCB and the CRBRWQCB with the regulatory authority to waive, certify, or deny any proposed federally permitted activity, which could result in a discharge to waters of the State. To waive or certify an activity, these agencies must find that the proposed discharge will comply with state water quality standards. According to the CWA, water quality standards include beneficial uses, water quality objectives/criteria, and compliance with the EPA's anti-degradation policy.

No license or permit may be issued by a federal agency until certification required by Section 401 has been granted. Under the CWA, USACE Section 404 permits are subject to CRBRWQCB Section 401 Water Quality Certification (Title 23 CCR Sections 3830 through 3869). As such, a determination of "federal waters" under Section 404 is required by the USACE. The ephemeral drainages on the Site were found not to conform to the requirements for designation as jurisdictional waters of the U.S. However, this finding still needs to be formally confirmed by the USACE and this process is underway.

While there is not a direct requirement under a 404 jurisdiction, the CRBRWQCB has authority under Porter-Cologne to regulate discharge of waste to waters of the state. The definition of the waters of the state is broader than that for waters of the U.S. in that all waters are considered to be a water of the state regardless of circumstances or condition. The term “discharge of waste” is also broadly defined in Porter-Cologne, such that discharges of waste include fill, any material resulting from human activity, or any other “discharge” that may directly or indirectly impact waters of the state relative to implementation of Section 401 of the CWA.

Porter-Cologne authorizes the CRBRWQCB to regulate discharges of waste and fill material to waters of the state, including “isolated” waters and wetlands, through the issuance of waste discharge requirements (WDRs). Under Porter-Cologne all parties proposing to discharge waste that could affect the quality of waters of the state, other than into a community sewer system, shall file with the appropriate CRBRWQCB a Report of Waste Discharge (ROWD) containing such information and data as may be required by the CRBRWQCB. As such, the PSPP will file a ROWD for evaluation of 401 water quality impacts and in association with the proposed LTU. The schedule for filing of such document is provided in Section 5.17.1.5.

Clean Water Act Section 402

Direct and indirect discharges and stormwater discharges into waters of the United States must be made pursuant to a NPDES permit (CWA Section 402). NPDES permits contain industry-specific, technology-based limits and may also include additional water quality-based limits, and establish pollutant-monitoring requirements. A NPDES permit may also include discharge limits based on Federal or State water quality criteria or standards.

In 1987, the CWA was amended to include a program to address stormwater discharges for industrial and construction activities. Stormwater discharge is covered by an NPDES permit, either as an individual or general permit. The Colorado River Basin RWQCB administers the NPDES permit program under the CWA in the Project area. Appendix L of this AFC provides a preliminary construction SWPPP/DESCP.

Clean Water Act Section 404

Activities resulting in the dredging or filling of jurisdictional waters of the U.S. require authorization under a Section 404 permit issued by the USACE. The USACE may grant authorization under either an individual permit or a nationwide permit (NWP) to address operations that may affect the ephemeral washes on the Project site. Section 404 permits are also subject to CWA Section 401 water quality certification through the CRBRWQCB.

An evaluation for jurisdictional waters on the Project site was performed by the Applicants. The ephemeral drainages on the Site were found not to conform to the requirements for designation as jurisdictional waters of the U.S. As noted above, this finding is under review and still needs to be confirmed by the USACE. Several drainages on the Site were delineated as jurisdictional waters of the State and are discussed in Section 5.17.1.2. A report documenting the results of the evaluation of the presence of jurisdictional waters of the U.S. is provided in Appendix F.

The U.S. Bureau of Reclamation, Colorado River – Proposed Accounting Surface Rule, 73 Federal Register 40, 916 (July 16, 2008) (subsequently withdrawn)

The Consolidated Decree of the United Sates Supreme Court in Arizona vs. California, 547 U.S. 150 recognized that consumptive use of water from the Colorado River can occur by groundwater withdrawal. Under this decree, users within the lower Colorado River Basin (which includes the PSPP) can divert tributary flow before it reaches the Colorado River. Once it reaches the river, entitlements are required for diversions. Wilson and Owen-Joyce and Owen-Joyce and others proposed the "river aquifer", which is hydraulically connected to the Colorado River, and the "accounting surface", which is defined as groundwater levels that would occur should the Colorado River be the only source of groundwater in the aquifer. Water levels higher than the accounting surface indicate recharge from tributary water sources.

Wells drawing water from the river aquifer (or water below the accounting surface) draw water from the Colorado River, and as such need to be accounted in the consumptive use of the river. In cases where water is drawn from the river aquifer, an entitlement is required from the USBR. The USBR proposed the accounting surface rule to eliminate the unlawful use of Colorado River on July 16, 2008 in the Federal Register (73 Federal Regulation 40,916). The USBR is currently preparing a new proposed rule.

The Project is proposing to use annually about 300 afy of groundwater from an onsite source for operational processes, including mirror washing, process makeup, equipment cooling, dust suppression and potable uses. Because groundwater is the only source of water for the proposed Project, and if the proposed rule is established, the Applicant will be required to submit an Application for Lower Colorado Water Supply Project Water to the Colorado River Board of California for entitlement to the groundwater. A contract with the City of Needles would be required to withdraw this water. Currently, a preliminary timeline for final implementation of the accounting surface rule is Summer 2011.

C.9.10.2 STATE

The administering agencies for the State LORS are the Energy Commission, the SWRCB, and the Colorado River Basin RWQCB

State of California Constitution Article X, Section 2

Article X, Section 2 prohibits the waste or unreasonable use of water, regulates the method of use and method of diversion of water and requires all water users to conserve and reuse available water supplies to the maximum extent possible. The project use of dry cooling will significantly reduce potential water use and prohibit waste and unreasonable use of groundwater.

California Storm Water Permitting Program

California Construction Storm Water Program. Construction activities that disturb one acre or more are required to be covered under California's General Permit for Discharges of Storm Water Associated with Construction Activity, Water Quality Order 99-08-DWQ (General Construction Permit CAS 000002).

Activities subject to permitting include clearing, grading, stockpiling, and excavation. The General Construction Permit requires the development and implementation of a SWPPP that specifies BMPs that will reduce or prevent construction pollutants from leaving the site in storm water runoff and will also minimize erosion associated with the construction project. The SWPPP must contain site map(s) that show the construction site perimeter; existing and proposed structures and roadways; storm water collection and discharge points, general topography both before and after construction; and drainage patterns across the site. Additionally, the SWPPP must describe the monitoring program to be implemented. GSEP also will prepare a DESCP to meet Energy Commission requirements (Appendix L). The content of a DESCP is very similar to a SWPPP, but the DESCP covers both construction and operation in one document whereas separate SWPPPs are prepared for construction and operation.

California Industrial Storm Water Program. Industrial activities with the potential to impact stormwater discharges are required to obtain a NPDES permit for those discharges. In California, an Industrial Storm Water General Permit, Order 97-03-DWQ (General Industrial Permit CAS 000001) may be issued to regulate discharges associated with ten broad categories of industrial activities, including electrical power generating facilities. The General Industrial Permit requires the implementation of management measures that will protect water quality. In addition, the discharger must develop and implement a SWPPP and a monitoring plan. Through the SWPPP, sources of pollutants are to be identified and the means to manage the sources to reduce storm water pollution described. The monitoring plan requires sampling of storm water discharges during the wet season and visual inspections during the dry season.

A report documenting the status of the program and monitoring results must be submitted to the CRBRWQCB annually by July 1. The General Industrial Permit, which requires the development and implementation of a SWPPP, is required for the Project's operations phase. The Applicant will prepare a separate SWPPP that outlines the monitoring and reporting plan, along with storm water mitigation measures for the facility based on BMPs.

California Water Code

Section 461. Stipulates that the primary interest of the people of the State of California is the conservation of all available water resources and requires the maximum reuse of reclaimed water as an offset to using potable resources.

The applicant was exploring a possible agreement with Chuckwalla Valley State Prison to treat reclaimed wastewater from that facility. Although the applicant states the amount of water would be insufficient for project needs, Staff urges GSEP to consider the option as a way to offset some use of groundwater.

Section 1200 "Water Rights." All water in California falls within one of three categories: surface water, percolating groundwater, or "subterranean streams that flow through known and definite channels." California's water rights law is a hybrid system in that the use of certain types of water requires a permit from the SWRCB, while other types of uses are governed by common law. Only surface water and subterranean stream water

are within the permitting jurisdiction of the SWRCB. Since 1914, appropriation of those waters has required a SWRCB permit, and is subject to various permit conditions.

Interstate water courses (such as the Colorado River) have additional contract requirements that are the equivalent of permits. For example, use of Colorado River water requires a contract with the Secretary of the Interior (through the Bureau of Reclamation).

Pre-1914 appropriative and riparian rights do not require a permit. Riparian rights are correlative rights of equal priority among all riparian right holders. The place of use of such water is limited to riparian property (property that is contiguous to a watercourse) that has not had its riparian rights severed. Riparian rights are senior to any appropriative rights, and may not be separated from the riparian parcel and used elsewhere.

Groundwater can be (a) the underground portion of a surface water course (subject to the same rights/permits as the affiliated water course); (b) a wholly underground water course which is treated like a water course; or (c) percolating groundwater. Water subject to appropriation is defined in Water Code Section 1201, as "all water flowing in any natural channel," except water that is or may be needed for use upon riparian land or water that is otherwise appropriated. The SWRCB's authority over groundwater extends only to the underground portion of a surface stream and to the water in un-appropriated subterranean streams that flow through known or defined channels, except as it is or may be reasonably be needed for useful and beneficial purposes upon lands riparian to the channel through which it is flowing. The traditional test to establish SWRCB jurisdiction over groundwater was whether there is sufficient evidence of bed and banks and water flowing along a line of a surface stream (Sax 2002).

Recent case law has redefined the boundaries of an underground stream to mean the bedrock bottom and side boundaries that are materially less permeable than the alluvium holding groundwater found within an alluvial valley across which flows a surface stream. If there is insufficient evidence to support a finding that the groundwater fits this definition, the SWRCB has no jurisdiction and no permit is required to appropriate the water.

Percolating groundwater has no SWRCB permit requirement and supports two kinds of rights: (a) overlying rights, a correlative right of equal priority shared by all who own overlying property and use groundwater on the overlying property; and (b) groundwater appropriative rights for use of the overlying property or on overlying property for which the water rights have been severed. The right to use groundwater on property that is not an overlying right is junior to all overlying rights, but has priority among other appropriators on a first in time use basis. Overlying users cannot take unlimited quantities of water without regard to the needs of other users. Surplus groundwater may be appropriated for use on non-overlying lands, provided such use will not create an overdraft condition.

Riparian water rights, groundwater rights and appropriative rights are all subject to modification to some degree if there is a basin-wide adjudication, which proceeding can be commenced before the SWRCB as an adjudicative body (not a permitting role) or

before a court. In adjudication, unused riparian rights and unused overlying rights can be subordinated to appropriative rights.

Water rights in California can be held by any legal entity. Thus the owner can be an individual, related individuals, non-related individuals, trusts, corporations and/or government agencies. Water rights are considered real property. Riparian rights and overlying groundwater rights are lost if severed from the land, while appropriative rights can be preserved and transferred to other properties. Transfers of water for use elsewhere are permissible without transfers of water rights, subject to many other conditions and approvals, including a "non-injury" to other water rights holders test, assessment of environmental impacts, and for post 1914 appropriative rights, SWRCB approval of any change in place of use, diversion point and/or purpose of use.

The California Water Code allows any local public agency that provides water service whose service area includes a groundwater basin or portion thereof that is not subject to groundwater management pursuant to a judgment or other order, to adopt and implement a groundwater management plan (California Water Code Sections 10750 et. seq.) Groundwater Management Plans often require reports of pumping and some restrictions on usage. There is no Groundwater Management Plan for the CVGB listed on the DWR website on Groundwater Management Plans.

The California Legislature has found that by reason of light rainfall, concentrated population, the conversion of land from agricultural to urban uses and heavy dependence on groundwater, the counties of Riverside, Ventura, San Bernardino and Los Angeles have certain reporting requirements for groundwater pumping. Any person or entity that pumps in excess of 25 af of water in any one year must file a "Notice of Extraction and Diversion of Water" with the SWRCB. (See Water Code Sections 4999 et. seq.) The Project would be subject to this requirement since it is located in Riverside County and will require more than 25 afy. Condition of Certification SOIL&WATER-16 would ensure the applicant complies with this requirement.

The GSEP is in Riverside County and the Chuckwalla Valley has no perennial streams. The Project site is located on BLM land that overlies the CVGB, which has a surface area of about 822,000 acres. A method was developed by the USGS, in cooperation with the USBR, to identify groundwater wells outside the flood plain of the lower Colorado River that yield water that will be replaced by water from the river. Wells placed into the groundwater beneath the Project site that extract groundwater may be considered as drawing water from the Colorado River and require an entitlement to extract groundwater. The specific method to determine whether wells draw water from the Colorado River (referred to as the accounting surface) has not been promulgated by the USBR. Entitlements to extract and use the groundwater beneath the site are granted by the USBR through their designated representative in California, the Colorado River Board of California. After eligibility for groundwater extraction has been approved by the USBR, a contract must be established with the City of Needles to acquire the water. In California, the City of Needles monitors the use of water extracted from the river aquifer and is the designated contracting agent for the USBR.

Porter-Cologne Water Quality Control Act

The Porter-Cologne Water Quality Control Act of 1967, Water Code Section 13000 et. seq. requires the SWRCB and the nine RWQCBs to adopt water quality standards to protect State waters. Those standards include the identification of beneficial uses, narrative and numerical water quality criteria, and implementation procedures. Water quality standards for the proposed project area are contained in the Water Quality Control Plan for the Colorado River Basin Region (Basin Plan), which was adopted in 1994 and was amended in 2006. This plan sets numeric and/or narrative water quality criteria controlling the discharge of wastes to the State's waters and land.

The Applicant proposes to construct a LTU as part of the facility. The LTU will be used to receive, temporarily store, and treat soil impacted with heat transfer fluid (HTF). The Project will comply with Title 23 CCR Division 3, Chapters 9 and 15 regarding the establishment of requirements for waste discharge and reporting along with requirements specifying conditions for the protection of water quality. Under Chapter 9, the CRBRWQCB is required to issue a ROWD for discharges of waste to land pursuant to the Water Code. The report requires the submittal of information regarding the proposed discharge and waste management unit design and monitoring program. WDRs issued by the CRBRWQCB provide construction and monitoring requirements for the proposed discharge. Chapter 15 outlines siting, construction, and monitoring requirements for waste discharges to land for landfills, surface impoundments, LTUs, and waste piles. The Chapter provides closure and post-closure maintenance and monitoring requirements for Class II designated waste facilities that are applicable to this project.

The Project will also comply with CCR Title 27 Division 2, Chapter 3. Section 20377 provides guidance for LTUs, referencing general criteria (Section 20320), precipitation, and drainage control (Section 20365) and seismic design requirements (Section 20370). Section 20250 stipulates operational and maintenance procedures to minimize mobilization of waste materials.

Section 13050. Surface waters (including ephemeral washes) that are affected by the Project are waters of the State and are subject to State requirements and the CRBRWQCB' authority to issue WDRs for construction and industrial storm water activities.

Section 13260 et seq. This section requires filing with the appropriate CRBRWQCB a ROWD for activities in which waste is discharged that could affect the water quality of the State. The report shall describe the physical and chemical characteristics of the waste and include the results of all tests required by regulations adopted by the board, any test adopted by the Department of Toxic Substances Control (DTSC) pursuant to Section 25141 of the Health and Safety Code for extractable, persistent, and bioaccumulative toxic substances in a waste or other material, and any other tests that the SWRCB or CRBRWQCB may require.

Section 13173 (Designated Wastes). This section defines designated waste as either: a) hazardous waste that has been granted a variance from hazardous waste management requirements pursuant to Section 14142 of the Health and Safety Code,

or, b) Non-hazardous waste that consists of, or contains, pollutants that, under ambient environmental conditions at a waste management unit, could be released in concentrations exceeding applicable water quality objectives or could reasonably be expected to affect beneficial uses of the waters of the state contained in the appropriate state water quality control plan.

As noted above, the Applicant proposes to construct an LTU to treat HTF-impacted soils. In 1995, the California DTSC determined that soils containing HTF up to 10,000 mg/kg were considered nonhazardous. However, recently the DTSC indicated that any determination of waste classification needs to be site specific.

Section 13240 et seq. (Water Control Plan). The Basin Plan for the Colorado River Basin Region establishes water quality objectives, including narrative and numerical standards that protect the beneficial uses of surface and ground waters in the region. The Basin Plan describes implementation plans and other control measures designed to ensure compliance with statewide plans and policies and provide comprehensive water quality planning. The following chapters are applicable to determining appropriate control measures and cleanup levels to protect beneficial uses and to meet the water quality objectives: Chapter 2, Beneficial Uses; Chapter 3, Water Quality Objectives; and the sections of Chapter 4, Implementation, entitled “Point Source Controls” and “Non-Point Source Controls.”

- Beneficial Uses: Chapter 2 of the Basin Plan describes beneficial uses of surface and ground waters. Beneficial uses of surface waters for the Chuckwalla Valley are not listed in the Basin Plan. The beneficial uses of ground waters of the Chuckwalla Valley Hydrologic Unit (717.00) are: municipal and domestic supply, industrial service supply, and agricultural supply.
- Water Quality Objectives: Region-wide numeric and narrative objectives for general surface waters are described in Chapter 3 of the Basin Plan under the “General Surface Water Quality Objectives” and region-wide objectives for groundwater under the “Ground Water Objectives.”
- Waste Discharge Requirements: Chapter 4 of the Basin Plan describes “Point-Source Controls” for wastewater reclamation and reuse, stormwater, and septic systems. The discussion of “Non-Point Source Controls” in the Basin Plan describes the authority given to the CRBRWQCB to certify projects for CWA Section 401 permits.

Section 13243. Under this section, the Regional Water Boards are granted authority to specify conditions or areas where the discharge of waste will not be permitted. The discharge of designated waste can only be discharged to an appropriately designed waste management unit.

Section 13263 (Waste Discharge Requirements). The CRBRWQCB will regulate the proposed discharge of fill material, including structural material and/or earthen wastes into wetlands and other waters of the State through WDRs. The CRBRWQCB considers WDRs necessary to adequately address potential and planned impacts to waters of the State and to require mitigation for these impacts to comply with the water quality standards specified in the Basin Plan.

WDRs from the CRBRWQCB are required for the LTU that will be used to treat (through bioremediation techniques) HTF-impacted soil. The Applicant will submit a ROWD application to the CRBRWQCB after AFC submittal.

Section 13271 (Discharge Notification). CWC section 13271 requires any person who, without regard to intent or negligence, causes or permits any hazardous substance or sewage to be discharged in or on any waters of the state, or discharge or deposited where it is, or probably will be, discharged in or on any waters of the state, to notify the Office of Emergency Services (OES) of the discharge as specified in that section. The OES then immediately notifies the appropriate regional board and the local health officer and administrator of environmental health of the discharge.

Section 13550. "The Legislature hereby finds and declares that the use of potable domestic water for non-potable uses, including, but not limited to, cemeteries, golf courses, parks, highway, landscaped areas, and industrial and irrigation uses, is a waste or an unreasonable use of the water within the meaning of Section 2 of Article X of the California Constitution if recycled water is available which meets all of the following conditions, as determined by the State Board." This section requires the use of recycled water for industrial purposes subject to recycled water being available and upon a number of criteria including: provisions that the quality and quantity of the recycled water are suitable for the use, the cost is reasonable, the use is not detrimental to public health, and the use will not impact downstream users or biological resources.

Section 13551. This section prohibits a person or public agency, including a State agency, city, county, city and county, district, or any other political subdivision of the State, shall not use water from any source of quality suitable for potable domestic use for non-potable uses if suitable recycled water is available as provided in Section 13550.

Section 13552. This section specifically identifies the use of potable domestic water for cooling towers as unreasonable use of water within the meaning of Article X Section 2 of the California Constitution, if suitable recycled water is available and the water meets the requirements set forth in Section 13550.

Section 13571. Requires that anyone who constructs, alters, or destroys a water well, cathodic protection well, groundwater monitoring well, or geothermal heat exchange well, file a well completion report with the California Department of Water Resources (CDWR). With no nearby sources of water available and no existing water supply wells on the Project site, a water supply well and groundwater monitoring wells will be constructed at the Site. These wells are required as part of the evaluation of water resources for the Project. A well completion report will be filed with DWR for each well that is constructed. Measures will be undertaken to protect the groundwater wells (whether for water supply or for monitoring purposes) on the Project site through the use of physical barriers (e.g., fencing, traffic bollards, etc.). In the event that an existing well is altered or destroyed, a well completion report will be filed with the DWR.

California Code of Regulations

Title 22, Article 3, Sections 64400.80 through 64445. This section requires monitoring for potable water wells, defined as non-transient, non-community water systems (serving 25 people or more for more than six months); the Project will employ approximately 130 workers during operations. Regulated wells must be sampled for bacteriological quality once a month and the results submitted to the California Department of Health Services (DHS). The wells must also be monitored for inorganic chemicals once and organic chemicals quarterly during the year designated by the DHS. DHS will designate the year based on historical monitoring frequency and laboratory capacity.

Title 23, Division 3, Chapter 9. Requires the CRBRWQCB to issue a report of waste discharge for discharges of waste to land pursuant to the Water Code. The report requires submittal of information regarding the proposed discharge and waste management unit design and monitoring program. WDRs issued by the CRBRWQCB provide construction and monitoring requirements for the proposed discharge. The SWRCB has adopted general waste discharge requirements (97-10-DWQ) for discharge to land by small domestic wastewater treatment systems.

Title 23, Division 3, Chapter 15. Regulates all discharges of hazardous waste to land that may affect water quality. Chapter 15 broadly defines a waste management area as "an area of land, or a portion of a waste management facility, at which waste is discharged." Therefore, unless exempted, all discharges of hazardous waste to land that may affect water quality are regulated by Chapter 15. This chapter outlines siting, construction and monitoring requirements for waste discharges to land for landfills, surface impoundments, land treatment units, and waste piles. The chapter provides closure and post-closure maintenance and monitoring requirements for surface impoundments that are applicable to the Project.

Title 27, Section 2000 et seq. and Title 23, Section 2510 et seq. These sections include requirements for siting and minimum waste management standards for discharges of waste to land. Establishes monitoring and corrective action requirements for discharges to land, including spills and leaks and other unauthorized discharges. Requires, assurances of financial responsibility for closure and post-closure activities and corrective actions for all known or reasonably foreseeable releases.

As discussed above, the Project would employ a LTU to manage soils impacted by releases of HTF. Provisions of Title 27 CCR apply to designated and non-hazardous solid waste. Provisions of Title 23 apply to hazardous waste. Energy Commission and CRBRWQCB staff are currently developing requirements for monitoring, mitigating, and reporting that will ensure compliance with these regulations and will include them as a condition of certification. Engineered alternatives that are consistent with Title 27 and Title 23 CCR performance goals may be considered for approval by the CRBRWQCB.

Section 20375 provides guidance for surface impoundments, including construction requirements (Table 4.1), operation, maintenance, and inspection. Section 20377 provides guidance for LTUs, referencing general criteria (Section 20320) and precipitation and drainage control (Section 20365) and seismic design requirements

(Section 20370). The regulations stipulate operational and maintenance procedures to minimize mobilization of the waste materials (Section 20250).

State Water Resources Control Board Policies

Anti-Degradation Policy (Resolution No. 68-16). Requires the CRBRWQCB, in regulating the discharge of waste, to: (a) maintain existing high quality waters of the State until it is demonstrated that any change in quality will be consistent with maximum benefit to the people of the State, will not unreasonably affect present and anticipated beneficial uses, and will not result in water quality less than that described in State or Regional Water Boards policies; and (b) require that any activity which produces or may produce a waste or increased volume or concentration of waste and which discharges or proposes to discharge to existing high quality waters, must meet waste discharge requirements which will result in the best practicable treatment or control of the discharge necessary to assure that: a) a pollution or nuisance will not occur and b) the highest water quality consistent with maximum benefit to the people of the State will be maintained.

Power Plant Cooling Water Policy (Resolution No. 75-58). On June 19, 1975, the SWRCB adopted the Water Quality Control Policy on the Use and Disposal of Inland Waters used for Power Plant Cooling. The purpose of the policy is to provide consistent statewide water quality principles and guidance for adoption of discharge requirements, and implementation actions for power plants that depend on inland waters for cooling.

The Resolution encourages the use of wastewater for power plant cooling and sets the following order of preference for cooling purposes: 1) wastewater being discharged to the ocean; 2) ocean water; 3) brackish water or irrigation return flows; 4) inland waste waters of low total dissolved solids (TDS); and 5) other inland waters. The criteria for the selection of water delivery options involves economic feasibility; engineering constraints, such as cooling water composition and temperature; and environmental considerations such as impacts on riparian habitat, groundwater levels, and surface and subsurface water quality.

Water Reclamation Policy (Resolution No. 77-01). Under this policy, the SWRCB and CRBRWQCBs shall encourage reclamation and reuse of water in water-short areas. Reclaimed water will replace or supplement the use of fresh water or better quality water.

Sources of Drinking Water Policy (Resolution No. 88-63). This policy designates all groundwater and surface waters of the States as potential sources of drinking water, worthy of protection for current or future beneficial uses, except where: (a) the total dissolved solids are greater than 3,000 milligrams per liter, (b) the well yield is less than 200 gallons per day (gpd) from a single well, (c) the water is a geothermal resource, or in a water conveyance facility, or (d) the water cannot reasonably be treated for domestic use using either best management practices or best economically achievable treatment practices.

Policies and Procedures for Investigations and Clean-up and Abatement of Discharges Under CWC Section 13304 (Resolution No. 92-49). This policy establishes

requirements for investigation and cleanup and abatement of discharges. Under this policy, clean-up and abatement actions are to implement applicable provisions of Title 23 CCR Chapter 15, to the extent feasible. The policy also requires the application of Section 2550.4 of Chapter 15 when approving any alternative cleanup levels less stringent than background. It requires remediation of the groundwater to the lowest concentration levels of constituents technically and economically feasible, which must be at least protect the beneficial uses of groundwater, but need not be more stringent than is necessary to achieve background levels of the constituents in groundwater.

Water Quality Control Policy for Recycled Water (Resolution No. 209-0011). (Not yet approved by Office of Administrative Law as of May 2009). The Recycled Water Policy is intended to promote sustainable local water supplies. The purpose of this Policy is to increase the use of recycled water from municipal wastewater sources that meets the definition in CWC Section 13050(n), in a manner that implements state and Federal water quality laws.

LORS and State Policy and Guidance

The Energy Commission has five sources for statements of policy relating to water use in California applicable to power plants. They are the California Constitution, the Warren-Alquist Act, the Commission's restatement of the State's water policy in the 2003 Integrated Energy Policy Report ("IEPR"), the State Water Resources Control Board ("SWRCB" or "Board") resolutions (in particular Resolutions 75-58 and 88-63), and the Genesis Solar Project Committee's water-issues order as guidance for interpreting all of the above.

California Constitution

Article X, section 2 prohibits the waste or unreasonable use, including unreasonable method of use, of water, and it requires all water users to conserve and reuse available water supplies to the maximum extent possible (Cal. Const., art. X, § 2). Groundwater is subject to reasonable use (*Katz v. Walkinshaw* (1903) 141 Cal. 116).

Warren-Alquist Act

Section 25008 of the Energy Commission's enabling statutes echoes the Constitutional concern, by promoting "all feasible means" of water conservation and "all feasible uses" of alternative water supply sources (Pub. Resources Code § 25008).

Integrated Energy Policy Report

In the 2003 Integrated Energy Policy Report (IEPR or Report), the Energy Commission reiterated certain principles from SWRCB's Resolution 75-58, discussed below, and clarified how they would be used to discourage use of fresh water for cooling power plants under the Commission's jurisdiction. The Report states that the Commission will approve the use of fresh water for cooling purposes only where alternative water supply sources or alternative cooling technologies are shown to be ‘‘environmentally undesirable" or "economically unsound" (IEPR (2003), p. 41). In the Report, the Commission interpreted "environmentally undesirable" as equivalent to a "significant adverse environmental impact" under CEQA, and "economically unsound" as meaning "economically or otherwise infeasible," also under CEQA (IEPR, p. 41). CEQA and the

Commission's siting regulations define feasible as "capable of being accomplished in a successful manner within a reasonable amount of time," taking into account economic and other factors (Cal. Code Regs., tit. 14, § 15364; tit. 20, § 1702, subd. (f)). At the time of publication in 2003, dry cooling was already feasible for three projects—two in operation and one just permitted (IEPR, p. 39).

The Report also notes California's exploding population, estimated to reach more than 47 million by 2020, a population that will continue to use "increasing quantities of fresh water at rates that cannot be sustained" (IEPR, p. 39).

State Water Resources Control Board Resolutions

The SWRCB not only considers quantity of water in its resolutions, but also the quality of water. In 1975, the Board adopted the *Water Quality Control Policy on the Use and Disposal of Inland Waters Used for Power Plant Cooling* (Resolution 75-58). In it, the Board encourages the use of wastewater for power plant cooling. It also determined that water with a TDS concentration of 1,000 mg/L or less should be considered fresh water (Resolution 75-58). One express purpose of that Resolution was to "keep the consumptive use of fresh water for power plant cooling to that *minimally essential*" for the welfare of the state (*Ibid*; emphasis added).

In 1988, the Board determined that water with TDS concentrations of 3,000 mg/L or less should be protected for and considered as potential supplies for municipal or domestic use unless otherwise designated by one of the Regional Water Quality Control Boards (Resolution 88-63).

Order from the Genesis Solar Project Committee

The Genesis Solar Project Committee considered all these sources of policy to arrive at a simple yet flexible determination for water use by power plants under Commission jurisdiction. The Order states:

> The Committee reads [the policies] as requiring projects seeking to use groundwater for power plant cooling to use the least amount of the worst available water, considering all applicable technical, legal, economic, and environmental factors (Genesis Solar Energy Project Committee, Decision and Scoping Order, Feb. 2, 2010).

Staff carefully considers all relevant factors when conducting analysis and arriving at recommendations for the Commission. Thus, staff must determine what is the least but nevertheless feasible amount of water available for use, and also the worst, feasible available water that applicant could use for particular purposes on a project.

In several cases, the Commission has accepted conservation programs that conserve water in the region as means of accepting compliance with the water policies. Staff takes this to mean that such conservation programs are an acceptable method to ensure compliance for current projects.

Proposed Use of Wet Cooling by the Genesis Solar Energy Project

To summarize, the applicant for the Genesis Solar Energy Project applicant proposes a wet-cooled facility that would use 1,644 acre feet a year (afy) of groundwater from onsite wells. Chuckwalla Valley is the source of groundwater for the project area. The project would pump water from new wells drilled near the project's power blocks. Pumped water would be used for various purposes besides cooling, including domestic use by workers, dust suppression, and mirror washing. Water is the only feasible means of cleaning the mirrors, which must be clean to maintain efficiency of output by parabolic trough solar plants. No use of reclaimed water and no recycling of water is currently proposed. Reject water from the treatment process would be discharged to evaporation ponds. Overall use of water would be inefficient for this technology, requiring 658 afy per 100 MW of capacity, or 2.834 acre feet per gigawatt hour generated versus 60 afy per 100 MW of capacity, or 0.30 acre feet per gigawatt hour generated for dry-cooled technology.

Quality of groundwater varies markedly in the basin and in the immediate project area. Applicant's test drilling found low quality water, with TDS levels of 5,000 mg/l or more, well beyond the CRBRWQCB Basin Plan's definition of municipal water of TDS levels at 3,000 mg/l or less.

The use of groundwater for wet cooling compounds the environmental concerns because the applicant proposes to use evaporation ponds for disposal of the wastewater generated by the wet cooling process. Potential impacts from the use of evaporation ponds could be mitigated consistent with state and local LORS. However, this method of wastewater disposal is not consistent with the Energy Commission's policy that encourages the use of ZLD systems that are designed to eliminate wastewater discharge and inherently conserve water. Therefore, staff finds this method of wastewater disposal does not comply with the state's water policies.

Staff concludes that the GSEP, as proposed by applicant, does not comply with the state's water policies as detailed above. While using poor quality water, and possibly the worst quality water reasonably available for the purposes of the project, the proposed project fails to use the least amount of water available. Staff believes the applicant has not demonstrated that dry cooling is environmentally undesirable nor has it fully demonstrated that it is economically unsound, especially in the light of parallel applications in the same region for dry cooled solar power plants. Therefore, staff recommends that the Commission adopt Condition of Certification **SOIL&WATER-18**, that requires the applicant to submit a Water Conservation Plan that outlines the actions necessary to bring the project cooling water use into compliance with the water policies. Staff would like to work with the applicant between the publication of this SA and the SSA to develop the details of the Water Conservation Plan. Specific options we would like to explore include:

1. Dry-cooling or hybrid cooling systems;

2. Use of a ZLD system;

3. Increase water use efficiency through project design changes such as increasing cycles of concentration for the evaporative cooling processes;

4. Payment for irrigation improvements in Palo Verde Irrigation District;

5. Purchase of water rights within the Colorado River Basin that will be held in reserve;

6. Funding of Tamarisk removal; and,

7. Other water conserving activities in the Colorado River Basin.

After exploring these options, as well as any others the applicant would like to consider, staff will draft a Condition of Certification that identifies the types of activities the applicant could take to ensure the project's conformity with state water policy. The condition could require the Water Conservation Plan to identify the details and descriptions of these activities, including:

a. Feasibility studies and costs;

b. Identification of the activity and water source, and the quantity of basin water that would be conserved;

c. Demonstration of the project owner's legal entitlement to the water or ability to conduct the activity;

d. Discussion of whether any agency, non-government organization, or private property right holders approval of the identified activities will be needed, and, if so, whether additional approval will require compliance with CEQA;

e. Demonstration of how groundwater will be replaced for each of the activities;

f. An estimated schedule for completion of the activities;

g. Performance measures that would be used to evaluate the amount of water replaced by the activities; and

h. Monitoring and Reporting Plan outlining the steps necessary and proposed frequency of reporting to show the activities are achieving the intended conservation.

C.9.10.3 REGIONAL AND LOCAL

Riverside County Ordinance Code, Title 13, Chapter 13.20 – Water Wells

Section 13-.20.160 Well Logs. This section requires that a report of well excavation for all wells dug or bored for which a permit has been issued be submitted to the Riverside County Department of Environmental Health within 60 days after completion of drilling. DWR Form 188 shall satisfy this requirement as stipulated under California Water Code Section 13571.

Section 13.20.190 Water Quality Standards. This section requires that water from wells that provide water for beneficial use shall be tested radiologically, bacteriologically and chemically as indicated by the Riverside County Department of Environmental Health. Laboratory testing must be performed by a State of California-certified laboratory. The results of the testing shall be provided to the County Department of Environmental Health within 90 days of pump installation.

Section 13.20.220 Well Abandonment. This section provides that all abandoned wells shall be destroyed in such a way that they will not produce water or act as a channel for

the interchange of water, and will not present a hazard to the safety and well-being of people or animals. Destruction of any well shall follow requirements stipulated in DWR Bulletin No.74-81, provided that at a minimum the top 50 feet shall be sealed with concrete, or other approved sealing material. Applications for well destruction must be submitted 90 days following abandonment of the well and in accordance with Section 14.08.170.

Section 13.20.240 Declaration of Proposed Reuse. Requires that any well that has not been used for a period of one (1) year shall be properly destroyed unless the owner has filled a "Notice of Intent" with the health officer declaring the well out of service and declaring his intention to use the well again.

Riverside County Ordinance Code, Title 8, Chapter 8.124 - Sewage Discharge

Section 8.124.030, General Requirements for an Approval and Construction Permit. The type, capacity, location, and layout of each private system shall comply with the rules and regulations of the health officer, and the WDRs of the CRBRWQCB. A private system shall be constructed and maintained on the lot which is the site of the building it serves, unless the health officer in his discretion authorizes a different location.

Section 8.124.050 Operation Permits. Each private system shall be managed, cleaned, regulated, repaired, modified and replaced from time to time by the owner or owner's representatives, in accordance with the rules, regulations and other reasonable requirements of the health officer in conformity with the WDR issued by the regional board and in a manner which will safeguard against and prevent pollution, contamination or nuisance.

Riverside County Title 15 Chapter 15, 24 Uniform Plumbing Code

Section 15.24.010. Adopted by Reference,, Appendix K, Section K1 amended – Private Sewage Disposal – General. In certain areas of the County which have poor soils or other problems relative to sewage disposal, the sewage disposal system shall be installed and inspected before the building foundation inspection is made.

Section 15.24.010. Adopted by Reference, Appendix K, Section K6(i) amended – Disposal fields. Disposal fields, trenches, and leaching beds shall not be paved over or covered by concrete or any material that can reduce or inhibit any possible evaporation of the sewer effluent unless the area of the disposal fields, trenches, and leaching beds is increased by a minimum of 25 percent.

Riverside County Title 15 Chapter 15.80 Regulating Flood Hazard Areas and Implementing the National Flood Insurance Program

This ordinance was developed to comply with Title 44 CFR Part 65 regarding requirements for the identification and mapping of areas identified as Federal Emergency Management Agency (FEMA) Special Flood Hazard Areas. The ordinance is applicable to development within unincorporated areas of Riverside County and is integrated into the process of application for development permits under other county ordinances including, but not limited to, Ordinance Nos. 348, 369, 457, 460, and 555. When the information required, or procedures involved, in the processing of such applications is not sufficient to assure compliance with the requirements of Chapter 15.80, a separate application must be filed.

Flood insurance rate maps for the Project site or surrounding areas have not been prepared by FEMA. According to the Riverside County General Plan (Riverside County, 2000) the Project site and surrounding lands do not lie within a 100-year or 500-year flood plain.

C.9.11 NOTEWORTHY PUBLIC BENEFITS

No noteworthy public benefits of the proposed Project were identified associated with soil and water resources.

C.9.12 PROPOSED CONDITIONS OF CERTIFICATION/MITIGATION MEASURES

This section section presents the mitigation, monitoring, compliance, and reporting measures for Soil and Water Resources. For a summary of all proposed Project impacts and their respective mitigation measures, please see the Impact Summary Tables provided at the end of the Executive Summary.

DRAINAGE EROSION AND SEDIMENTATION CONTROL PLAN (DESCP)

SOIL&WATER-1 Prior to site mobilization, the Project owner shall obtain both the BLM's Authorized Officer (AO) and Compliance Project Manager (CPM) approval of the Drainage Erosion and Sedimentation Control Plan (DESCP) for managing stormwater during Project construction and operations as normally administered by the County of Riverside. The DESCP must ensure proper protection of water quality and soil resources, demonstrate no increase in off-site flooding potential, include provisions for sediment and stormwater retention from both the power block, solar fields and transmission right of way to meet Riverside County requirements, address exposed soil treatments in the solar fields for both road and non-road surfaces, and identify all monitoring and maintenance activities. The DESCP shall contain, at minimum, the elements presented below that outline site management activities and erosion and sediment-control BMPs to be implemented during site mobilization, excavation, construction, and post construction (operating) activities.

A. Vicinity Map – A map(s), at a minimum scale 1 inch=100 feet, shall be provided indicating the location of all Project elements (construction sites, laydown area, pipelines) with depictions of all significant geographic features including swales, storm drains, and sensitive areas.

B. Site Delineation – All areas subject to soil disturbance for the proposed Project (Project phases, laydown area, all linear facilities, landscaping areas, and any other Project elements) shall be delineated showing boundary lines of all construction areas and the location of all existing and proposed structures, pipelines, roads, and drainage facilities.

C. Watercourses and Critical Areas – The DESCP shall show the location of all nearby watercourses including swales, storm drains, and drainage

ditches. It shall indicate the proximity of those features to the proposed Project construction, laydown, and landscape areas and all transmission and pipeline construction corridors.

a. The DESCP shall describe how the project will avoid or minimize impacts to Palen-McCoy Valley sand corridor,

b. All proposed linear features (with the exception of Power Pylons) shall be constructed flush with the surrounding ground surface and without ground level obstructions.

D. Drainage Map – The DESCP shall provide a topographic site map(s), at a minimum scale of 1 inch=100 feet, showing existing, interim, and proposed drainage swales and drainage systems and drainage-area boundaries. On the map, spot elevations are required where relatively flat conditions exist. The spot elevations and contours shall be extended off site for a minimum distance of 100 feet.

E. Drainage of Project Site Narrative – The DESCP shall include a narrative of the drainage measures necessary to protect the site and potentially affected soil and water resources within the drainage downstream of the site. The narrative shall include the summary pages from the hydraulic analysis prepared by a professional engineer and erosion control specialist. The narrative shall state the watershed size(s) in acres that was used in the calculation of drainage features.

F. Clearing and Grading Plans – The DESCP shall provide a delineation of all areas to be cleared of vegetation and areas to be preserved. The plan shall provide elevations, slopes, locations, and extent of all proposed grading as shown by contours, cross sections, or other means. The locations of any disposal areas, fills, or other special features shall also be shown. Existing and proposed topography shall be illustrated by tying in proposed contours with existing topography.

G. Clearing and Grading Narrative – The DESCP shall include a table with the quantities of material excavated or filled for the site and all Project elements (Project site, laydown area, transmission and pipeline corridors, roadways, and bridges) whether such excavation or fill is temporary or permanent, and the amount of such material to be imported or exported.

H. Soil Wind and Water Erosion Control - The plan shall address exposed soil treatments to be used during construction and operation of the proposed Project for both road and non-road surfaces including specifically identifying all chemical based dust palliatives, soil bonding, and weighting agents appropriate for use at the proposed Project site that would not cause adverse effects to vegetation. BMPs shall include measures designed to prevent wind and water erosion including application of chemical dust palliatives after rough grading to limit water use. All dust palliatives, soil binders, and weighting agents shall be approved by both the AO and CPM prior to use.

I. **Best Management Practices Plan –** The DESCP shall identify on the topographic site map(s) the location of the site specific BMPs to be employed during each phase of construction (initial grading, Project element excavation and construction, and final grading/stabilization). BMPs shall include measures designed to control dust, stabilize construction access roads and entrances, and control storm water runoff and sediment transport.

J. **Best Management Practices Narrative –** The DESCP shall show the location (as identified in (I) above), timing, and maintenance schedule of all erosion- and sediment-control BMPs to be used prior to initial grading, during all Project element (site, pipelines) excavations and construction, final grading/stabilization, and operation. Separate BMP implementation schedules shall be provided for each Project element for each phase of construction. The maintenance schedule shall include post-construction maintenance of structural-control BMPs, or a statement provided about when such information would be available.

K. **Project Schedule –** The DESCP shall identify on the topographic site map the location of the site-specific BMPs to be employed during each phase of construction (initial grading, Project element construction, and final grading/stabilization). Separate BMP implementation schedules shall be provided for each Project element for each phase of construction.

L. **Erosion Control Drawings –** The erosion-control drawings and narrative shall be designed, stamped and sealed by a professional engineer or erosion control specialist.

M. **Agency Comments –** The DESCP shall include copies of recommendations, conditions, and provisions from the County of Riverside, California Department of Fish and Game (CDFG), and CRBRWQCB.

N. **Monitoring Plan:** Monitoring activities shall include routine measurement of the volume of accumulated sediment in the onsite drainage ditches, and storm water diversions. The monitoring plan shall be part of the Channel Monitoring and Maintenance Plan, **SOIL&WATER-13.**

Verification: No later than 90 days prior to start of site mobilization, the Project owner shall submit a copy of the final DESCP to the County of Riverside, the CRBRWQCB, and both the AO and CPM for review and comment. No later than 60 days prior to start of site mobilization, the Project owner shall submit the DESCP with the County's and CRBRWQCB's comments to the both the AO and CPM for review and approval. Both the AO and CPM shall consider comments by the county and CRBRWQCB before approval of the DESCP.

The DESCP shall be consistent with the grading and drainage plan as required by Condition of Certification **CIVIL-1**, and relevant portions of the DESCP shall clearly show approval by the chief building official. The DESCP shall be a separate plan

from the SWPPP developed in conjunction with any NPDES permit for Construction Activity. The Project owner shall provide in the monthly compliance report with a narrative on the effectiveness of the drainage, erosion, and sediment-control measures and the results of monitoring and maintenance activities. Once operational, the Project owner shall update and maintain the DESCP for the life of the Project and shall provide in the annual compliance report information on the results of monitoring and maintenance activities.

NPDES STORMWATER PERMIT-CONSTRUCTION ACTIVITY

SOIL&WATER-2 In the event it is determined the project will discharge to water of the US, the Project owner shall comply with the requirements of the general National Pollutant Discharge Elimination System (NPDES) permit for discharge of stormwater associated with construction activity. The Project owner shall develop, obtain both the AO and CPM approval of, and implement a Storm Water Pollution Prevention Plan (SWPPP) for the construction of the GSEP phases, laydown area, and all linear facilities.

Verification: At least 60 days prior to site mobilization, the Project owner shall submit to both the AO and CPM a copy of the final construction SWPPP for review and approval prior to site mobilization. The Project owner shall retain a copy at the Project site. The Project owner shall submit copies to the both the AO and CPM all correspondence between the Project owner and the CRBRWQCB regarding the NPDES permit for the discharge of stormwater associated with construction activity within 10 days of its receipt or submittal. Copies of correspondence shall include the notice of intent sent to the SWRCB, and the SWRCB confirmation letter indicating receipt and acceptance of the notice of intent.

PROJECT GROUNDWATER WELLS, PRE-WELL INSTALLATION

SOIL&WATER-3 The Project owner proposes to construct and operate up to two onsite groundwater production wells that produce water from the CVGB. The Project owner shall ensure that the wells are completed in accordance with all applicable state and local water well construction permits (see C.9.9.2) and requirements. Prior to initiation of well construction activities, the Project owner shall submit for review and comment a well construction packet to the County of Riverside and fees normally required for the county's well permit, with copies to both the AO and CPM. The Project shall not construct a well or extract and use groundwater until both the AO and CPM provide approval to construct and operate the well.

Post-Well Installation. The Project owner shall provide documentation to both the AO and CPM that the well has been properly completed. In accordance with California's Water Code section 13754, the driller of the well shall submit to the DWR a Well Completion Report for each well installed. The Project owner shall ensure the Well Completion reports are submitted. The Project owner shall ensure compliance with all county water well standards and requirements for the life of the wells and shall provide the AO and CPM with two (2) copies each of all monitoring or other reports required for compliance with the County of Riverside water well standards and

operation requirements, as well as any changes made to the operation of the well.

Verification: The Project owner shall do all of the following:

A. No later than sixty (60) days prior to the construction of the onsite groundwater production wells, the Project owner shall submit to both the AO and CPM a copy of the water well construction packet submitted to the County of Riverside.

B. No later than thirty (30) days prior to the construction of the onsite groundwater production wells, the Project owner shall submit a copy of written concurrence received from the County of Riverside that the proposed well construction activities comply with all county well requirements and meet the requirements established by the county's water well permit program.

C. No later than sixty (60) days after installation of each well at the Project site, the Project owner shall ensure that the well driller submits a Well Completion Report to the DWR with a copy provided to both the AO and CPM. The Project owner shall submit to both the AO and the CPM, together with the Well Completion Report, a copy of well drilling logs, water quality analyses, and any inspection reports.

D. During well construction and for the operational life of the well, the Project owner shall submit two (2) copies each to the AO and CPM of any proposed well construction or operation permit changes within ten (10) days of submittal to or receipt from the County of Riverside.

E. No later than fifteen (15) days after completion of the onsite groundwater production wells, the Project owner shall submit documentation to BLM's Authorized Officer, the CPM, and the CRBRWQCB that well drilling activities were conducted in compliance with Title 23, California Code of Regulations, Chapter 15, Discharges of Hazardous Wastes to Land, (23 CCR, sections 2510 et seq.) requirements and that any onsite drilling sumps used for Project drilling activities were removed in compliance with 23 CCR section 2511(c).

CONSTRUCTION AND OPERATION WATER USE

SOIL&WATER-4 The Project owner proposes to use groundwater for water supply during construction and during operation. The proposed Project's use of groundwater during construction shall not exceed 1,368 afy during the 37 months of construction and 1,644 afy during operation. Water quality used for project construction and operation will be reported in accordance with Condition of Certification **SOIL&WATER-20** to ensure compliance with this condition.

Prior to the use of groundwater for construction, the Project owner shall install and maintain metering devices as part of the water supply and distribution system to document Project water use and to monitor and record in gallons per day the total volume(s) of water supplied to the Project from this water source. The metering devices shall be operational for the life of the Project.

Verification: At least sixty (60) days prior to the start of construction of the proposed Project, the Project owner shall submit to both the AO and CPM a copy of evidence that metering devices have been installed and are operational.

Beginning six (6) months after the start of construction, the Project owner shall prepare a semi-annual summary of amount of water used for construction purposes. The summary shall include the monthly range and monthly average of daily water usage in gallons per day.

The Project owner shall prepare an annual summary, which will include daily usage, monthly range and monthly average of daily water usage in gallons per day, and total water used on a monthly and annual basis in acre-feet. For years subsequent to the initial year of operation, the annual summary will also include the yearly range and yearly average water use by source. For calculating the total water use, the term "year" will correspond to the date established for the annual compliance report submittal.

GROUNDWATER LEVEL MONITORING, MITIGATION, AND REPORTING

SOIL&WATER-5 The Project owner shall submit a Groundwater Level Monitoring and Reporting Plan to both the AO and CPM for review and approval. The Groundwater Level Monitoring and Reporting Plan shall provide detailed methodology for monitoring background and site groundwater levels. Monitoring shall include pre-construction, construction, and Project operation water use. The primary objective for the monitoring is to establish pre-construction and Project related groundwater level trends that can be quantitatively compared against observed and simulated trends near the Project pumping wells and near potentially impacted existing wells.

The Project Owner shall:

A. Prior to Project Construction

1. Monitor to establish preconstruction base-line conditions. The monitoring plan and network of monitoring wells may make use of existing wells in the basin that would satisfy the requirements for the monitoring program. The monitoring plan shall also include the identification of any seeps and or springs within one mile of the perimeter of the project site. The seeps and or springs shall be included in the groundwater level monitoring network.

2. Collect groundwater levels from the off-site and on-site wells, seeps and or springs to provide baseline groundwater levels for both on-site and off-site wells.

3. Map groundwater levels within the CVGB from the groundwater data collected prior to construction. Update trend plots and statistical analyses, as data is available.

B. During Construction:

1. Collect water levels within the monitoring network and seeps and or springs on a quarterly basis throughout the construction period and at the end of the construction period. Perform statistical trend analysis for water levels and the water quality data. Assess the significance of an apparent trend and estimate the magnitude of that trend.

C. During Operation:

1. On a quarterly basis for the first five years of operation, collect water level measurements from the wells and seeps and or springs identified in the groundwater monitoring program to evaluate operational influence from the Project. Quarterly operational parameters (i.e., pumping rate) of the water supply wells shall be monitored. Additionally, quarterly groundwater-use in the CVGB shall be estimated.

2. On an annual basis, perform statistical trend for water levels. Analysis of the significance of an apparent trend shall be determined and the magnitude of that trend estimated. Based on the results of the statistical trend analyses, the Project owner shall determine if the Project pumping has induced a drawdown in the water supply at a level of 5 feet or more below the baseline trend.

3. If water levels have been lowered below pre-site operational trends, and monitoring data provided by the Project owner show these water level changes are different from background trends and are caused by Project pumping, then the Project owner shall provide mitigation to the well owner(s) if impacted. Mitigation shall be provided if the both the AO and CPM's inspection of the well monitoring data confirms changes to water levels and water level trends relative to measured pre-project water levels, and the well yields outside the Project have been lowered by Project pumping. The type and extent of mitigation shall be determined by the amount of water level decline and site specific well construction and water use characteristics. The mitigation of impacts shall be determined as follows:

    a. If Project pumping has lowered water levels and increased pumping lifts, increased energy costs shall be calculated. Payment or reimbursement for the increased costs shall be provided at the option of the affected well owner.

    b. If groundwater monitoring data indicate Project pumping has lowered water levels below the top of the well screen, and the well yield is shown to have decreased by 10 percent or more of the initial yield, compensation shall be provided for the diagnosis and maintenance to treat and remove encrustation from the well screen. Reimbursement shall be provided at an amount equal to the customary local cost of performing the necessary diagnosis and maintenance for well screen encrustation. Should well yield

reductions be reoccurring, the Project owner shall provide payment or reimbursement for either periodic maintenance throughout the life of the Project or, if treatment is anticipated to be required more frequently than every 3-5 years, replacement of the well.

c. If Project pumping has lowered water levels to significantly impact well yield or cause casing collapse, payment or reimbursement of an amount equal to the cost of deepening or replacing the well shall be provided to accommodate these effects. Payment or reimbursement shall be at an amount equal to the customary local cost of deepening the existing well or constructing a new well. The demand for water, which determines the required well yield, shall be determined on a per well basis using well owner interviews and field verification of property conditions and water requirements compiled as part of the pre-project well reconnaissance. Well yield shall be considered significantly impacted if it is incapable of meeting 150 percent of the well owner's maximum daily demand, dry-season demand, or annual demand – assuming the pre-project well yield documented by the initial well reconnaissance met or exceeded these yield levels. For already low-yielding wells identified prior to Project construction, a reduction due solely to Project pumping of 10 percent or more below the pre-project yield shall be considered a significant impact. The contribution of Project pumping to observed decreases in observed well yield shall be determined using the groundwater monitoring data collected.

d. Electrical cost reimbursement – If the pumping water level falls below a depth of 5 feet from an average of the baseline measurements, the well owner shall be compensated by the Project owner for the additional electrical costs commensurate with the additional lift required to pump. The water level in the well will be assessed relative to the pumping rate established during the pre-site development period.

e. The Project owner shall notify all owners of the impacted wells within one month of both the AO and CPM approval of the compensation analysis for increased energy costs.

f. Pump lowering – In the event that groundwater is lowered to an extent where pumps are exposed but well screens remain submerged the pumps shall be lowered to maintain production in the well. All costs associated with lowering pumps shall be borne by the Project owner.

g. Deepening of wells – If the groundwater is lowered enough that well screens are exposed, pump lowering is not an option. In this case, the wells shall be deepened or new wells constructed. All costs associated with deepening existing wells or constructing new wells shall be borne by the Project owner.

4. After the first five-year operational and monitoring period both the AO and CPM shall evaluate the data and determine if the monitoring program water level measurement frequencies should be revised or eliminated. Revision or elimination of any monitoring program elements shall be based on the consistency of the data collected. The determination of whether the monitoring program should be revised or eliminated shall be made by the both the AO and CPM.

5. At the end of every subsequent five-year monitoring period, the collected data shall be evaluated by the both the AO and CPM and they shall determine if the sampling frequency should be revised or eliminated.

6. During the life of the Project, the Project owner shall provide to the both the AO and CPM all monitoring reports, complaints, studies and other relevant data within 10 days of being received by the Project owner.

Verification: The Project owner shall do all of the following:

1. At least 30 days prior to Project construction, the Project owner shall submit to the both the AO and CPM, a comprehensive report presenting all the data and information required in item A above.

2. The Project owner shall submit to the both the AO and CPM all calculations and assumptions made in development of the report data and interpretations.

3. During Project construction, the Project owner shall submit to the both the AO and CPM quarterly reports presenting all the data and information required in item B above.

4. The Project owner shall submit to the both the AO and CPM all calculations and assumptions made in development of the report data and interpretations.

5. No later than 60 days prior to Project operation, the Project owner shall provide to the both the AO and CPM for review and approval, documentation showing that any mitigation to private well owners during Project construction was satisfied, based on the requirements of the property owner as determined by both the AO and CPM.

6. During Project operation, the Project owner shall submit to the both the AO and CPM, applicable quarterly and annual reports presenting all the data and information required in item C above.

7. The Project owner shall submit to the both the AO and CPM all calculations and assumptions made in development of report data and interpretations, calculations, and assumptions used in development of any reports.

8. The Project owner shall provide mitigation as described in item 3.c above, if the both the AO and CPM's inspection of the monitoring information confirms changes to water levels and water level trends relative to measured pre-project water levels, and well yield has been lowered by Project pumping. The type and extent of

mitigation shall be determined by the amount of water level decline and site specific well construction and water use characteristics. The mitigation of impacts will be determined as set forth in item 3.c above.

9. If mitigation includes monetary compensation, the Project owner shall provide documentation to the both the AO and CPM that compensation payments have been made by March 31 of each year of Project operation or, if lump-sum payment are made, payment is made by March 31 following the first year of operation only. Within 30 days after compensation is paid, the Project owner shall submit to the both the AO and CPM a compliance report describing compensation for increased energy costs necessary to comply with the provisions of this condition.

10. After the first five year operational and monitoring period, the Project owner shall submit a 5 year monitoring report to both the AO and CPM that submits all monitoring data collected and provides a summary of the findings. Both the AO and CPM will determine if the water level measurement frequencies should be revised or eliminated.

WASTE DISCHARGE REQUIREMENTS

SOIL&WATER-6 Conditions to require implementation of waste discharge requirements for LTU and surface impoundments are currently in development and will be included in the SA/FEIS.

SEPTIC SYSTEM AND LEACH FIELD REQUIREMENTS

SOIL&WATER-7 The project owner shall comply with the requirements of the County of Riverside Ordinance Code Title 8, Chapter 8.124 and the California Plumbing Code (California Code of Regulations Title 24, Part 5) regarding sanitary waste disposal facilities such as septic systems and leach fields. The septic system and leach fields shall be designed, operated, and maintained in a manner that ensures no deleterious impact to groundwater or surface water. Compliance shall include an engineering report on the septic system and leach field design, operation, maintenance, and loading impact to groundwater.

Verification: The project owner shall submit all necessary information and the appropriate fee to the County of Riverside to ensure that the project has complied with county sanitary waste disposal facilities requirements. Written assessments prepared by the County of Riverside regarding the project's compliance with these requirements must be submitted to the AO and CPM for review and approval 30-days prior to the start of power plant operation.

REVISED PROJECT DRAINAGE REPORT AND PLANS

SOIL&WATER-8 The Project owner shall provide a revised Drainage Report which includes the following additional information:

A. Channel rating calculations for all the collector/conveyance channels and onsite drainage channels. Data provided shall include depth, velocity, Froude number and other relevant hydraulic parameters.

B. Detailed scour calculations to justify toe-down depths for all soil cement segments, drop structures, slope protection, and any other features where scour is an issue.

C. A discussion and associated calculation documenting the methods to be used for erosion control at outlet locations along the southern property boundary where flow is released to existing ground.

D. Revised hydrology map showing peak discharge values at locations where the onsite drainage system discharges into the proposed detention basins, or directly offsite, including discharge values at each of the outlet structures along the southern project boundary.

E. Stage-discharge ratings calculations for all outlet structures (i.e. pipes and weirs) used to outlet water along the southern project boundary.

F. Digital copies of all hydrologic and hydraulic analysis.

The Project owner shall also provide the 30 percent Grading and Drainage Plans which include the design based on information provided in the revised Drainage Report outlined above.

Verification: The Project owner shall submit a Revised Project Drainage Report with the 30 percent Grading and Drainage Plans to both the AO and CPM for their review and comments 30 days after project certification. The owner will address comments provided by both the AO and CPM until approval of the report is issued. All comments and concepts presented in the approved Revised Project Drainage Report with the 30 percent Grading and Drainage Plans will be included in the final Grading and Drainage Plans. The Revised Project Drainage Report and 30 percent Grading and Drainage Plans shall be approved by both the AO and CPM.

DETAILED FLO-2D ANALYSIS

SOIL&WATER-9 The Project owner shall provide a revised FLO-2D analysis which models the post-development flood conditions for the 10-, 25- and 100-year storm events along the southern project boundary where flow is released to existing ground. The post-development model must include all outlet structure in the model with appropriate elevations and stage-discharge data. The methods and results of the analysis must be fully documented in the revised Project Drainage Report required in **Soil&Water-8**. Graphical output must include depth and velocity mapping for the post-development condition. Color shading schemes used for the mapping must be consistent between all maps as well as clear and easily differentiated between designated intervals for hydraulic parameters. Intervals to be used in the mapping are as follows:

- Flow Depth: at 0.20 ft intervals up to 1 ft, and 0.40 ft intervals thereafter.
- Velocity: 0.5 ft/s intervals

A set of figures will be provided for the 10-, 25- and 100-year events at a scale of no less than 1 in=200 ft which show the extent, depths and velocities of flows being

discharged along the southern property boundary, as well as annotation indicating the location and type of outlet structure. Digital input and output files associated with the FLO-2D analysis must be included with all submittals.

The results of this analysis will be used for design of the 30 percent project grading and drainage plans

Verification: The Project owner shall submit a detailed FLO-2D analysis to both the AO and CPM for their review and comments with the 30 percent Grading and Drainage Plans and revised Project Drainage Report required in **Soil&Water-8**. The Project owner will address comments provided by both the AO and CPM until approval of the analysis is issued.

DRAINAGE CHANNEL DESIGN

SOIL&WATER-10 All collector and conveyance channels shall be constructed consistent with Riverside County Flood Control and Water Conservation District (RCFCWCD) guidelines where applicable. Deviation from those guidelines should be documented in the Project drainage report along with justification. Grade control structures shall be utilized where needed to meet channel velocity and Froude number requirements. Channels shall be sized along discreet sections based on the results of the detailed FLO-2D analysis described in **SOIL&WATER-9**. All grade control and drop structures shall have adequate toe-down to account for the design drop plus two additional feet to account for potential downcutting of the channel over time.

Channel confluence design must be given special consideration, especially as the preliminary Grading and Drainage Plans show 90 degree angles of confluence at nearly all locations. The issues of confluence hydraulics and potential scour shall be specifically addressed in the revised Drainage Report.

Offsite flows shall discharge directly into collector channels following the natural drainage patterns. The Project owner shall also flatten constructed channel side slopes at a 4:1 ratio along reaches requiring soil cement.

The proposed collector channel design must be fully documented in the Grading and Drainage plans and must include the following information:

A. Detailed and accurate cut/fill lines demonstrating in plan view how the channel would tie into existing grade and the solar facility.

B. Channel cross-sections at 100-foot intervals showing the channel geometry, existing grade, proposed grade at the facility and how the channel would tie in at on both sides.

C. Detailed channel profiles showing existing and finished grades at channel flow line and left and right banks. All drop structures as well as the toe-of soil cement profile must also be shown and fully annotated. The 100-year water surface elevation will be provided on all profiles.

D. Typical sections and design details for all discreet channel sections, drop structures, channel confluences, flow dispersion structures and other relevant drainage features.

E. Details for all outlet structures to be used along the downstream property boundary to release flow from the engineered channels to existing ground as well as details and specifications for all erosion protection measures to be used at those locations.

F. Consistent nomenclature and stationing on all plans, sections, profiles and details.

Verification: The Project owner shall prepare preliminary, 30 percent channel design drawings and submit two (2) copies for both the AO and CPM review and comment. The preliminary design drawings shall be submitted at the same time as the **Revised Project Drainage Report** in **SOIL&WATER-8** and FLO 2D Analysis in **SOIL&WATER-9**. The Project owner will update and modify the design as necessary to obtain both the AO and CPM approval.

CHANNEL EROSION PROTECTION

SOIL&WATER–11 The Project owner must provide revised preliminary Grading and Drainage Plans which incorporate the items and information as listed below for the channels designated as A, B, C, D, E, B/C, D/E on the Conceptual Grading Plans (GSEP 2010a).

A. Soil cement bank protection must be provided such that the channels are protected from bank erosion and lateral headcutting. The extents of the proposed bank protection must be shown on the revised Grading and Drainage Plans. Typical sections for these channels must show the layout of the bank protection including thickness, width and toe-down location and depth consistent with the scour calculation provided in the revised Drainage Report.

B. Soil cement bank protection shall be provided on both channel banks wherever 10-year channel flow velocity exceeds 5 ft/s. It shall be provided on the outer channel bank wherever offsite topography and a detailed FLO-2D analysis indicate surface flow would enter the collector channels.

C. Soil cement bank protection shall be provided at all channel confluences of otherwise unlined channels where the result of the detailed hydraulic analysis presented in the revised Drainage Report indicate the increased potential for erosion due to adverse angles of confluence. Detailed plans for each confluence showing the extents of the soil cement based on specific hydraulic conditions shall be provided in the formal Grading and Drainage Plans.

D. Other methods of channel stabilization, such as dumped riprap or gabions, will not be permitted. Bio-stabilization measures are not permitted.

E. Earthen berms used on the outside of collector channels to guide flow to discreet points of discharge into a channel shall not be utilized in lieu of soil cement on the outside bank of collector channels. Offsite flows shall discharge directly into collector channels.

F. The plans shall include reference to regionally accepted specifications for soil cement production and construction. A copy of the specification must be submitted with the revised plans.

G. A soils report indicating the suitability of the Project soils for use in the production of soil cement to the Project specifications shall be submitted with the revised Grading and Drainage Plans.

H. The bottom of engineered collector channels may be left earthen or fully lined at the discretion of the engineer. Fully lined channels will have higher allowable velocities and Froude numbers assuming hydraulic jumps are modeled and considered in the channel design.

I. If modifications to the existing drainages to allow construction of and future access to linear facilities require stabilization of the channel in the vicinity of those modifications, location of disturbance to the existing drainages shall be stabilized consistent with best engineering practice to eliminate future negative impacts to those drainages upstream and downstream of the linear facility in the form of downcutting, erosion and headcutting. The use of "non-engineered" culvert crossings shall not be allowed. All structures to be utilized in existing drainages along linear facilities shall be documented in the project drainage report and reflected in the project improvement plans. Channel erosion mitigation measures along linear facilities shall be subject to all the requirements of this Condition of Certification where applicable.

Verification: The required information and criteria shall be incorporated into the Grading and Drainage Plans and with all subsequent submittals as required in **SOIL&WATER-8** through **SOIL&WATER-10**. The Project owner will update and modify the design as necessary to obtain both the AO and CPM approval.

NPDES STORMWATER PERMIT- INDUSTRIAL ACTIVITY

SOIL&WATER-12 In the event it is determined the project will discharge to waters of the US, the Project owner shall comply with the requirements of the general NPDES permit for discharges of storm water associated with industrial activity. The Project owner shall develop, obtain both the AO and CPM approval of, and implement an industrial SWPPP for the operation of the Project.

Verification: At least 60 days prior to commercial operation, the Project owner shall submit to the both the AO and CPM a copy of the final industrial SWPPP for operation of the Project for review and approval prior to commercial operation. The Project owner shall retain a copy on site. The Project owner shall submit copies to the both the AO and CPM of all correspondence between the Project owner and the CRBRWQCB regarding the general NPDES permit for discharge of storm water associated with

industrial activity within 10 days of its receipt or submittal. Copies of correspondence shall include the Notice of Intent sent by the Project owner to the SWRCB.

CHANNEL MAINTENANCE PROGRAM

SOIL&WATER-13 The Project owner shall develop and implement a Channel Maintenance Program that provides long-term guidance to implement routine channel maintenance projects and comply with conditions of certification in a feasible and environmentally-sensitive manner. The Channel Maintenance Program will be a process and policy document prepared by the Project owner, reviewed by both the AO and CPM. The Channel Maintenance Program shall include the following:

A. Purpose and Objectives – establishes the main goals of the Program, of indefinite length, to maintain the diversion channel to meet its original design to provide flood protection, support GSEP mitigation, protect wildlife habitat and movement/ migration, and maintain groundwater recharge.

B. Application and Use - The channel maintenance work area is defined as the GSEP engineered channel, typically extending to the top of bank, include access roads, and any adjacent property that GSEP owns or holds an easement for access and maintenance. The Program would include all channel maintenance as needed to protect the GSEP facilities and downstream property owners.

C. Channel Maintenance Activities

1. **Sediment Removal** - sediment is removed when it: (1) reduces the diversion channel effective flood capacity, to less than the design discharge, (2) prevents appurtenant hydraulic structures from functioning as intended, and (3) becomes a permanent, non-erodible barrier to instream flows.

2. **Vegetation Management** - manage vegetation in and adjacent to the diversion channel to maintain the biological functions and values proposed in the mitigation. Vegetation management shall include control of invasive or nonnative vegetation as prescribed in Condition of Certification **BIO-14**.

3. **Bank Protection and Grade Control Repairs** – Bank protection and grade control structure repairs involve any action by the Project owner to repair eroding banks, incising toes, scoured channel beds, as well as preventative erosion protection. The Project owner would implement instream repairs when the problem: (1) causes or could cause significant damage to GSEP; adjacent property, or the structural elements of the diversion channel; (2) is a public safety concern; (3) negatively affects groundwater recharge; or (4) negatively affects the mitigation vegetation, habitat, or species of concern.

4. **Routine Channel Maintenance** - trash removal and associated debris to maintain channel design capacity; repair and installation of fences, gates and signs; grading and other repairs to restore the original contour of access roads and levees (if applicable); and removal of flow obstructions at GSEP storm drain outfalls.

5. **Channel Maintenance Program –** Exclusions including: emergency repair and CIP.

D. Related Programmatic Documentation – both the AO and CPM will review and approve the Channel Maintenance Program programmatic documentation. Maintenance activities shall comply with the stream alteration agreement provisions and requirements for channel maintenance activities consistent with California's endangered species protection regulations and other applicable regulations.

E. Channel Maintenance Process Overview

1. **Program Development and Documentation** – This documentation provides the permitting requirements for channel maintenance work in accordance with the conditions of certification for individual routine maintenance of the engineered channel without having to perform separate CEQA/NEPA review or obtain permits.

2. **Maintenance Guidelines** - based on two concepts: (1) the maintenance standard and (2) the acceptable maintenance condition, and applies to sediment removal, vegetation management, trash and debris collection, blockage removal, fence repairs, and access road maintenance.

3. **Implementation** – Sets Maintenance Guidelines for vegetation and sediment management. GSEP's vegetation management activities are established in Condition of Certification **BIO-14**. Maintenance Guidelines for sediment removal provide information on the allowable depth of sediment for the engineered channel that would continue to provide design discharge protection.

4. **Reporting** – both the AO and CPM requires the following reports to be submitted each year as part of the Annual Compliance Report:

   a. Channel Maintenance Work Plan - Describes the planned "major" maintenance activities and extent of work to be accomplished; and

   b. Channel Maintenance Program Annual Report – Specifies which maintenance activities were completed during the year including type of work, location, and measure of the activity (e.g. cubic yards of sediment removed).

   c. A report describing "Lessons Learned" to evaluate the effectiveness of both resource protection and maintenance methods used throughout the year.

F. Resource Protection Policies - establishes policies to ensure that resources would be protected to the fullest extent feasible during routine channel maintenance activities. Policies would be developed to guide decision-making for channel maintenance activities. BMPs shall be developed to implement these policies.

Verification: At least 60 days prior to the start of any project-related site disturbance activities, the Project owner shall coordinate with both the AO and CPM to develop the Channel Maintenance Program. The Project owner shall submit two copies of the programmatic documentation, describing the proposed Channel Maintenance Program, to the both the AO and CPM (for review and approval). The Project Owner shall provide written notification that they plan to adopt and implement the measures identified in the approved Channel Maintenance Program. The Project owner shall:

- Supervise the implementation of a Channel Maintenance Program in accordance with conditions of certification;
- Ensure the GSEP Construction and Operation Managers receive training on the Channel Maintenance Program;
- As part of the GSEP Annual Compliance Report to the both the AO and CPM , submit a Channel Maintenance Program Annual Report specifying which maintenance activities were completed during the year including type of work, location, and measure of the activity (e.g. cubic yards of sediment removed).

CLOSURE AND DECOMMISSIONING PLAN

SOIL&WATER–14 The Project owner shall identify likely decommissioning scenarios and develop specific decommissioning plans for each scenario that will identify actions to be taken to avoid or mitigate long-term impacts related to water and wind erosion after decommissioning. Actions may include such measures as a decommissioning SWPPP, revegetation and restoration of disturbed areas, post-decommissioning maintenance, collection and disposal of project materials and chemicals, and access restrictions.

Verification: At least 90 days prior to the start of site mobilization, the Project owner shall submit decommissioning plans to the AO and CPM for review and approval. The Project owner shall amend these documents as necessary, with approval from the AO and CPM, should the decommissioning scenario change in the future.

MITIGATION OF COLORADO RIVER IMPACTS

SOIL&WATER–15 The Project owner shall undertake one or more of the activities identified below to mitigate project impacts to flows in the Colorado River. These activities shall result in replacement of 51,920 acre feet or 1,644 AFY under wet cooling Project or 6,560 acre feet or 132 AFY for a dry cooling Project alternative in the Colorado River Basin over the life of the project.

The Project owner shall first consider the use of dry cooling for project operation, and mitigate any remaining project impacts on the Colorado River.

If dry-cooling is not used for project operation then the activities may include water conservation projects in the following order of priority: Zero Liquid Discharge systems, increase cycles of concentration in the evaporative cooling process, hybrid cooling, payment for irrigation improvements in Palo Verde Irrigation District, purchase of water rights within the Colorado River Basin that will be held in reserve, and/or BLM's Tamarisk Removal Program.

The activities proposed for mitigation will be outlined in a Water Supply Plan that will be provided to the CPM and AO for review and approval.

If the project owner has filed an application to the Colorado River Board to obtain an allocation of water from the Colorado River, obtaining an allocation of 51,920 acre feet or 1,644 AFY under a wet cooling Project alternative or 6,560 acre feet or 132 AFY for a dry cooling Project alternative will meet the requirements of this condition.

The Project owner can choose to refine the estimate of the quantity of water attributed to flow from the Colorado River by implementing **SOIL&WATER-19.** If a lesser volume of water is determined to be diverted from the Colorado River as a result of project pumping pursuant to **SOIL&WATER-19**, that lesser volume shall be replaced in accordance with this Condition

Verification: The Project Owner shall submit a Water Supply Plan to the CPM and AO for review and approval 30 days before the start of extraction of groundwater for construction or operation. The Water Supply Plan shall include the following at a minimum:

a. Identification of the activity and water source that will replace 51,920 acre feet or 1,644 AFY under a wet cooling Project alternative or 6,560 acre feet or 132 AFY for a dry cooling Project alternative diverted from the Colorado River over the life of the project;

b. Demonstration of the project owner's legal entitlement to the water or ability to conduct the activity;

c. Include a discussion of any needed governmental approval of the identified activities, including a discussion of whether that approval that requires ;

d. Discuss whether any governmental approval of the identified activities will be needed, and, if so, whether additional that approval will require compliance with CEQA or NEPA;

e. Demonstration of how water diverted from the Colorado River will be replaced for each of the activities;

f. An estimated schedule for completion of the activities;

g. Performance measures that would be used to evaluate the amount of water replaced by the activities;

h. Monitoring and Reporting Plan outlining the steps necessary and proposed frequency of reporting to show the activities are achieving the intended benefits and replacing Colorado River diversions; and

i. If the application for allocation from the Colorado River is accepted by the USBR, the project owner shall submit to both AO and the CPM for their approval, a copy of a water allocation from the Colorado River issued by the CRB for the Projects diversion of Colorado River water.

The project owner shall implement the activities reviewed and approved in the Water Supply Plan in accordance with the agreed upon schedule in the Water Supply Plan. If agreement on identification or implementation of mitigation activities cannot be achieved the project owner shall immediately halt construction or operation until assurance that the agreed upon activities can be identified and implemented.

GROUNDWATER PRODUCTION REPORTING

SOIL&WATER–16 The Project is subject to the requirement of Water Code Sections 4999 et. seq. for reporting of groundwater production in excess of 25 acre feet per year.

Verification: The Project Owner shall file an annual "Notice of Extraction and Diversion of Water" with the SWRCB in accordance with Water Code Sections 4999 et. seq. The Project Owner shall include a copy of the filling in the annual compliance report.

GROUND SUBSIDENCE MONITORING AND ACTION PLAN

SOIL&WATER–17 Three extensometers shall be constructed to measure potential inelastic subsidence that may alter surface characteristics of the Chuckwalla Valley near the proposed production wells. The applicant will be required to:

A. Prepare and submit a Subsidence Monitoring Plan (SMP). The plan shall include the following elements:

   1. Construction diagrams of the proposed extensometers including borehole size, planned depth of anchor point(s), measuring points,

   2. Map depicting locations (minimum of three) of the planned extensometers;

   3. Monitoring program that includes monitoring frequency, thresholds of significance, reporting format.

B. Prepare quarterly reports commencing 3 months following commencement of groundwater production during construction and operations.

   1. The reports will include presentation and interpretation of the data collected including comparison to the thresholds developed in Item C.

C. Prepare a Mitigation Action Plan that will detail the following:

1. Thresholds of significance for implementation of proposed action plan;

a. Any subsidence that may occur will not be allowed to damage existing structures either on or off the site or alter the appearance or use of the structure;

b. Any subsidence that may occur will not be allowed to alter the natural drainage patterns or permit the formation of playas or lakes to form;

c. Any subsidence that violates (a) or (b) will result in the Project owner immediately reducing/ceasing pumping until subsidence abates and the structures or drainage patterns are returned to their pre-subsidence conditions.

2. Action Plan that details proposed actions by the applicant in the event thresholds are achieved during the monitoring program

The applicant will be required to submit the Ground Subsidence Monitoring and Action Plan that is prepared by an Engineering Geologist registered in the State of California 30 days prior to the start of extraction of groundwater for construction or operation.

Verification: The Project owner shall do all of the following:

1. At least 30 days prior to Project construction, the Project owner shall submit to the both the AO and CPM, a comprehensive report presenting all the data and information required in item A above.

2. The Project owner shall submit to the both the AO and CPM all calculations and assumptions made in development of the SMP.

3. During Project construction and operations, the Project owner shall submit to the both the AO and CPM quarterly reports presenting all the data and information required in item B above.

4. The Project owner shall submit to the both the AO and CPM all calculations and assumptions made in development of the report data and interpretations.

5. After the first five years of the monitoring period, the Project owner shall submit a 5 year monitoring report to both the AO and CPM that submits all monitoring data collected and provides a summary of the findings. Both the AO and CPM will determine if the Ground Subsidence Monitoring and Action Plan frequencies should be revised or eliminated.

WATER POLICY COMPLIANCE

SOIL&WATER-18 Pending agreement on the actions needed to bring the project into compliance with the water policy.

ESTIMATION OF COLORADO RIVER IMPACTS

SOIL&WATER-19 The Project owner may choose to refine the estimates of the amount of subsurface water flowing from the Colorado River due to project pumping. This estimate may be used for determining the appropriate volume of water for mitigation in accordance with **SOIL&WATER-15**. The Project owner shall do the following to provide an estimate for review and approval by the AO and CPM:

1. The Project owner shall conduct a detailed analysis of the contribution of Colorado River water to the PVMGB from the Projects groundwater extraction activities. The detailed analysis shall include:

   a. The development of a conceptual model

   b. The use of a numerical model.

   c. Reporting of the results of the modeling effort

   d. Estimation of the contribution of Colorado River water and groundwater from the adjacent Palo Verde Valley Groundwater Basin to the Palo Verde Mesa Groundwater Basin as a result of Project groundwater extraction in the CVGB.

2. The analysis shall include development of a conceptual model that includes a detailed description of the: geology; hydrogeology; boundary conditions; aquifer homogeneity/heterogeneity, recharge estimates, discharge estimates, flow regime and water balance.

   The development of the conceptual model shall be based on existing data. In instances where available data is deficient, assumptions shall be developed along with the basis of the assumptions. The conceptual model shall be the basis for the numerical model.

3. The development of the numerical model shall include development of the grid orientation, cell size, and layering in sufficient detail to provide information concerning inflow from adjacent groundwater basins and boundaries including the Colorado River and the adjacent Palo Verde Valley Groundwater Basin for the life of the project. Model input data shall be developed for each of the boundary conditions and aquifer properties identified in the Conceptual Model.

   The numerical model shall be run under steady-state conditions using groundwater heads from existing wells in the basin. The numerical model shall include calibration of the model with existing conditions including simulation of groundwater levels. The model shall be based upon an industry standard model whose code is available in the public domain. The creation and calibration of the model shall use the following techniques/requirements set forth in:

   a. ASTM D5447 - Application of a Ground-Water Flow Model to a Site-Specific Problem

   b. ASTM D5490 - Comparing Ground-Water Flow Model Simulations to Site-Specific Information

c. ASTM D5609 - Defining Boundary Conditions in Ground-Water Flow Modeling

d. ASTM D5610 - Defining Initial Conditions in Ground-Water Flow Modeling

e. ASTM D5981 - Calibrating a Ground-Water Flow Model Application

f. ASTM D5611 - Standard Guide for Conducting a Sensitivity Analysis for a Ground-Water Flow Model Application

4. The numerical model shall be calibrated and shall consist of comparing model results with actual field measurements and adjusting model parameters within predefined limits to improve the agreement between model estimates and actual data. Model calibration shall be completed for a specific time period that represents a period for which sufficient field data (e.g. groundwater levels) are available. Initial calibration efforts shall be completed for “steady-state” conditions when groundwater pumping was minimal. This portion of the calibration effort shall be designed to test the basic components of the conceptual model and to provide a set of groundwater levels that can be used to initialize the transient calibration solution. The transient period shall be selected based on data availability, and the model shall be calibrated using data and information from Item (1).

5. The Project owner shall conduct transient groundwater model runs (including analysis) of the proposed project from construction through operation for the life of the project. The model shall use the information developed in Item (1).

6. The Project owner shall conduct an analysis of the anticipated increased inflow (in afy) from the Colorado River and adjacent Palo Verde Valley Groundwater Basin during the life of the project.

7. The Project owner shall provide a statistical analysis identifying the accuracy of the results of the model as well as the information developed in Item (6) in terms of percent error.

8. The Project owner shall present the results of the development of the conceptual model, numerical model, calibration, transient runs and sensitivity analysis in a report for review and approval by AO and CPM. The report shall include all pertinent information regarding the development of the conceptual and numerical models. The report shall include:

   a. Introduction

   b. Previous Investigations and Data Collection Results

   c. Conceptual Model Development/Refinement

   d. Mathematical Model and Input Parameters

   e. Calibration and Sensitivity Analysis

   f. Transient Modeling Runs

g. Conclusions

Verification: Within 30 days following certification of the proposed Project, the Project owner will submit to both AO and the CPM for their approval a report detailing the results of the modeling effort. The report will include the estimated amount of subsurface water flowing from the Colorado River due to project pumping. This estimate shall be used for determining the appropriate volume of water for mitigation in accordance with **SOIL&WATER-15**.

GROUNDWATER QUALITY MONITORING AND REPORTING PLAN

SOIL&WATER-20 The project owner shall submit a Groundwater Quality Monitoring and Reporting Plan to the CPM for review and approval. The Groundwater Quality Monitoring and Reporting Plan shall provide a description of the methodology for monitoring background and site groundwater levels and quality. Prior to project construction, monitoring shall commence to establish pre-construction base-line groundwater level conditions and shall include pre-construction, construction, and project operation water use. A water quality baseline and groundwater level baseline shall be established for any existing and newly installed well on the ROW. The primary objectives for the monitoring is to ensure the project does not degrade the existing water quality of the proposed water supply in concert with Condition of Certification **SOIL&WATER–4,** establish pre-construction and project related groundwater quality and groundwater elevation levels that can be quantitatively compared against observed and simulated levels near the project pumping well and near potentially impacted existing wells, and to avoid, minimize, or mitigate impacts or degradation to sensitive receptors (springs and groundwater-dependent vegetation, and groundwater supply users) .

Verification: The project owner shall complete the following:

1. At least six (6) weeks prior to construction, a Groundwater Level and Quality Monitoring and Reporting Plan shall be submitted to the BLM AO and CPM for review and approval before completion of Condition of Certification **SOIL&WATER-3**. The Plan shall include a scaled map showing the site and vicinity, existing well locations, and proposed monitoring locations (both existing wells and new monitoring wells proposed for construction). The map shall also include relevant natural and man-made features (existing and proposed as part of this project). The plan also shall provide: (1) well construction information and borehole lithology for each existing well proposed for use as a monitoring well; (2) description of proposed drilling and well installation methods; (3) proposed monitoring well design; and, (4) schedule for completion of the work.
2. At least four (4) weeks prior to construction, a Well Monitoring Installation and Groundwater Level Network Report shall be submitted to the CPM for review and approval. The report shall include a scaled map showing the final monitoring well network. It shall document the drilling methods employed, provide individual well construction as-builds, borehole lithology recorded from the drill cuttings, well development, and well survey results. The well survey shall measure the location and elevation of the top of the well casing and reference point for all water level measurements, and shall include the coordinate system and datum for the survey

measurements. Additionally, the report shall describe the water level monitoring equipment employed in the wells and document their deployment and use.

3. As part of the monitoring well network development, all newly constructed monitoring wells shall be constructed consistent with State and Riverside County specifications.
4. At least four (4) weeks prior to project construction, all groundwater quality and groundwater level monitoring data shall be reported to the CPM. The report shall include the following:
    a. An assessment of pre-project groundwater levels, a summary of available climatic information (monthly average temperature and rainfall records from the nearest weather station), and a comparison and assessment of water level data relative to the assumptions and spatial trends simulated by the applicant's groundwater model.
    b. As assessment of pre-project groundwater quality with groundwater samples analyzed for TDS, chloride, nitrates, major cations and anions, oxygen-18 and deuterium isotopes, and any other constituents the AO and/or CPM deem critical in protecting existing water supply quality.
    c. The data shall be tabulated, summarized, and submitted to the AO and CPM. The data summary shall include the estimated range (minimum and maximum values), average, and median for each constituent analyzed. The data shall also be analyzed using the Mann-Kendall test for trend to assess whether pre-project water quality trends, if any, are statistically significant.
5. During project construction and during project operations, the project owner shall semi-annually monitor the quality of groundwater and changes in groundwater elevation and submit data semi-annually to the CPM and BLM AO. The summary report shall document water level monitoring methods, the water level data, water level plots, and a comparison between pre- and post-project start-up water level trends as itemized below. The report shall also include a summary of actual water use conditions, monthly climatic information (temperature and rainfall), and a comparison and assessment of water level data relative to the assumptions and simulated spatial trends predicted by the applicant's groundwater model.
    a. Groundwater samples from all wells in the monitoring well network shall be analyzed and reported semi-annually for TDS, chloride, nitrates, cations and anions, oxygen-18 and deuterium isotopes. These analyses, and particularly the stable isotope data, can be useful for identifying water sources and assessing their contributions to the quality of water produced by wells.
    b. For analysis purposes, pre-project water quality shall be defined by samples collected prior to project construction as specified above, and compliance data shall be defined by samples collected after the construction start date. The compliance data shall be analyzed for both trends and for contrast with the pre-project data.
    c. Trends shall be analyzed using the Mann-Kendall test for trend. Trends in the compliance data shall be compared and contrasted to pre-project trends, if any.

d. The contrast between pre-project and compliance mean or median concentrations shall be compared using an Analysis of Variance (ANOVA). A parametric ANOVA (for example, an F-test) can be conducted on the two data sets if the residuals between observed and expected values are normally distributed and have equal variance, or the data can be transformed to an approximately normal distribution. If the data cannot be represented by a normal distribution, then a nonparametric ANOVA shall be conducted (for example, the Kruskal-Wallis test). If a statistically significant difference is identified between the two data sets, the monitoring data are inconsistent with random differences between the pre-project and baseline data indicating a significant water quality impact from project pumping may be occurring.

e. If compliance data indicate that the water supply quality has deteriorated (exceeds pre-project constituent concentrations in TDS, sodium, chloride, or other constituents identified as part of the monitoring plan) for three consecutive years, the project owner shall provide treatment or a new water supply to either meet or exceed pre-project water quality conditions to any impacted water supply wells.

C.9.13 CONCLUSIONS

Staff's conclusions based on analysis of the information submitted to-date are as follows:

1. The proposed Project would be located on an alluvial fan where flash flooding and mass erosion could impact the Project. Project-related changes to the alluvial fan hydrology could result in impacts to adjacent land users. A Draft Drainage, Erosion, and Sedimentation Control Plan (DESCP) has been developed to mitigate the potential storm water and sediment project-related impacts. However, the calculations and assumptions used to evaluate potential storm water and sedimentation impacts are imprecise and have limitations and uncertainties associated with them such that the magnitude of potential impacts that could occur cannot be determined precisely. Based on these factors, the proposed Project could result in impacts that would be significant with respect to CEQA significance criteria specified herein and the Council on Environmental Quality Regulations for Implementing the Procedural Provisions of the NEPA (CEQ NEPA Regulations) significance criteria specified in 40 CFR 1508.27. Therefore, Conditions of Certification have been developed that define the requirements for reports, plans, monitoring, and inspection, as well as standards and procedures for implementing Best Management Practices during construction and operations.

2. The proposed Project would be located in an area with no designated entity responsible for maintaining integrity of the rerouted channels. Staff believes the applicant should be required to establish a Channel Maintenance Program as indicated in Condition of Certification **SOIL&WATER-13**.

3. The proposed Project would have an impact on levels of groundwater in the Chuckwalla Valley Groundwater Basin (CVGB). However, the calculations and assumptions used to evaluate potential groundwater level impacts are imprecise and

have limitations and uncertainties associated with them such that the magnitude of potential impacts that could occur cannot be determined precisely. To ensure that the Project's proposed use of groundwater does not significantly impact the groundwater levels in the CVGB, staff believes the Applicant should be required to develop a monitoring program and identify what changes are occurring in basin water levels. Substantial changes to groundwater levels caused by the proposed Project and other pumping in the basin would be documented by this monitoring, and a mitigation and reporting program would be required in accordance with Conditions of Certification **SOIL&WATER-3**, **-4**, **-5** and **-20**.These measures, along with mitigation identified in the Biological Resources section of this document that could be required for impacts to groundwater-dependent vegetation that may occur, will be sufficient to ensure that significant impacts related to changes in groundwater levels do not occur.

The cumulative impact analysis indicates that groundwater extraction during construction and operation of this and other foreseeable projects would place the basin into an overdraft condition. This impact may be exacerbated by other unidentified renewable energy projects in the I-10 corridor, which has been targeted as a potential area for further renewable energy development. However, the amount of water that is storage in the basin greatly exceeds the amount of cumulative overdraft, rendering the project's contribution to this cumulative impacts less than cumulative considerable.

Finally, the cumulative effects may indirectly impact the adjacent Palo Verde Mesa Groundwater Basin inducing underflow from the Colorado River. To mitigate the project's contribution to impacts to the Colorado River, the applicant must complete **SOIL&WATER-15** that would require mitigation to ensure that impacts to the Lower Colorado River do not occur.

4. The applicant has proposed to use groundwater for wet cooling when other feasible technologies are available. Staff believes the proposed use of groundwater for wet cooling would not comply with the state's water policies. To address this inconsistency with state water policy, staff recommends implementation of Condition of Certification **SOIL&WATER-18** that would require the project owner to reduce the proposed water use through a project design change(s) and/or through a water conservation program.

5. The applicant has proposed the use of evaporation ponds as the preferred method of wastewater disposal. Staff believes potential impacts related to the use of evaporation ponds to dispose of the industrial wastewater could be mitigated through effective application of state and local LORS. However, this method of wastewater disposal is not consistent with the Energy Commission's policy that encourages the use of zero liquid discharge (ZLD) systems that are designed to eliminate wastewater discharge and inherently conserve water. Therefore, staff finds that this method of wastewater disposal does not comply with the state's water policies. As discussed above, to resolve this impact, staff recommends implementation of Condition of Certification **SOIL&WATER-18**

The state has expressed a strong interest in developing its solar energy resources. However, the construction and operation of solar energy facilities requires the use of water, which state policy also protects. The Energy Commission must balance the state's interest in promoting solar energy development with its interest in conserving and protecting the state's water resources. Several projects currently proposed for the Mojave and Colorado deserts would use water for power plant cooling, which staff believes is contrary to the state's long term interest in maximizing solar power generation and minimizing adverse environmental impacts. This will be an especially critical issue in the renewable development areas that will be identified in the Desert Renewable Energy Conservation Plan (DRECP). Later this year, staff plans to file a request for an Order Instituting an Informational Proceeding to address this issue.

Completion of staff's analysis of the proposed Project is subject to the following:

A finding by the U.S. Army Corps of Engineers of whether the ephemeral drainages on the Project site are jurisdictional waters of the U.S. Without this determination, staff cannot determine whether the Project would comply with Section 404 of the Clean Water Act.

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ACRONYMS

af	acre-feet
AF	Acre-feet
AFC	Application for Certification
afy	acre-feet per year
AFY	Acre-Feet per Year
msl	Above mean sea level
AO	BLM's Authorized Officer
bgs	Below ground surface
BLM	United States Bureau of Land Management
BMPs	Best management practices
BP	Before Present
CEC	California Energy Commission
CEQ	Council on Environmental Quality, Executive Office of the President
CEQA	California Environmental Quality Act
cfs	cubic feet per second
CIMIS	California Irrigation Management Information System
CRB	Colorado River Board of California
CRBRWQCB	Colorado River Basin Regional Water Control Board
CVGB	Chuckwalla Valley Groundwater Basin
CWA	Clean Water Act
DESCP	Drainage Erosion and Sediment Control Plan
DR	Data Request
DWR	California Department of Water Resources
EPA	United States Environmental Protection Agency
FEMA	Federal Emergency Management Agency
ft	feet
ft/s	feet per second
ft^2	square feet
ft^2/d	square feet per day
gpd	gallon per day
gpm	Gallons per minute
GSEP	Genesis Solar Energy Project
HTF	Heat Transfer Fluid
in	inches
LORS	Laws Ordinances, Regulations and Standards
LTU	Liquid Treatment Unit

mg/L	milligrams per liter
NPDES	National Pollutant Discharge Elimination System
NRCS	National Resource Conservation Service
NWIS	National Water Information System
OW	Observation Well
PSPP	Palen Solar Power Project
PVID	Palo Verde Irrigation District
RCFCWCD	Riverside County Flood Control and Water Conservation District
RO	Reverse Osmosis
ROW	Right of Way
RPS	Renewable Portfolio Standard
RWQCB	Colorado River Basin Regional Water Control Board
SWPPP	Storm Water Pollution Prevention Plan
SWRCB	California State Water Resources Control Board
t/ac/yr	tons per acre per year
TDS	Total Dissolved Solids
TW	Test Well
USBR	United States Bureau of Reclamation
USGS	United States Geological Survey

GLOSSARY

Drought condition - hydrologic conditions during a defined period when rainfall and runoff are much less than average.

Groundwater Overdraft - the condition of a groundwater basin in which the amount of water withdrawn by pumping exceeds the amount of water that recharges the basin over a period of years during which water supply conditions approximate average conditions (CDWR, 1998).

Perennial Yield - the maximum quantity of water that can be annually withdrawn from a groundwater basin over a long period of time [during which water supply conditions approximate average conditions] without developing an overdraft condition.- CDWR, 1998).

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APPENDIX A (SOIL & WATER REPORT)

Date:	February 26, 2010
To:	Susan Sanders
CC:	Susan Lee, Mike Monasmith, CEC workgroup for Genesis
From:	Andrew Collison, Ph.D.
PWA Project #:	#2006.00 CEC Genesis
Subject:	**Geomorphic assessment of Genesis Solar project site**

Objectives of this Appendix:

1. Provide a brief description of the project area's sand dunes and a discussion of the sand transport processes that created and now maintain the existing dunes.

2. Discussion of potential direct and indirect impacts of the proposed project and its alternative on the existing sand dune system and the processes that support them.

3. Mitigation for those impacts, or a well-supported conclusion that those impacts cannot be mitigated.

Summary of Key Findings

PWA has reviewed the applicant's geomorphic review of the Genesis project site entitled "Aeolian transport evaluation and ancient shoreline delineation report", Worley Parsons, February 5th 2010. I visited the western part of the field site with the report's author, Dr. Miles Kenney, to assess the accuracy of the mapping and conclusions, and carried out a desk study for the eastern side of the project based on aerial photos, literature sources and experience in similar locations. I am largely in agreement with the report conclusions regarding the western solar array: it is located on two land surface units that are relatively geomorphically stable and that are not part of an active wind transport corridor. There are no large washes in this part of the site that carry large amounts of sediment across the project site. As a result there should not be significant off-site geomorphic impacts from the western solar array or project components. There will be some disruption of drainage from capturing a large number of small ephemeral washes that currently cross the project site from north to south, diverting them around the property and discharging them back on to the fan surface. I have investigated a similar reference site 12 miles to the west of the Genesis site where I10 drainage is captured over a similar area, concentrated into a single channel and released back on to the fan surface. This site suggests that it is feasible to capture drainages and redistribute them on the alluvial fan with relatively minor impacts, though care will be needed in the design of this system.

The eastern solar array is somewhat more complex since it overlays a larger and more active ephemeral wash and it intrudes into the outer edges of two wind-borne sand transport corridors that deliver sand to ecologically-significant dune habitat downwind, including habitat that supports Mojave Fringe Toed Lizard. The degree of intrusion is somewhat hard to estimate since both wind corridors have poorly defined edges, and because sand transport rates vary greatly across the corridor width. By the applicant's estimation (Worley Parsons, 2010) the eastern solar array intrudes across 19% of the width of the Palen-McCoy corridor, and 7% of the Chuckwalla corridor. These delineations appear reasonable based on a field and aerial photo analysis, and by comparison with the NECO land classification maps (BLM CDD, 2002). There is good evidence from the field and the Worley Parsons report to demonstrate that the rate of sand transport is relatively low in the edges of the corridor where the project footprint is proposed, with most of the sand volume being transported in more central parts of the corridor. The overall disruption to sand delivery is conservatively estimated by this author to be less than 10% for the Palen-McCoy transport corridor and less than 6% for the Chuckwalla corridor. Note however that the project laterals will pass through the core of the Palen-McCoy corridor where there is a much higher rate of sediment transport, and will need to be designed to minimize disruption of sand transport by both wind and water. This will preclude the use of wind fences beyond the initial construction period, and will require keeping infrastructure below or at ground level where possible, and avoiding constructing berms or drainage channels that trap sediment or disrupt channel processes.

Although the magnitude of sand reduction from the eastern solar array is not believed to be great in terms of regional sand transport patterns along the Chuckwalla Valley, an area of approximately 453 acres of sandy plains and partially stabilized vegetated sand dunes immediately downwind of the eastern solar array will be indirectly impacted by the project, with wind-borne sand being cut off by the project footprint. Based on previous studies on the effects of wind breaks on sand dune habitat in the Coachella Valley (Turner et. al. 1984), this area is likely to experience deflation (blowing away of sand from the dunes) and potential loss of sandy habitat within a few years of the project's construction.

A large wash complex that currently crosses the eastern side of the proposed eastern solar array will be captured and redirected around the project footprint. Unlike the small washes that cross the western solar array site, this wash complex appears to supply a large amount of sand to the surrounding area (under the proposed eastern solar array). It appears that it may be possible to redirect this wash east of the project site in a natural (earth rather than concrete or soil cement) channel, to minimize erosion and habitat impacts. As with the western solar array, the applicant proposes to capture small drainages and pass them around the project footprint before dispersing them downstream. This should be feasible without major impacts downstream provided that the drainage plan is well designed and implemented.

Relationship Between Hydro-Geomorphic Processes and Biological Resources

This Appendix focuses on several hydro-geomorphic processes that play a significant role in the health of the ecosystem of the project site and its surroundings. These processes are wind transportation of sand relative to the creation, preservation and destruction of sand dunes, and water transport of sediment through the alluvial fan drainage system.

Wind Transport

The Fringe Toed Lizard relies on active sand dunes and a regular supply of fine wind blown sand for its habitat (Figure 1). Active sand dunes (dunes that have an active layer of mobile sand) exist in a state of dynamic equilibrium: they are continuously losing sand downwind due to erosion and transport, but that is offset by supplies of new sand from upwind (see Figure 2). If the upwind sand supply is cut off the dunes *deflate*; that is to say they lose sand downwind and shrink in size and depth (see Figure 3 for an example). The finest sand (which is most easily transported) is lost first with coarser sand and gravel being left behind to form an armor or lag. This combination of lag and thin sand deposits does not support FTL habitat.

Maintaining FTL habitat requires the regular addition of wind-blown sand from a reliable source. Most of the sand in the Chuckwalla Valley is transported via a series of sand transport corridors, controlled by wind direction and the availability of loose sand to be transported. The applicant's sand dune report (Worley Parsons, 2010) provides a good explanation of the location of these corridors relative to the project site. The main Chuckwalla Valley corridor runs west to east across the southern edge of the proposed Genesis project, while the Palen-McCoy corridor runs through the eastern edge of the site. Sand delivered from upwind passes through dune areas including FTL habitat and is deposited, replenishing sand that has been lost downwind. In addition to the direct biological impact of constructing a project in a dune area (direct loss of habitat), construction activities have two potential offsite impacts on sand transport corridors. Firstly, if the project footprint is constructed in a dune area it will cut off a supply of sand that would otherwise have been transported downwind to other dune areas. Dunes downwind of a constructed site will deflate over time as sand output is not matched by sand input. Secondly, new sand that would have been transported across the project footprint from upwind will potentially be cut off by drainage ditches, wind fences and above ground infrastructure. Thus, if a project is built into a wind corridor it will create a 'sand shadow' area where dune deflation occurs over time.

Turner et al (1984) conducted experiments on paired plots of sand dunes up and downwind of wind barriers. They showed that 'sand shadows' formed within 4-17 years of the erection of a relatively small wind barrier (a single line of tamarisk trees) and that while FTL were abundant upwind of the barriers they were virtually absent downwind. Thus barriers pose a direct threat to sand transport and habitat.

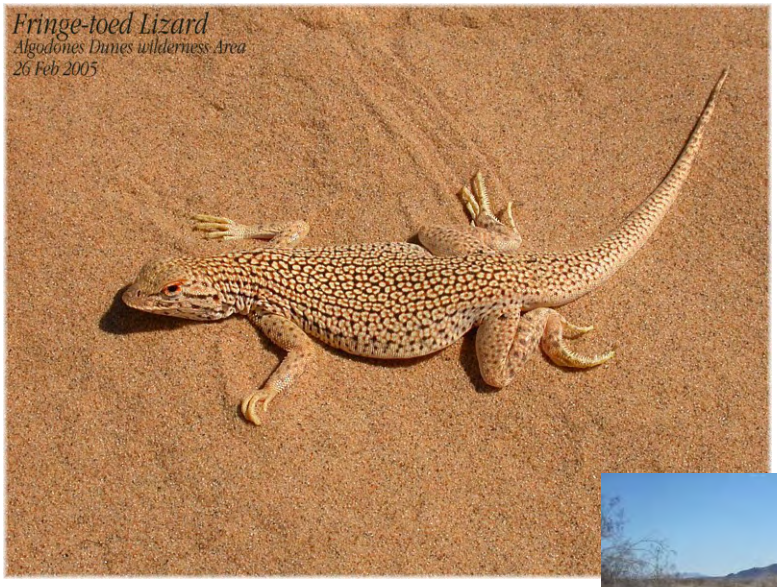

Figure 1. Fringe Toed Lizard showing its preferred habitat of fine, loose sand. Source: Southwest Images.

Figure 2. Potential FTL habitat showing 'plump', vegetated dunes connected by relatively deep, loose sand sheets with active sand movement.

Figure 3. Deflated former vegetated dune showing remnants of eroding dune under creosote bushes surrounded by shallow, compacted sand. This habitat does not support FTL.

Figure 4. Sparse sand on an alluvial fan area away from a major wash (note photos are not from Genesis – shown to illustrate the concept)

Figure 5. Much sandier conditions than Figure 4 in a large wash complex indicating sand transport from the channel to the surrounding alluvial fan. (Note photos are not from Genesis – shown to illustrate the concept.)

Sand Transport by Alluvial Fan Washes

In addition to the regional wind transport corridor sand can also be transported locally by washes. These carry sediment from upstream and distribute it on the alluvial fan where it is available to wind transport, creating smaller sand corridors around the main washes. The large wash complex that passes east of the solar arrays and is crossed by the laterals likely functions in this way.

Disrupting the drainage pattern (for example by channelizing the washes in hydraulically-efficient concrete channels deep below the fan surface) is likely to move sediment downstream at the expense of the surrounding habitat corridor. (The area where the channel discharges may however benefit from greater-than-before sand delivery.)

Description of the Genesis Project Sites

I visited the Genesis project site on January 12th 2010. Conditions on January 12th were warm and dry, with no recent rain. I visited the area of active sand dunes in the Wiley Wells Rest Stop where the proposed lateral meet I10, traversed the Chuckwalla Valley sand transportation corridor, hiked in to the western boundary of the property and hiked a loop of approximately 3 miles in the proposed western solar array area. On a subsequent visit to the Palen project site located 12 miles west of Genesis I visited a large ephemeral wash that passed under I10 to assess the effects of concentrating several small washes into a single channel, as a reference condition for potential site drainage approaches on Genesis.

The site is located on an alluvial fan that drains from north to south towards Ford Dry Lake. The average gradient is about 0.5 degree. There are a series of different geological units that underlay the site and its laterals (shown in Figure 4 below). The boundaries between these areas are somewhat interwoven and gradual, but can be seen on aerial photos and in the field. In addition there are a series of smaller land units that cut across the major land units.

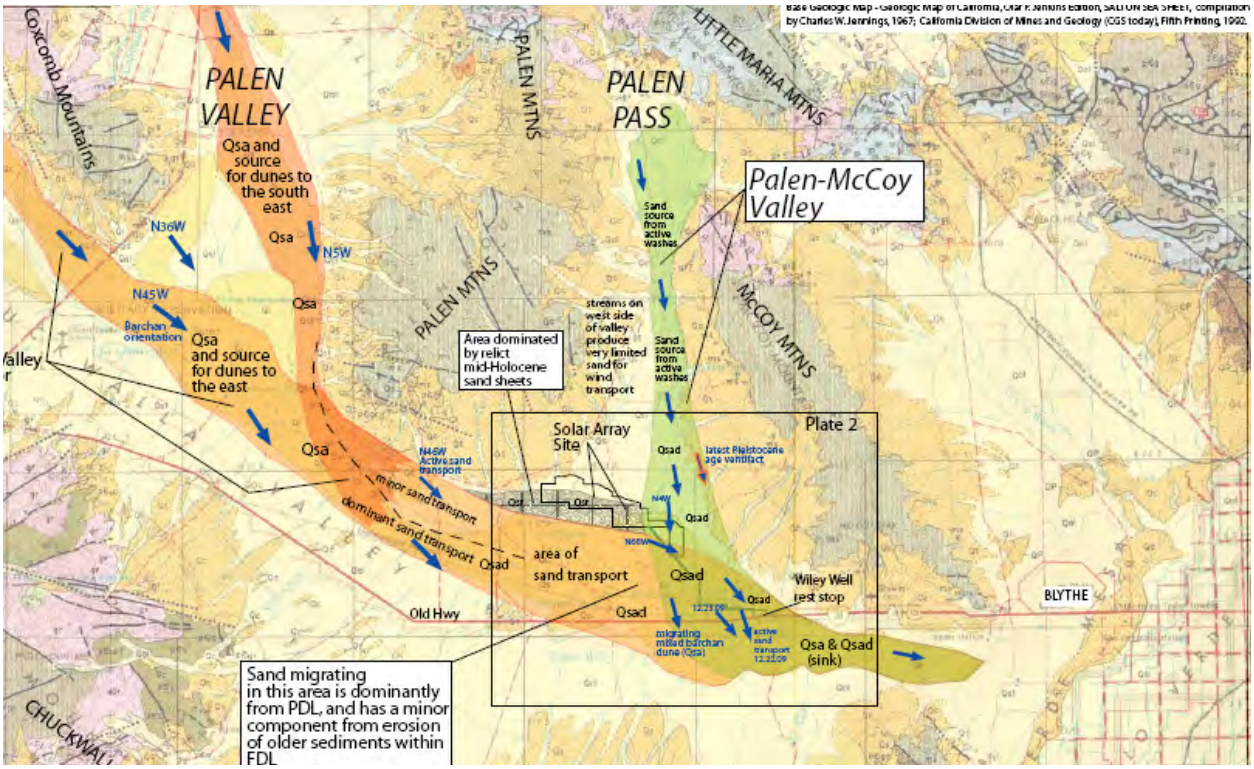

Figure 4. Generalized Sand Migration Corridors, Worley Parsons 2010.

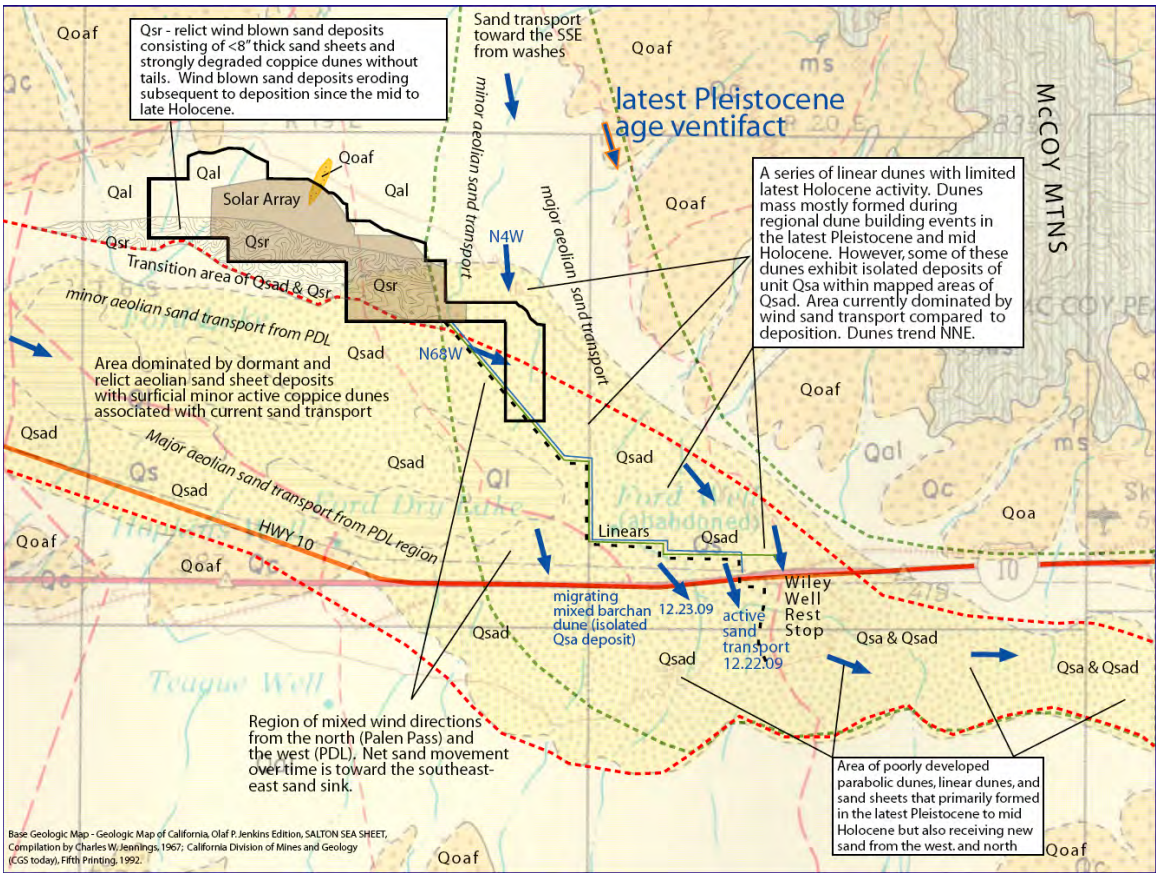

Figure 5. Detail of sand migration corridor and geological units around project site, Plate 2, Worley Parsons 2010.

Major Land Units

I visited as many of the main land types mapped by Worley Parsons as possible to assess their geomorphic condition and the accuracy with which they were delineated. These are described below. In each case I start with the description provided by Worley Parsons (in italics) and add my own comments and photos below (plain text).

<u>Qal Quaternary Alluvium</u>

Description (from Worley Parsons, 2010)

Quaternary Alluvium consisting of fluvial distal fan deposits. Within the site these deposits are composed of fine to very coarse sand and small gravel, well bedded and generally only 6-inches to 2-feet thick. Soil horizons indicate that the deposits are between 1ky to approximately 8 ky old.

These areas are found on the upper (north) area of the project site, and make up much of the footprint for the proposed western solar array. They cover some of the northern portion of the proposed eastern solar

array. The presence of coarse alluvial gravels with desert varnish (see figures 6 and 7) and established soil horizons is an indicator that this surface has been relatively stable for several thousand years. This is because desert varnish and soil horizons take thousands of years to develop, so that if the surface was subject to more frequent erosion or deposition these features would either be buried or eroded rather than found on the surface. This implies that sand deposition is not taking place, and that the fluvial channels found here are in equilibrium (pass the sediment they receive from upstream, but neither erode or deposit in significant amounts).

Figure 6. Alluvium surface. Person in photo is pointing into the northwest corner of the project site from the west.

Figure 7. Close up of alluvium surface showing lag (residual deposit) of coarse gravel overlaying sand, with desert varnish (black coloration of gravel).

Qsr Relict Sand Sheets and Dunes

Description (from Worley Parsons, 2010)

Area containing relict wind blown sand sheet and degrading coppice dune sediments with very limited to no active sand transport. These deposits are typically stabilized with grasses, creosote and wind generated very coarse sand to small gravel abrasion lag deposits. The youngest members of this unit exhibit near surface soil Bw soil horizons with an estimated minimum age of 1000 years.

Figure 8. Relict sand sheets and deflated vegetated dunes in the southern part of the project footprint.

This is the predominant land unit under the proposed eastern solar array, and along the southern edge of the western array. This surface is a transitional unit between the Qal and the Qsad, with thin sheets of sand and degraded vegetated dunes but little evidence of active sand transport or storage. As with the Qal this unit has soils that indicate relative stability over the order of thousands of years, but has not formed an alluvial lag surface. This unit provides little or no habitat for FTL.

Qsad Stabilized Dunes

Description (from Worley Parsons, 2010)

Area dominated by latest Pleistocene to late Holocene stabilized dunes but remain regions of current sand transport with isolated areas exhibiting wind blown sand deposition (sand sheets, coppice and avalanche face of linear dunes). Thus, many areas within mapped Qsad do not exhibit loose sand on the surface and fall under the definition of unit Qsr. Small isolated areas of mapped Qsad also fall under the definition of unit Qsa.

Figure 9. Vegetated sand dunes in the sand transportation corridor mostly south of the project footprint, with close up of ground surface.

This unit makes up the area south of the main project boundary. The southwest corner of the eastern solar array intrudes into this unit by about 1,500 – 2,000 feet. This unit appears suitable for FTL habitat, and has evidence of active wind transport of sand (for example 'plumper' vegetated dunes, coppice dunes indicating active sand movement, deeper sheets of sand with ripples). This area is part of the Chuckwalla Valley sand transport corridor.

Qsa Active Quaternary Sand Areas

Description (from Worley Parsons, 2010)

Areas of reasonable size to map that receive sufficient active wind blown sand migration to maintain dune system. Dunes within Qsa areas generally exhibit free avalanche faces and surficial loose sand. Qsa areas may exhibit active sand sheets (deposits from migrating ripples) and coppice dunes with tails (deposits associated with vegetation). Qsa areas are primarily located in Palen [Ford?] *Dry Lake and east of Wiley Well road. Limited areas of Qsa occur east of the Genesis Power site.*

Figure 10. Active sand dunes north of Wiley Wells Rest Stop. The laterals will pass through and alongside patches of similar conditions along their course.

Figure 11. Coppice dunes indicating active sand transport near Wiley Wells Rest Stop.

The Qsa formation is active sand associated with the Palen – McCoy Valley sand transport corridor and the large washes on the eastern side of the project. These routes deliver large quantities of sand to the east of the project area and supports active migrating sand dunes. The laterals will need to be designed to avoid blocking wind transport south through this unit, since blocking this corridor would .

Qoaf Fine Alluvial Deposits
Description (from Worley Parsons, 2010)
Latest Pleistocene distal fan deposits. They are composed silty fine to very coarse sand and minor small gravel. The unit is generally within 1 to 2 feet of the surface within the Project Solar Array site and exhibits a pedogenic soil horizon sequence that is likely a minimum of latest Pleistocene age.

Note – I did not visit any Qoaf sites in the field. It makes up a very small area in the north edge of the western solar array. It is possible that this unit supports FTL.

Drainage Features
Overlain on the major landscape units there are a series of drainage lines that cross the site from north to south. The vast majority of these are minor washes that appear to be distributary channels or that capture local flow in the fan surface. On my field visit I encountered only one well defined channel (west of the project footprint). It appears that there are much larger well defined channels that run east of the proposed eastern solar array and through the laterals corridor.

Minor Washes
More than a hundred minor washes cross the site from north to south. These channels are typically very subtle, with a width of 2-10 feet and a depth of 3-9 inches. They are found approximately every 100 feet when traversing along a contour on the mid fan surface. The presence of these channels in areas of desert varnish and soil horizons suggests that these channels are relatively stable (do not cut and fill vertically). It is likely that in the Qsr unit the channels avulse laterally across the surface without cutting vertically. The channels do not appear to transport much sediment, as evidenced by their shallow depth and the absence of scour features.

Figure 12. Typical minor ephemeral wash in the proposed western solar array.

Figure 13. Typical minor wash in the proposed western solar array.

Major ephemeral washes

Figure 14. Larger wash in western side of property showing west bank.

Figure 15. Larger wash with west bank out of shot on right, and east bank visible on upper left of photo.

A single larger wash was encountered that passes within the project boundary but west of the proposed western solar array. This was looked at as a potential reference condition for the washes that passes through the eastern side of the site, though these washes appear from aerial photos to be larger, and to carry more sand. The larger washes have braided channels that show more evidence of active sediment transport, with well defined banks and some sand in the channel bottom. Large washes visited elsewhere in the Chuckwalla Valley show evidence of wind-blown sand and vegetated sand dunes in a corridor around the channels, though this could not be confirmed in the Genesis project as the eastern washes were not visited.

Discussion of Mapping Accuracy and Interpretation

During the site visit I inspected most of the geologic units with Dr. Miles Kenney, who conducted the mapping and field investigation for Worley Parsons. I visited representative units of Qal and Qsr (which make up most of the proposed array footprints) and crossed the Qsad/Chuckwalla sand transport corridor from south to north in the western part of the project. I visited an area of Qsa at the south end of the laterals. I did not visit the western edge of the Palen-McCoy wind corridor and the large washes in this area. Defining the boundaries of the wind corridors is somewhat subjective since they do not have sharp edges and different researchers will likely place them in slightly different locations. The NECO land classification map provides a potential method of cross checking the boundaries, since it classifies areas of 'sand covered plains' and 'undifferentiated sand dunes' that tend to conform to wind transport corridors in other places where they have been mapped. The NECO classification (see Figure 16) is very similar to the Worley Parsons classification for the northern edge of the Chuckwalla corridor within the project area, with the NECO classification placing the corridor approximately 500 feet further within the project footprint. Given the subtleties of the boundary this difference is very minor. The NECO classification for the western edge of the Palen-McCoy corridor places it further east than Worley Parsons, reducing the area within the project footprint.

Based on the field visit, review of the applicant's reports, review of aerial photos and of the NECO classification I found the applicant's classification and interpretation to be reasonable and was satisfied with the evidence used to indicate the location and geomorphic stability of the different units. My only area of potential disagreement is over the importance of the large wash that crosses the project in the eastern array (discussed under the impacts section).

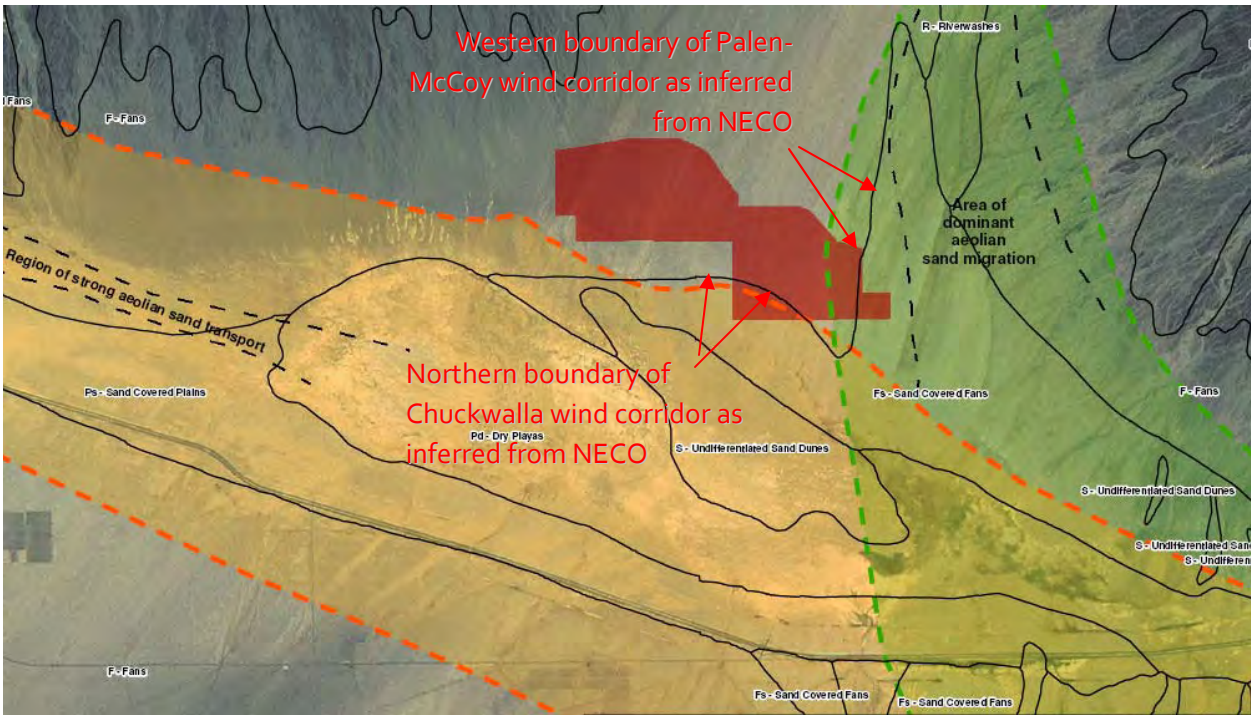

Figure 16. Detail of NECO land classifications superimposed over Worley Parsons mapping (Sources: Helix, 2010 and Plate 5, Worley Parsons, 2010). Note black comments and all dashed lines are from Worley Parsons, black text with white shadow and black line boundaries are from NECO classification, and red text and red arrows are from PWA.

Potential Project Impacts

Impacts to the Qal

The Qal is a relatively stable surface, with little evidence of active sand transport. The presence of the gravel with desert pavement and varnish is evidence that this surface is also stable from a fluvial perspective (i.e. that the small channels, while potentially prone to lateral migration and avulsion across the stable surface, do not tend to cut vertically into the surface. From a geomorphic perspective construction of the project on the Qal area should have relatively little off site impact. Because there is little sediment transport occurring on this surface construction of the proposed project does not appear likely to disrupt the movement of sediment to habitat areas elsewhere.

Potential Avoidance and Mitigation of Impacts to the Qal Area

None proposed on geomorphic grounds.

Impacts to the Qsr

The Qsr is a relatively stable surface, with little evidence of active sand transport. The presence of the soil horizons is evidence that this surface is also stable from a fluvial perspective (i.e. that the small channels, while laterally active, do not tend to downcut or fill vertically). From a geomorphic perspective construction of the project on the Qal area should have relatively little off site impact. Because there is little sediment transport occurring on this surface construction of the proposed project does not appear likely to disrupt the movement of sediment to habitat areas elsewhere.

Potential Avoidance and Mitigation of Impacts to the Qsr Area

None proposed on geomorphic grounds.

Impacts to the Qsad/Chuckwalla Wind Transport Corridor

The western array avoids the Chuckwalla sand transport corridor as mapped by both Worley Parsons and NECO. The eastern array intrudes into the corridor by approximately 1,600 feet at a point where the corridor is 24,000 feet wide based on Worley Parsons. This intrusion represents about 7% of the Chuckwalla sand corridor width. Using the NECO classification the intrusion is 12% (largely due to NECO mapping the corridor as thinner than Worley Parsons rather than big differences in the boundary at the project site). The part of the corridor that is impacted does not appear to be the most active with regard to sediment transport rates based on the amount of sand in storage on the ground, evidence for sand transport from ripples and coppice dunes etc. Conservatively assuming that sediment transport rates in the area impacted are half those in the central corridor, and taking the more conservative NECO corridor classification, the reduction in sediment transport capacity is less than 6%, and likely lower. This does not represent a significant impact on sediment transport processes for the corridor as a whole, though

it does present a moderate off-site impact immediately downwind of the project site. Based on the degree of intrusion into the corridor and the length of the intrusion I estimated an area of 157 acres of sand covered plains (Qsad) that would be impacted. This area is expected to experience deflation of existing sand areas and armoring of substrate (see Figure 17).

Potential Avoidance and Mitigation of Impacts to the Qsad/Chuckwalla Wind Transport Corridor

It is recommended that the project minimize encroachment of the main footprint into the Qsad/sand transport corridor. Mitigation to compensate for 157 acres of vegetated sand dune is proposed for the current project footprint.

Impacts to the Palen-McCoy Wind Transport Corridor

Based on the applicant's report the eastern solar array intrudes into the Palen-McCoy corridor by approximately 2,800 feet at a point where the corridor is 15,000 feet wide (cutting off 19% of the corridor). Based on the NECO mapping the intrusion is smaller (1,700 feet) but the undisturbed corridor is also narrower (8,300 feet), also resulting in a 20% reduction in width. Although the project cuts off a large area of sand corridor, there is good evidence to suggest that most sand transport takes place east of this zone (outside the project footprint, though within the area crossed by the laterals). Plates 14 and 15 of the Worley Parsons report show field conditions in the impacted area (Plate 14) and further east (Plate 15), providing evidence of much greater rates of sand transport to the east of the project footprint. In the absence of quantitative data and conservatively assuming that the rate of sediment transport is half as much in the outer corridor as it is in the inner corridor the intrusion probably represents less than a 10% reduction in sand transport. Based on the photos it is feasible that the true rate of sediment transport in the impacted area may be significantly less than this. However, although the magnitude of impact to the entire wind transport corridor is relatively low, the area of off-site impacts immediately downwind of the project is large: the lee area downwind of the project that is likely to experience sand depletion is 309 acres (see Figure 17). Since there is 13 acres of overlap from both wind shadows the combined area impacted by intrusions into both corridors is 453 acres. This area would be expected to experience deflation (loss of sand from the existing vegetated dunes over time) and armoring (coarsening of the sand and gravel as fine sand is eroded by the wind).

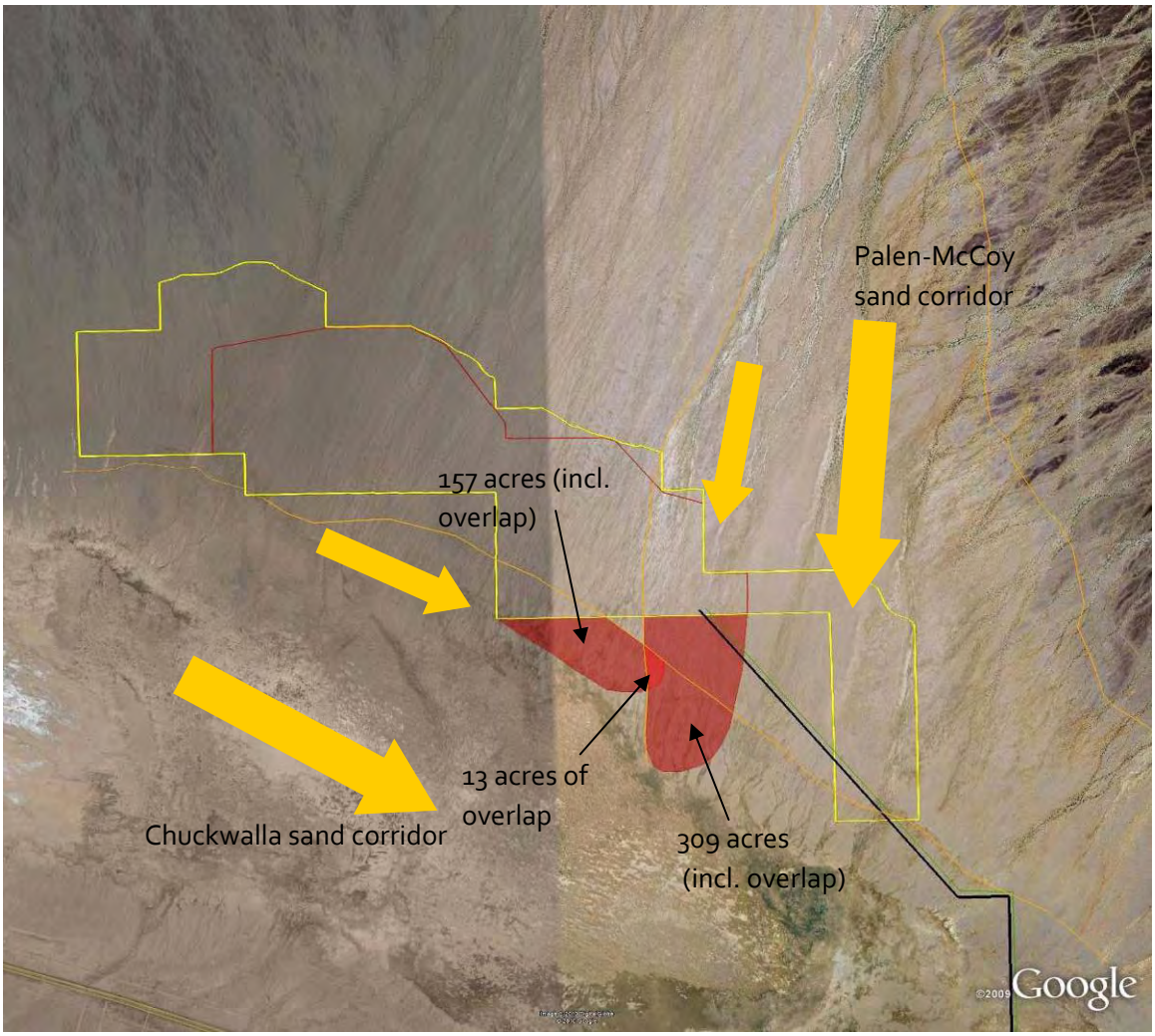

Figure 17. Zones of moderate impact to the wind transport corridor and vegetated sand dunes from encroachment of the project into the Chuckwalla and Palen-McCoy sand corridors. Major wind transport zones shown with large gold arrows, less significant wind transport zones shown with small gold arrows.

Impacts to the Qsa

The Qsa is the active area of sand dunes supplied by wind and water transport from the Palen – McCoy Valley sand corridor. This corridor supplies biologically-significant sand dune habitat downwind, and preserving sand transport is important. This area is crossed by the laterals near Wiley Wells Rest Stop.

Potential Avoidance and Mitigation of Impacts to the Qsa Area

The main project footprint should avoid this area completely since large scale obstruction of this unit would be hard or impossible to mitigate for. The project should be able to avoid or minimize

impacts created by the laterals within this zone by avoiding creating barriers to wind and water transport. Most wind-borne transport of sand occurs within 3 feet of the ground, so infrastructure should be constructed flush with the surrounding ground surface and without ground level obstructions. Power pylons should not pose a significant problem due to their small surface area at ground level. Water and gas pipelines should be buried below ground. Road surfaces should be flush with the ground surface. There should not be drainage ditches running perpendicular to the wind direction (approximately north-south in the northern section of the lateral route, shifting to west-east in the southern area). Wind fences should not be permanently erected in the lateral area. It is understood that temporary wind fences are proposed for during construction, but not permanently. The duration that wind fences are used for should be kept to the minimum, since downwind impacts may be felt within 1-2 years.

Drainage Plan

The drainage plan for Genesis involves constructing an interceptor channel around the north project boundary, collecting flows in constructed channels and passing them around the project for discharge onto the alluvial fan downslope. In order to assess whether such a plan is likely to cause impacts I visited I10 to look at a drainage that passes through the freeway and back on to the alluvial fan surface 12 miles west of Genesis. The pattern of major and minor washes may be an analogue for conditions following construction of a solar array and drainage plan at Genesis.

I10 as a Reference Site for the Genesis Drainage Plan

Numerous small ephemeral channels heading towards I10 have been intercepted and concentrated into two drainage channels. The westerly channel intercepts a 1.6 mile width of upper alluvial fan, and the easterly channel intercepts 1.9 miles of fan. The flow is collected into a single engineered earth channel then passed under I10 in a concrete trapezoidal channel and discharged back onto the fan surface downslope without any dissipation. The applicant for Genesis proposes an interceptor channel that collects flow from the ephemeral washes, routes it around the solar arrays, and discharges flow back onto the fan below, but with a more controlled treatment of flows at the discharge point consisting of a series of structures designed to spread flow out in small volumes across a wide fan area. Thus I10 might be viewed as a ‘worst case’ scenario for release of concentrated flows. Offsetting this, the discharge point on I10 is in coarse alluvial gravels, which have mitigated some of the impacts of uncontrolled flow.

I visited the easterly collector channel and walked it for a distance of 1,000 feet onto the mid fan surface. The collector channel that ran parallel with I10, though artificial, had a somewhat natural appearance and function (earth banks and bed, apparently stable, no excessive erosion or deposition, some typical wash vegetation present in the channel). The wash formed a slightly incised single channel immediately downstream of I10 where it passed from the concrete channel onto the mid fan (vertical banks

approximately 4 feet high, with a width of 50 feet). However, incision ceased within a few hundred feet of I10 and the channel widened and formed braids. The channel showed evidence of higher energy flows in the presence of scour features and very coarse bed material (coarse gravel and cobble sized sediment). However, the gravel and cobble bed appeared to be a natural armor layer that formed from selective scour of the finer sand, forming a protective layer. Within a few hundred feet of I10 the wash supported typical large wash morphology and vegetation, and appeared to be depositing the sand eroded upstream along its margins, creating good quality sandy habitat.

Figure 18. Interceptor channel running parallel with I10 (flow towards viewer)

Figure 19. Close up of vegetation in the constructed interceptor channel

Figure 20. Interceptor channel passes under I10 (flow away from viewer)

Figure 21. Incised and scoured channel immediately downstream of I10. Bank detail shown in next photo.

Figure 22. Channel bank is 4 feet high. Gravel in the fan provides armor that stabilizes the channel.

Figure 23. Channel widens and becomes less incised 300 feet downstream of I10

Figure 24. Channel widens and becomes less incised 800 feet downstream of I10

Based on this reconnaissance-level assessment it seems likely that it would be feasible to capture the minor washes at the Genesis project boundary, concentrate them in earth-lined channels and dissipate them back on to the fan surface downstream provided that:

- The watershed area of the captured channels is similar to that of the reference reaches assessed
- The fan gradient at the discharge point is similar or less
- The sediment at discharge point has some coarse gravel and cobble to form an armor (or this is imported for a few hundred feet)

The first two assumptions are likely to be correct, though the third assumption is likely not since sediment tends to be finer downfan and the proposed discharge locations may be more prone to scour than the area near I10. If this is the case cobble and gravel would need to be added to provide an armor layer.

Assuming these conditions to be the case it appears that it is feasible to bring water around the Genesis site in relatively natural channels that may provide habitat and migration value. It also appears likely that water may be discharged back on to the fan surface with minimal impact, provided that there is a cobble supply to armor the first few hundred feet of discharge. There is potential to develop the drainage channels using more natural channel morphology than currently proposed, to provide biological functions and act as wildlife corridors.

Discussion of Project Alternatives

The Reduced Acreage Alternative (shown in Figure 25) was assessed for its potential geomorphic impacts. The alternative removes the proposed eastern solar array from the project. Since the main geomorphic impacts identified in this report are associated with the eastern solar array this alternative would have lower impacts, with no impact on the Chuckwalla and Palen-McCoy sand corridors or on the eastern wash complex.

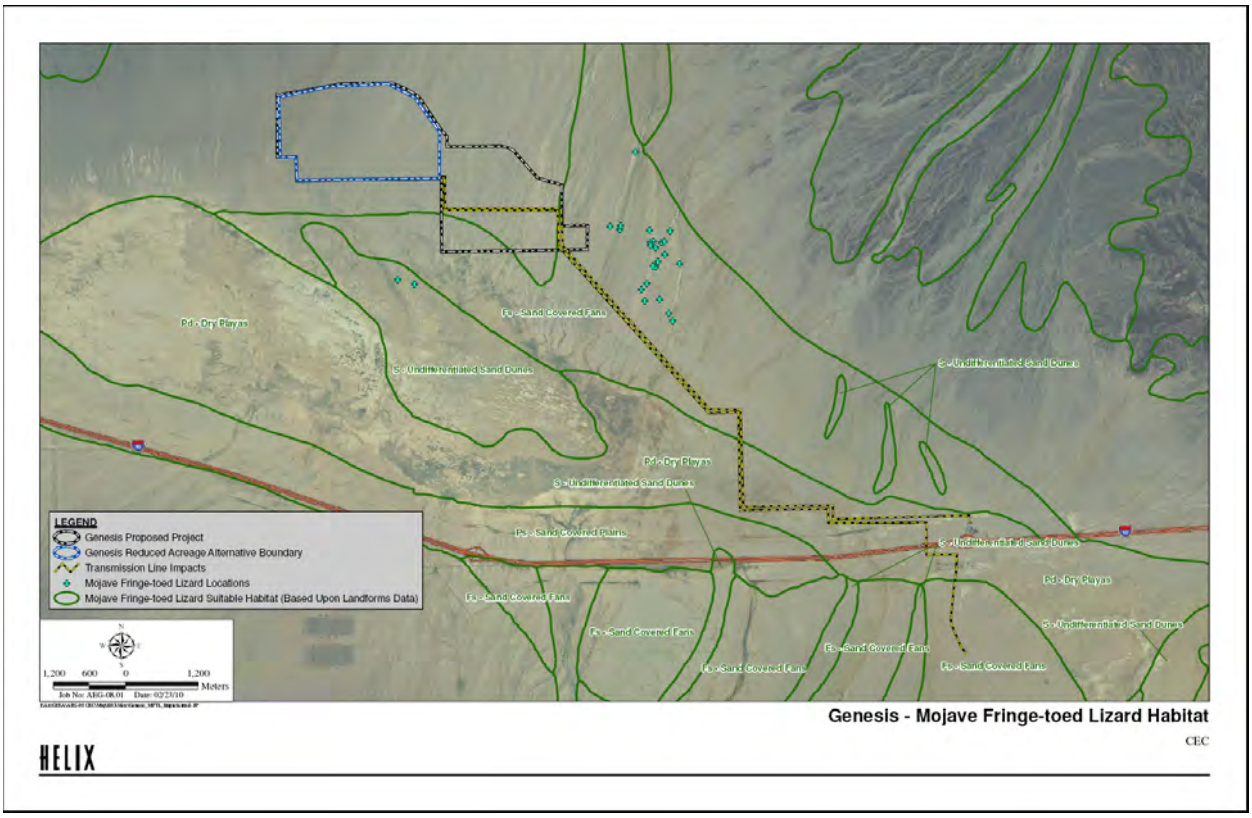

Figure 25. Reduced acreage alternative (source: Helix, 2010)

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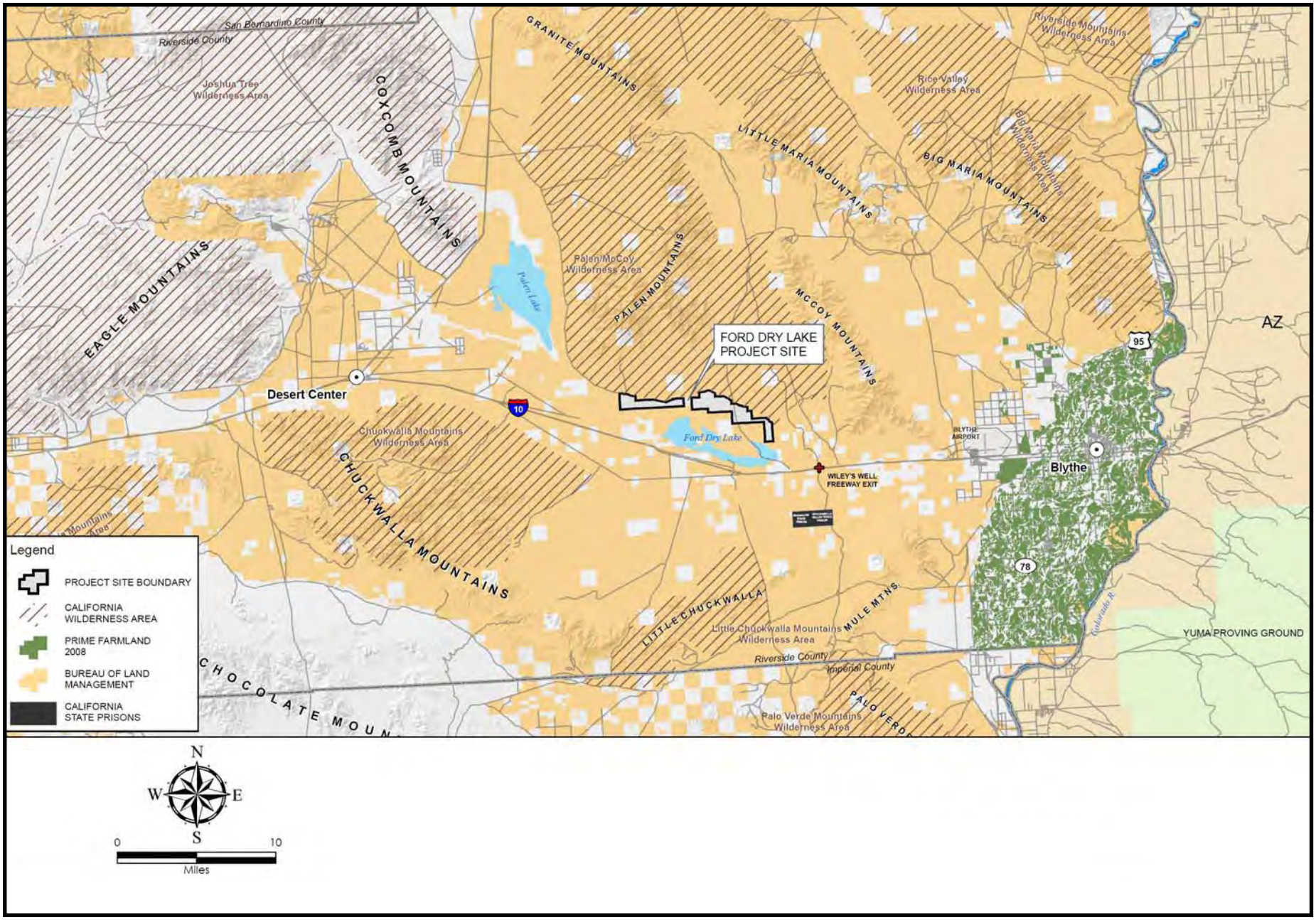
Turner, F.B., Weaver, D.C. and Rorabaugh, J.C. Effects of reduction in windblown sand on the abundance of the Fringe_toed Lizard (*Uma inornata*) in the Coachella Valley, California. Copeia, 1984(2), pp. 370-378.

Worley Parsons. Aeolian transport evaluation and ancient shoreline delineation report, Genesis solar energy project, Riverside County, CA. February 5th 2010.

SOIL AND WATER - FIGURE 1

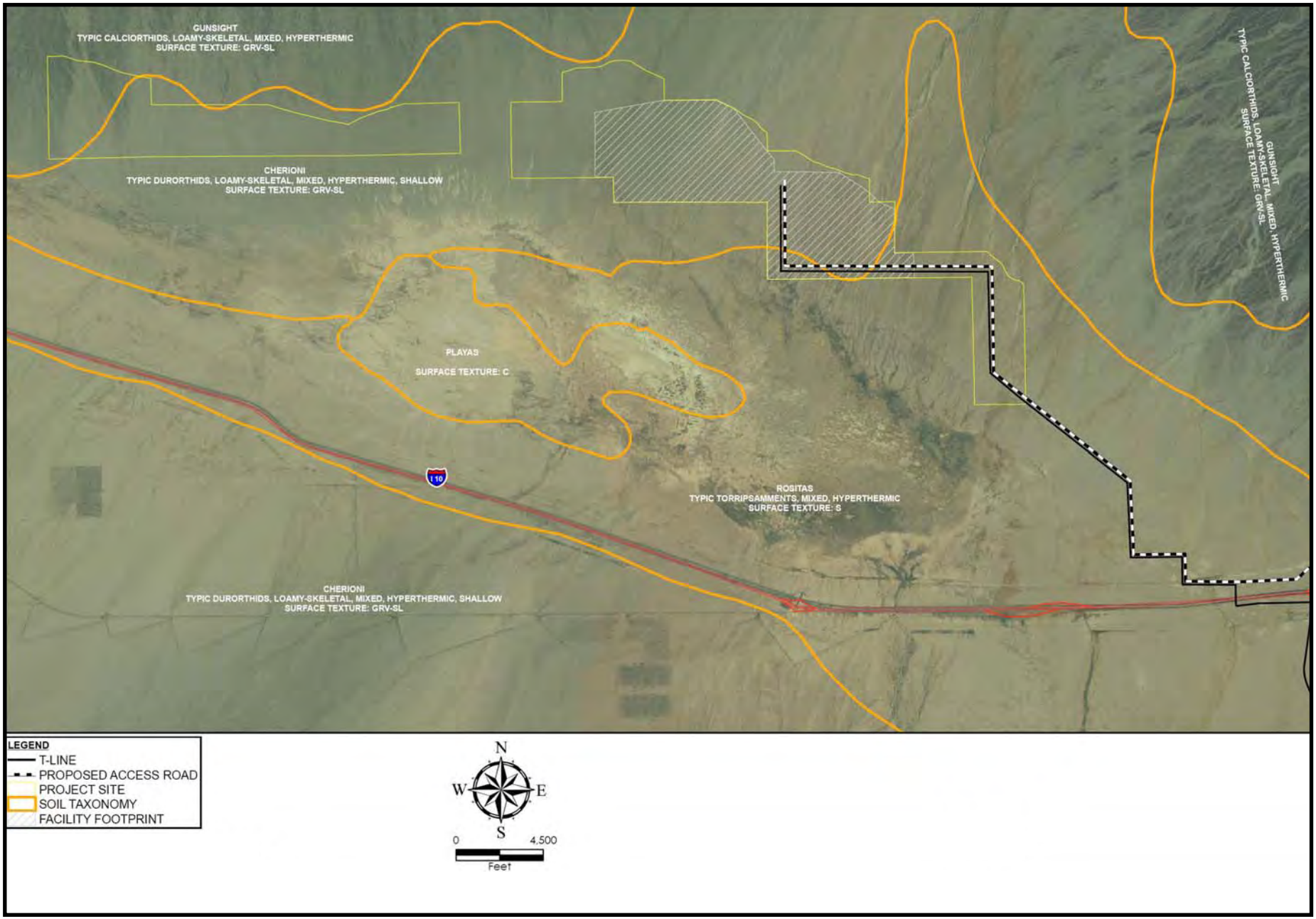
Genesis Solar Energy Project - Project Location Map



SOURCE: GSEP 2009f

SOIL AND WATER - FIGURE 2

Genesis Solar Energy Project - Soils Map

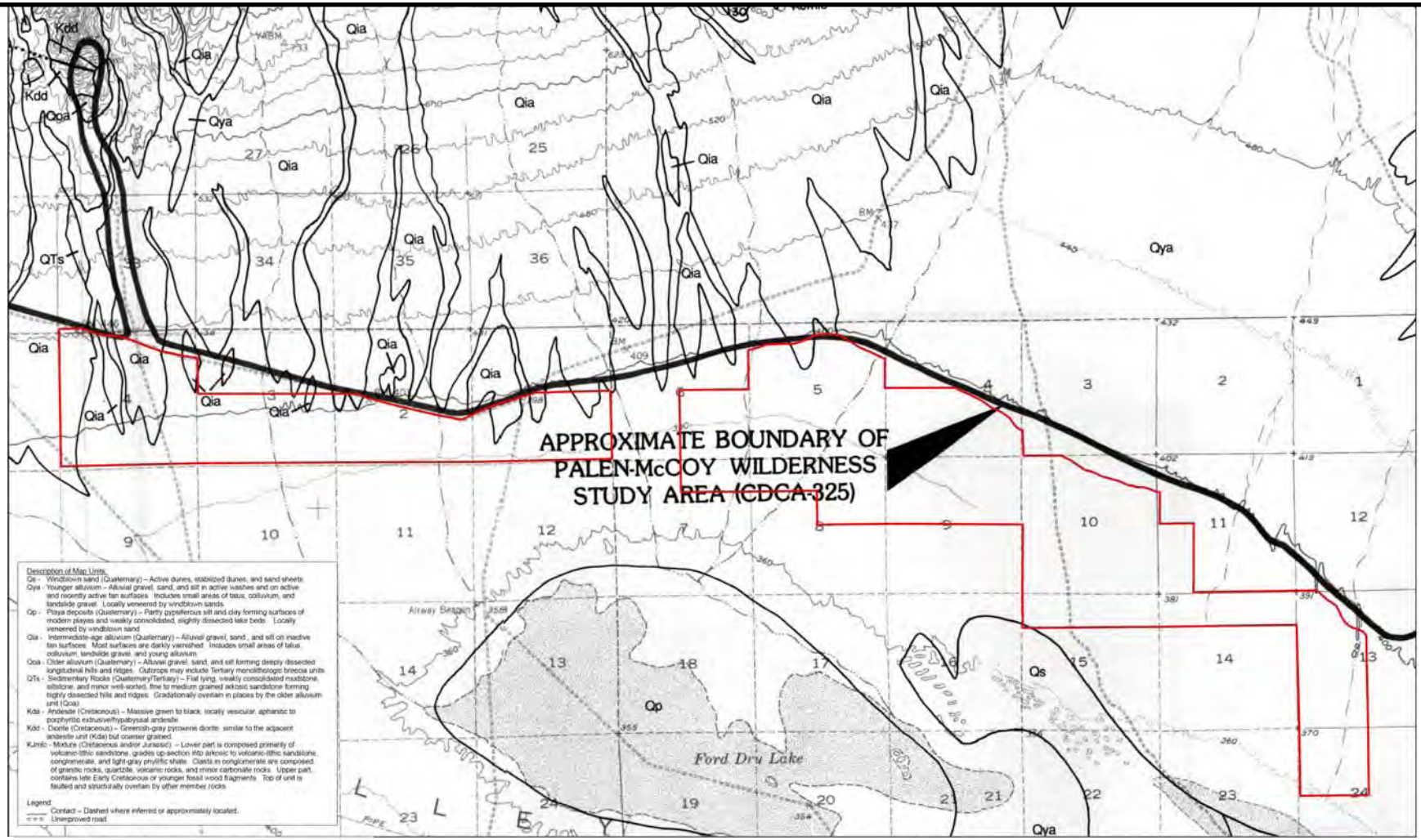


CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION, MARCH 2010

SOURCE: GSEP 2009a

SOIL AND WATER - FIGURE 3

Genesis Solar Energy Project - Regional Geologic Map

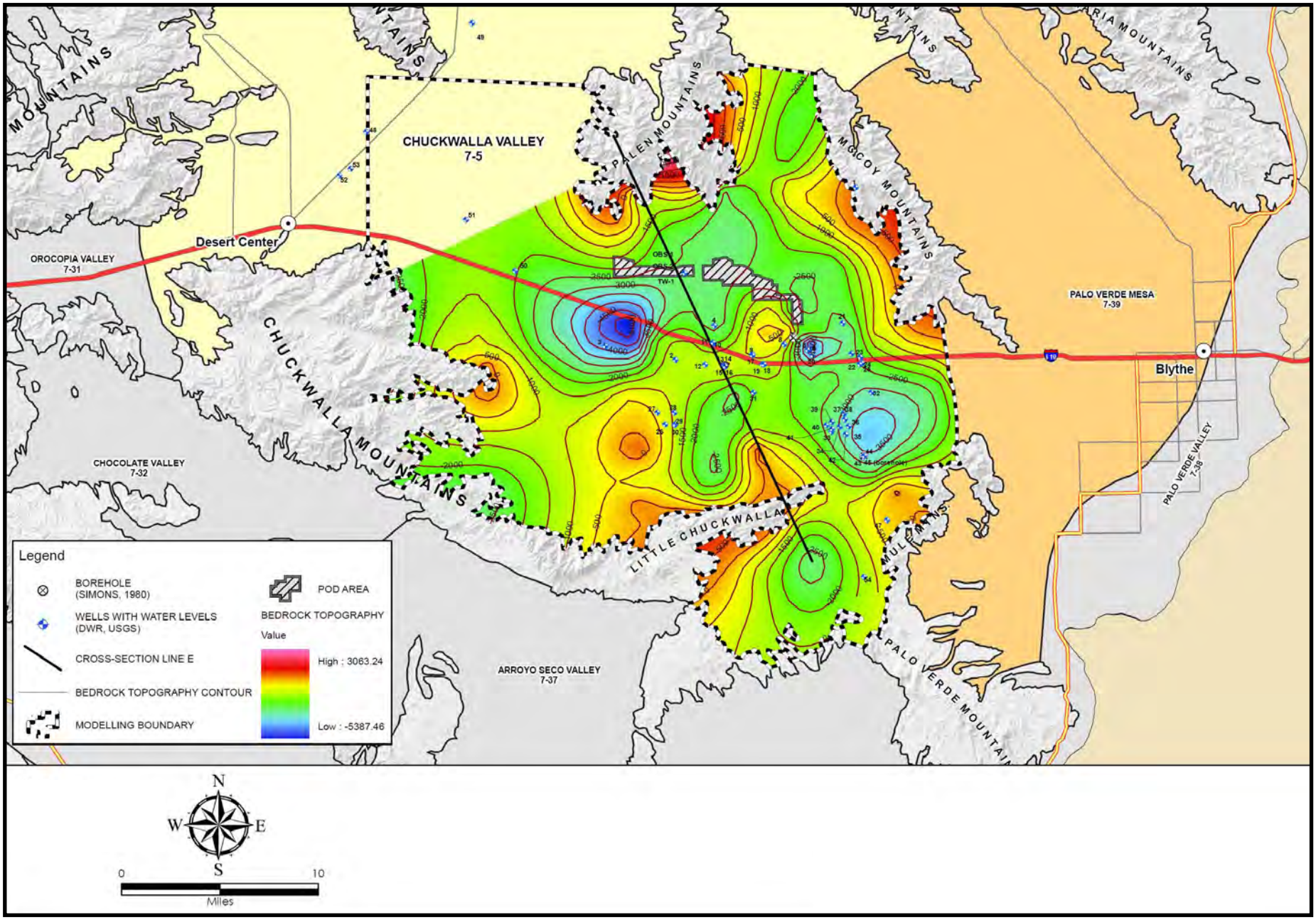


CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION, MARCH 2010

SOURCE: GSEP 2009f

SOIL AND WATER - FIGURE 4

Genesis Solar Energy Project - Chuckwalla Valley Groundwater Basin Bedrock Topography Map - Ford Dry Lake Area

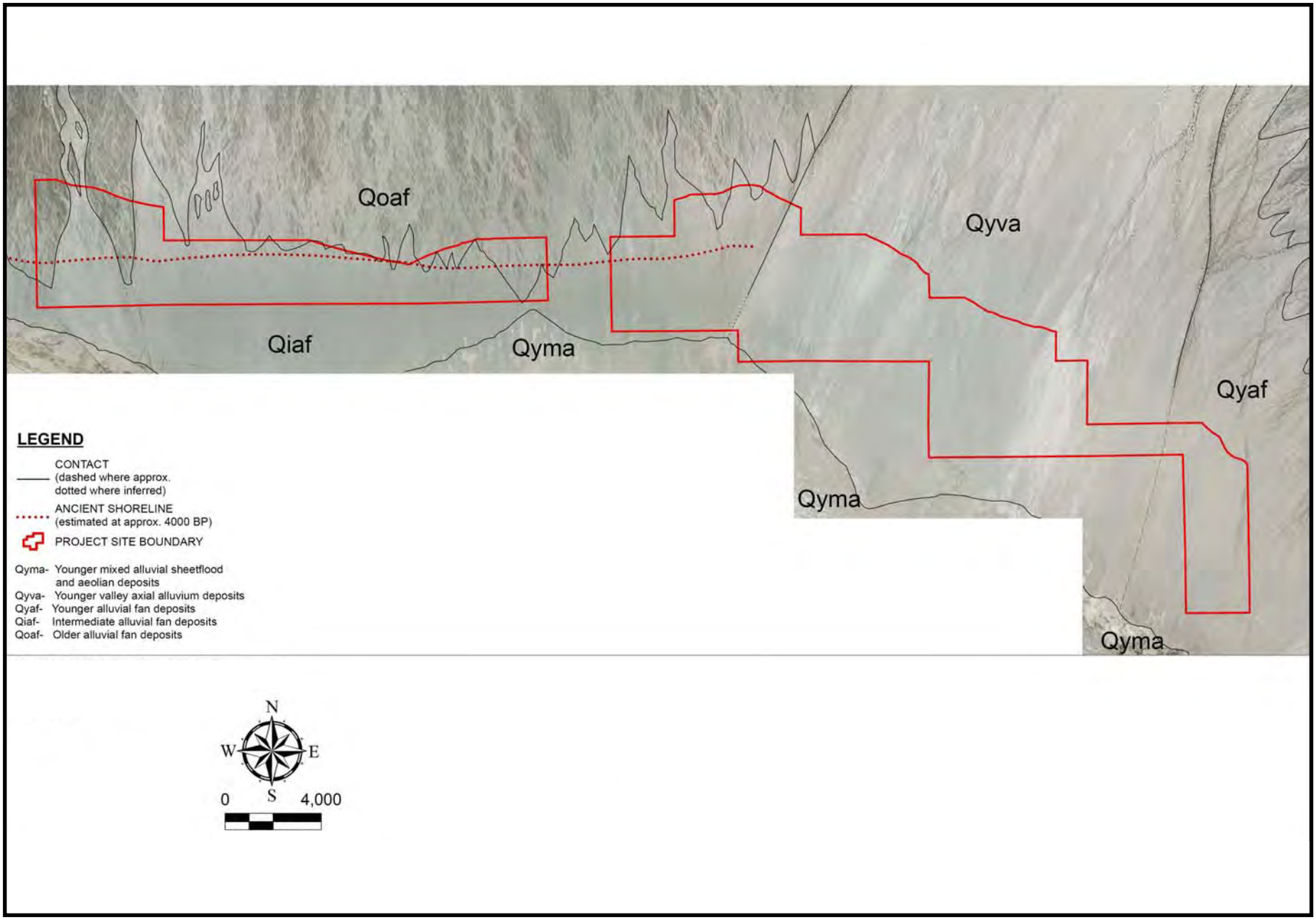


CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION, MARCH 2010

SOURCE: GSEP 2009f

SOIL AND WATER - FIGURE 5

Genesis Solar Energy Project - Local Geologic Map



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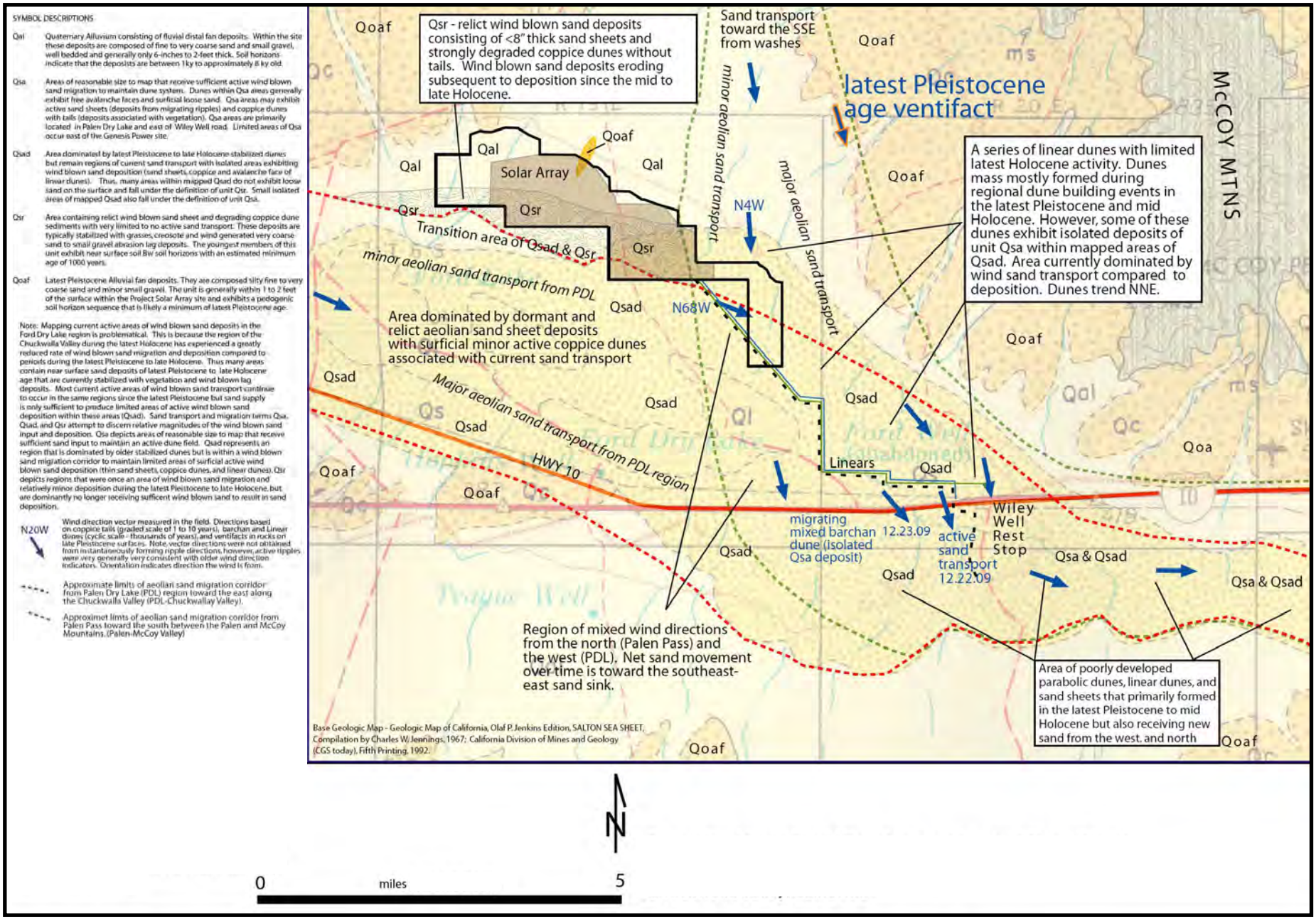
SOURCE: GSEP 2009a

SOIL AND WATER - FIGURE 6

Genesis Solar Energy Project - Generalized Local Sand Migration Corridors and Depositional Areas

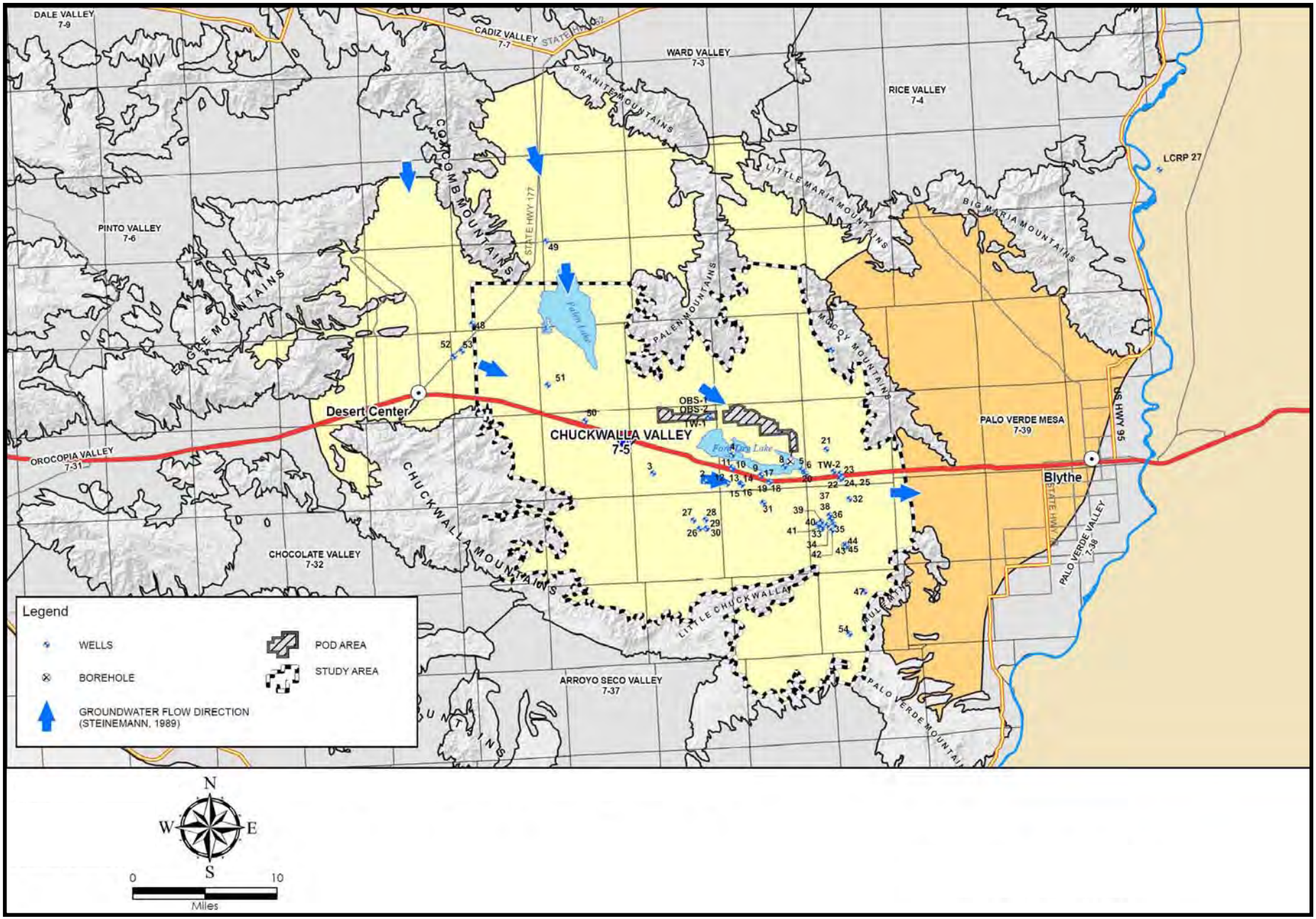


CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION, MARCH 2010

SOURCE: WPAR, 2010

SOIL AND WATER - FIGURE 7

Genesis Solar Energy Project - Hydrogeologic Setting



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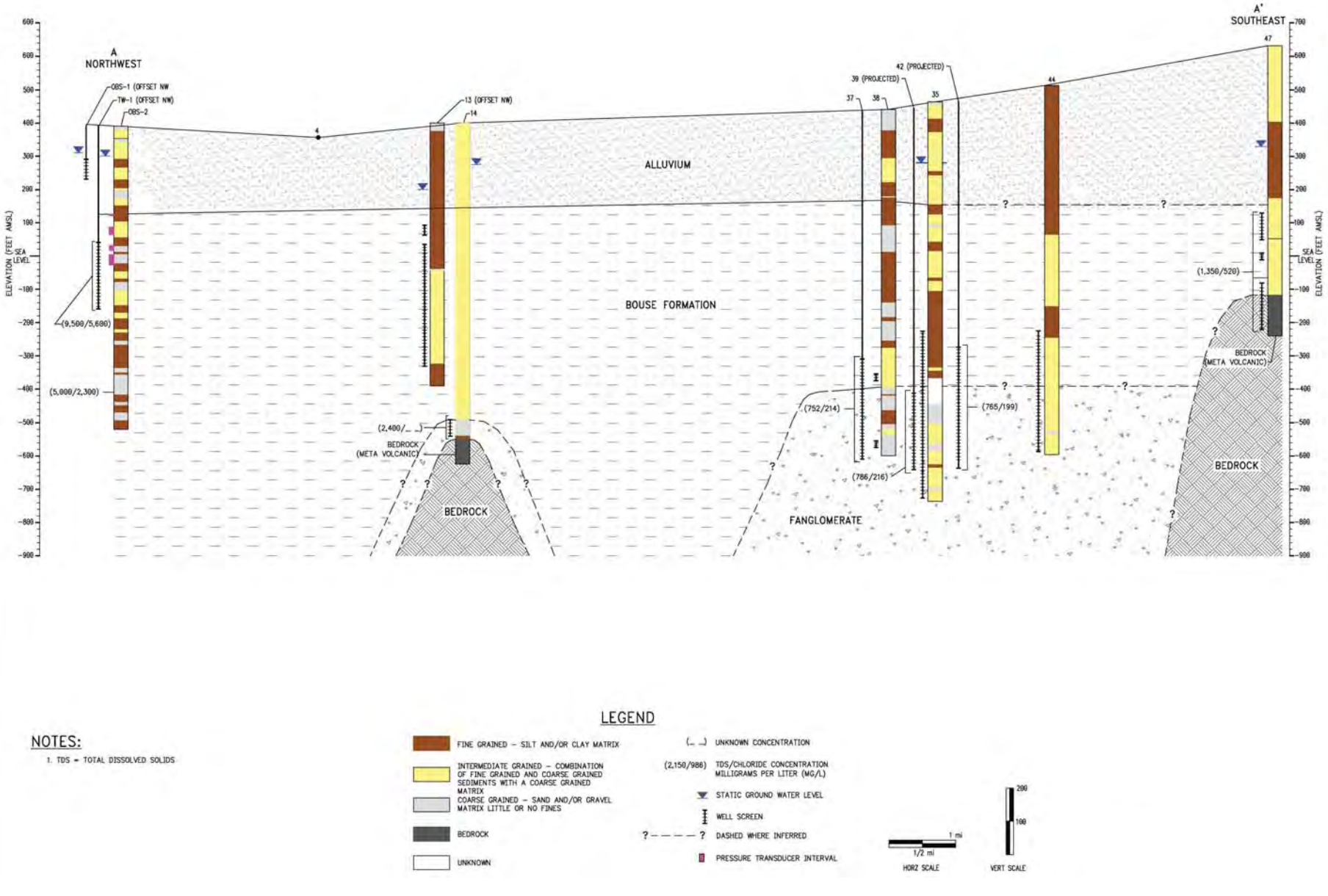
SOURCE: GSEP 2009f

SOIL AND WATER - FIGURE 8

Genesis Solar Energy Project - Hydrostratigraphic Cross-Section A-A'



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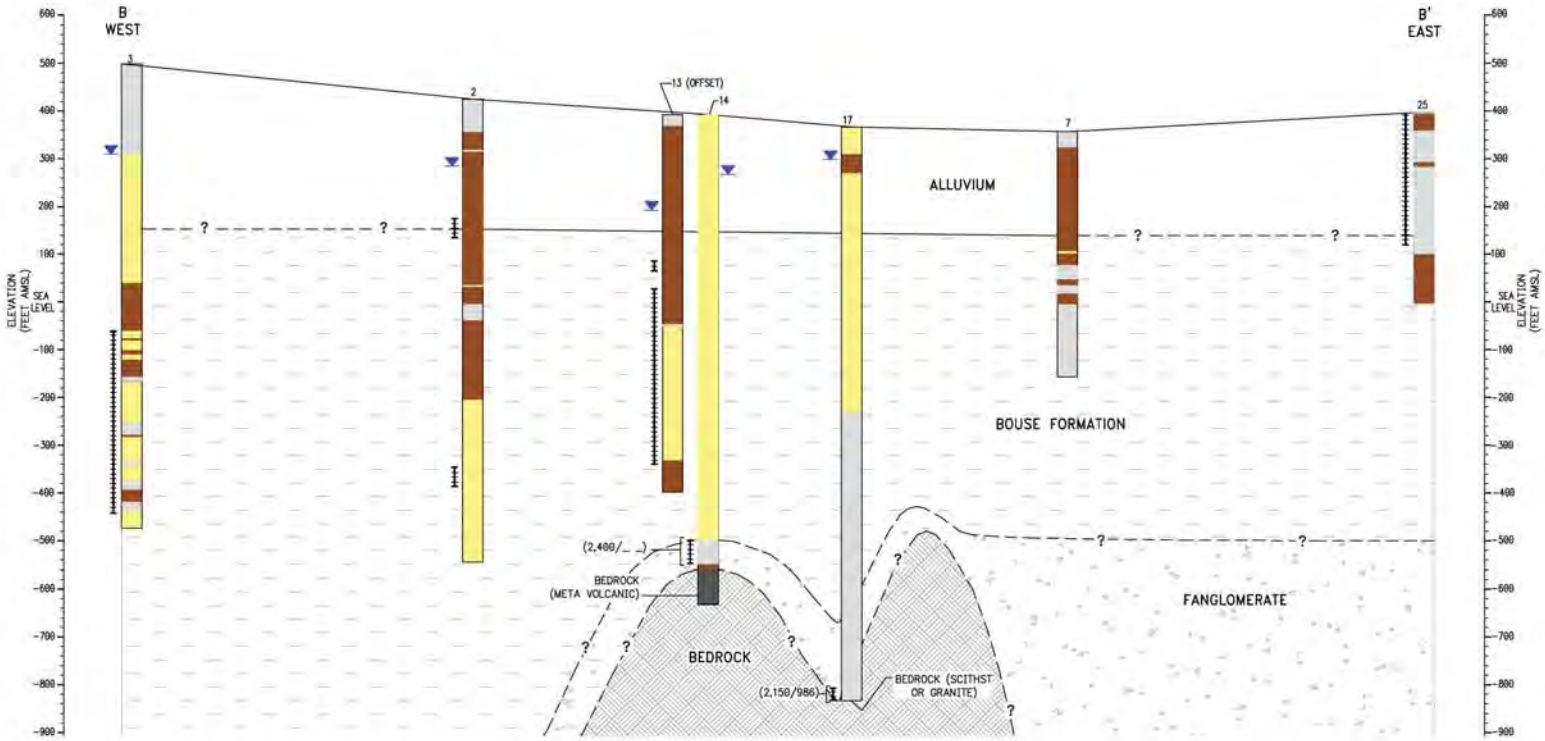
SOURCE: GSEP 2009f

SOIL AND WATER - FIGURE 9

Genesis Solar Energy Project - Hydrostratigraphic Cross-Section B-B'



NOTES:

1. TDS = TOTAL DISSOLVED SOLIDS

LEGEND

- FINE GRAINED – SILT AND/OR CLAY MATRIX
- INTERMEDIATE GRAINED – COMBINATION OF FINE GRAINED AND COARSE GRAINED SEDIMENTS WITH A COARSE GRAINED MATRIX
- COARSE GRAINED – SAND AND/OR GRAVEL MATRIX LITTLE OR NO FINES
- BEDROCK
- (_ _) UNKNOWN CONCENTRATION
- (2,150/986) TDS/CHLORIDE CONCENTRATION MILLIGRAMS PER LITER (MG/L)
- STATIC GROUND WATER LEVEL
- WELL SCREEN
- ? – – – – ? DASHED WHERE INFERRED

HORZ SCALE: 1 mi, 1/2 mi

VERT SCALE: 200, 100

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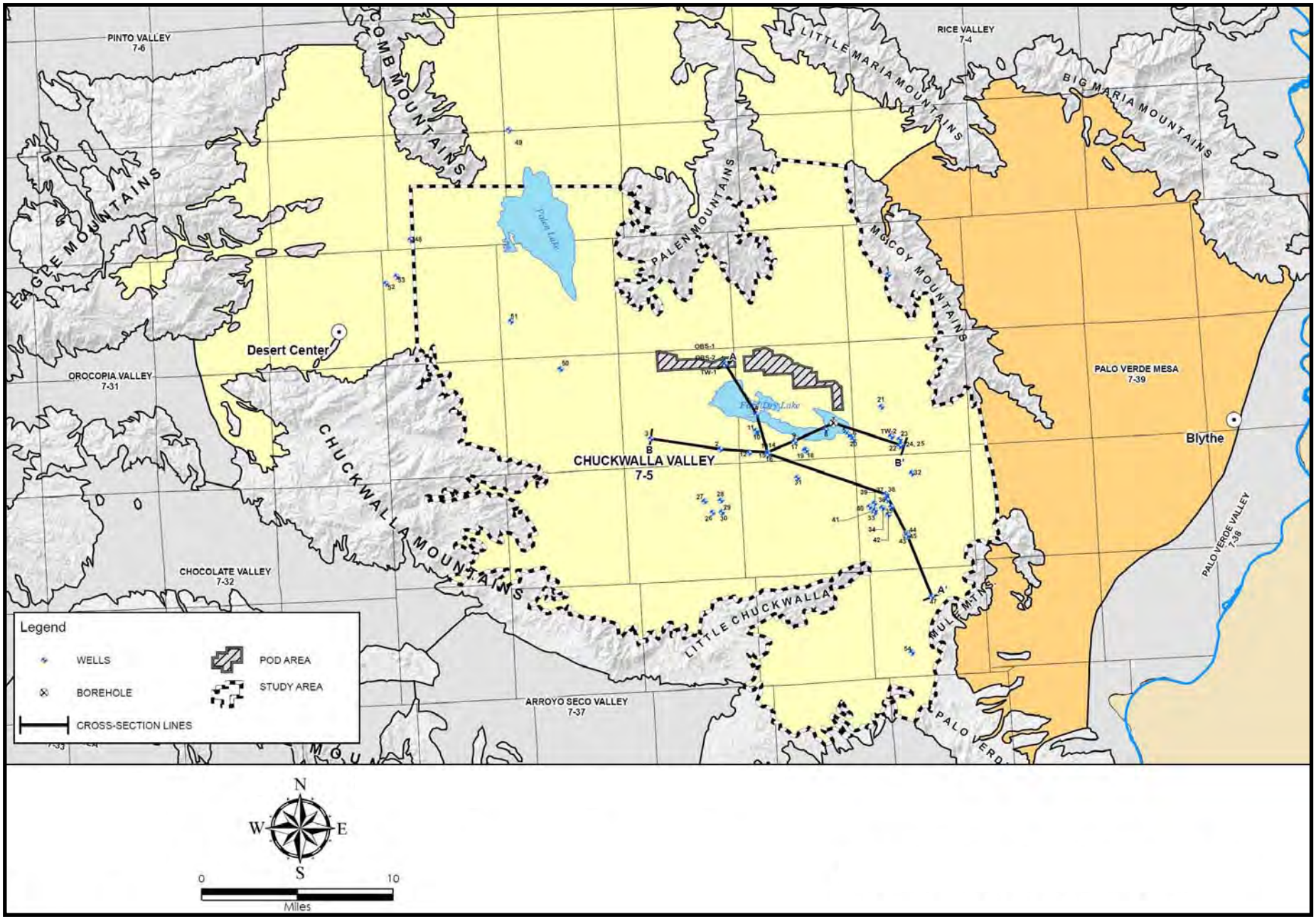
SOURCE: GSEP 2009f

SOIL AND WATER - FIGURE 10

Genesis Solar Energy Project - Hydrostratigraphic Cross-Section Lines



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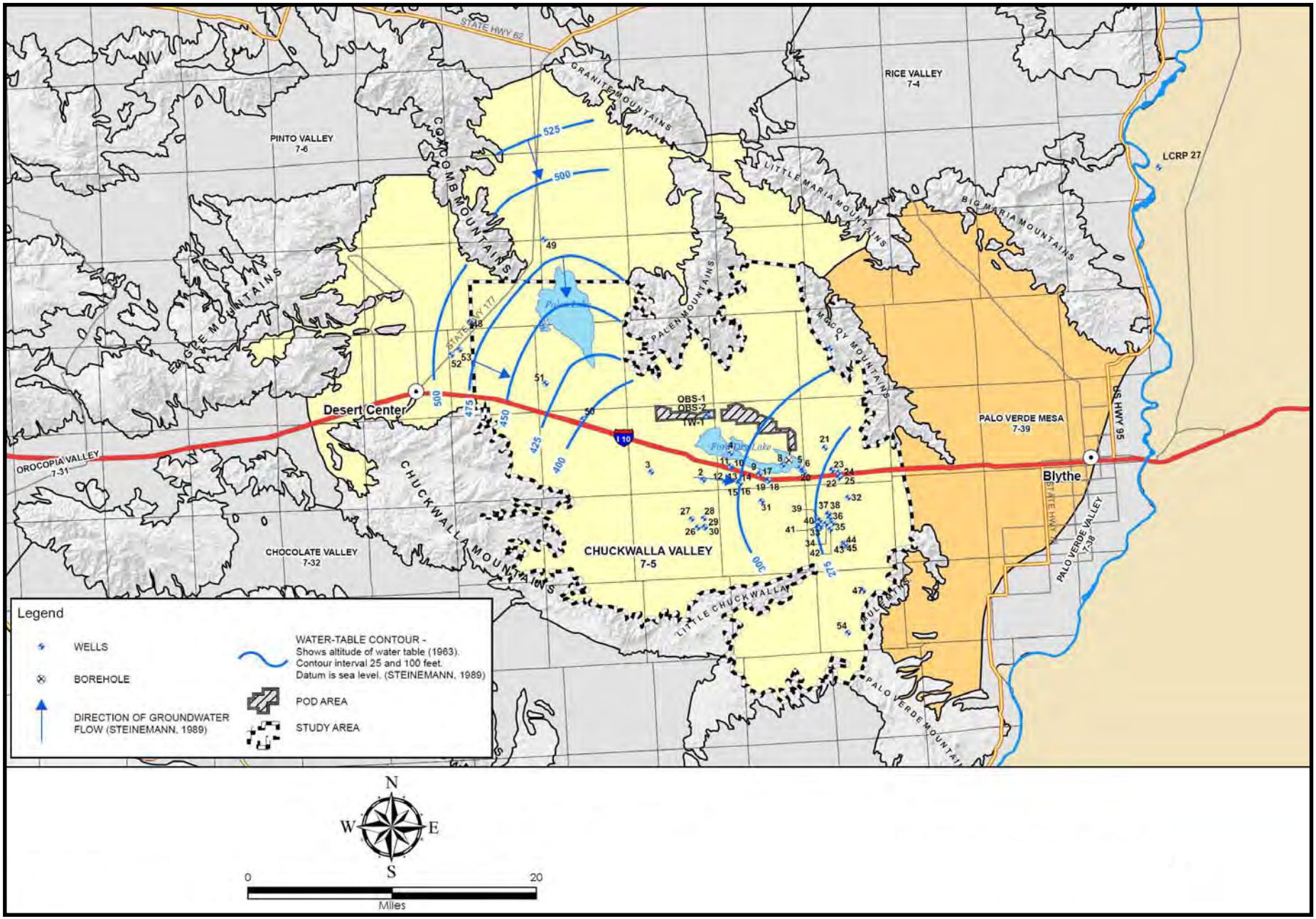
SOURCE: GSEP 2009f

SOIL AND WATER - FIGURE 11

Genesis Solar Energy Project - Groundwater Level Contour Map (1963)



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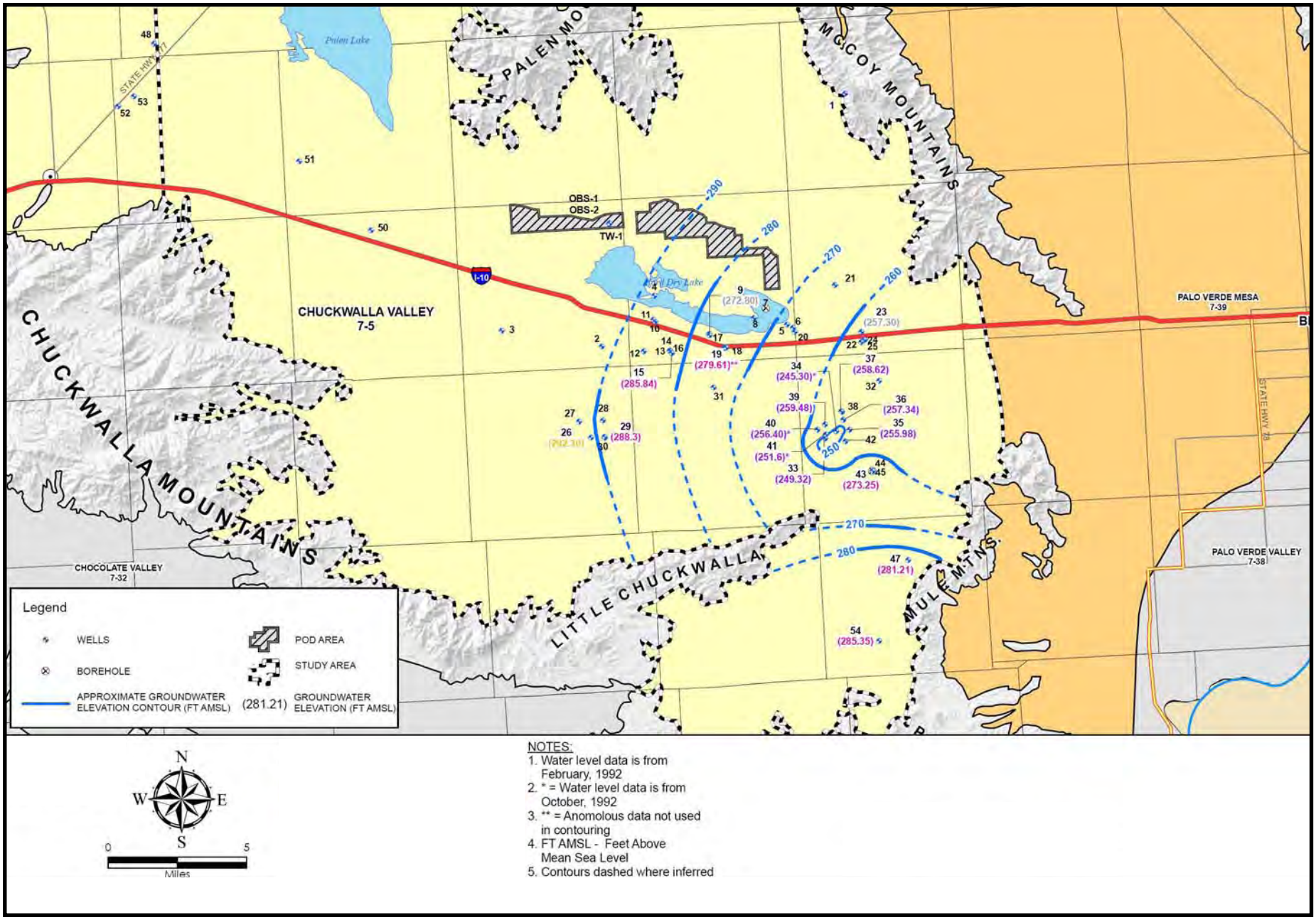
SOURCE: GSEP 2009f

SOIL AND WATER - FIGURE 12

Genesis Solar Energy Project - Groundwater Level Contour Map (1992)



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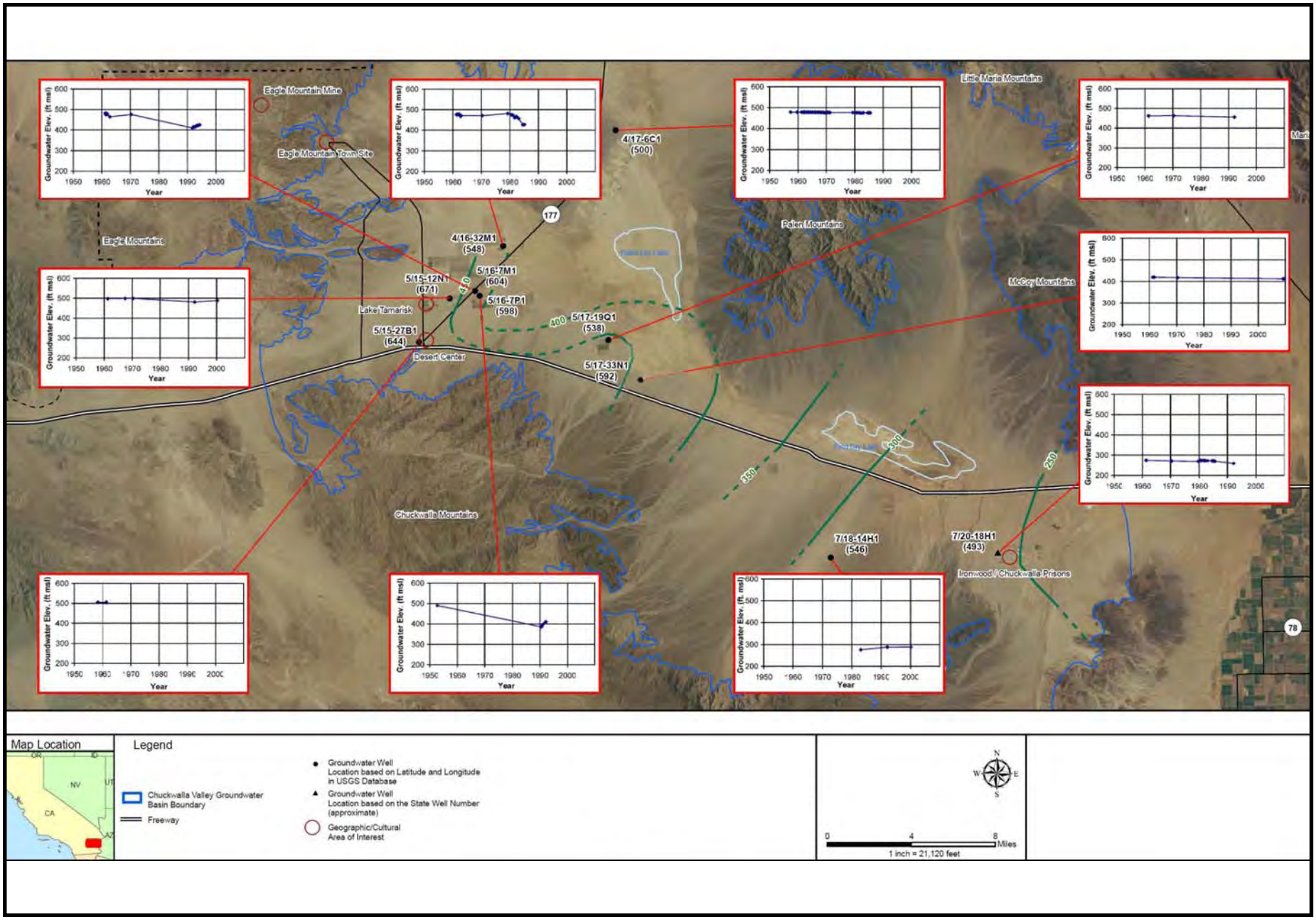
SOURCE: GSEP 2009f

SOIL AND WATER - FIGURE 13

Genesis Solar Energy Project - Basin Wide Hydrographs - Chuckwalla Valley Groundwater Basin



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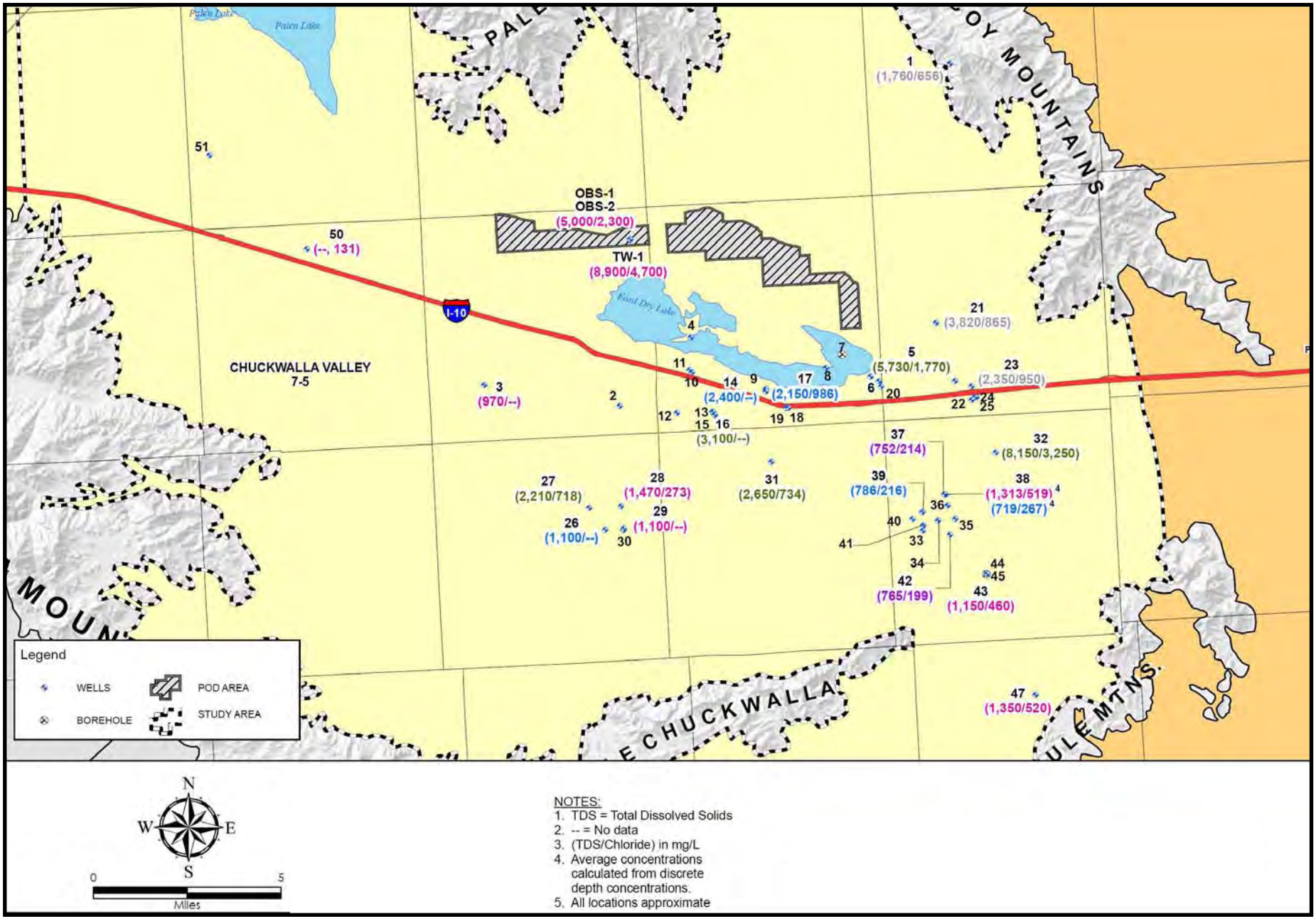
SOURCE: AECOM2010a

SOIL AND WATER - FIGURE 14

Genesis Solar Energy Project - TDS and Chloride Concentrations Detected in Wells in the Eastern Chuckwalla Valley Groundwater Basin



NOTES:
1. TDS = Total Dissolved Solids
2. -- = No data
3. (TDS/Chloride) in mg/L
4. Average concentrations calculated from discrete depth concentrations.
5. All locations approximate

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SOURCE: GSEP 2009f

SOIL AND WATER - FIGURE 15

Genesis Solar Energy Project - Sub-Basin Watershed Boundaries

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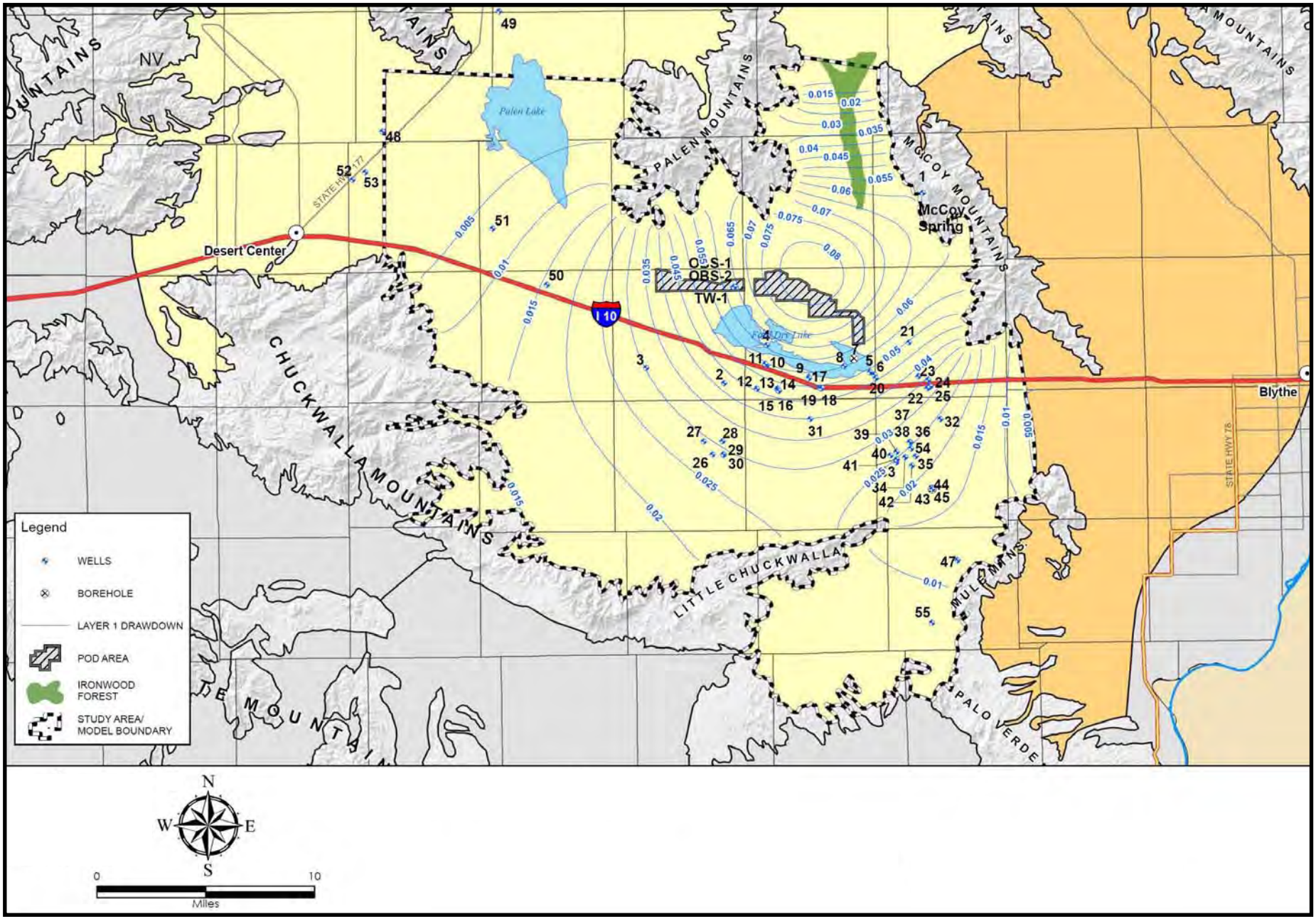
SOURCE: GSEP 2009f

SOIL AND WATER - FIGURE 16

Genesis Solar Energy Project - Predicted Drawdown at the Water Table (Layer 1) after 33 Years



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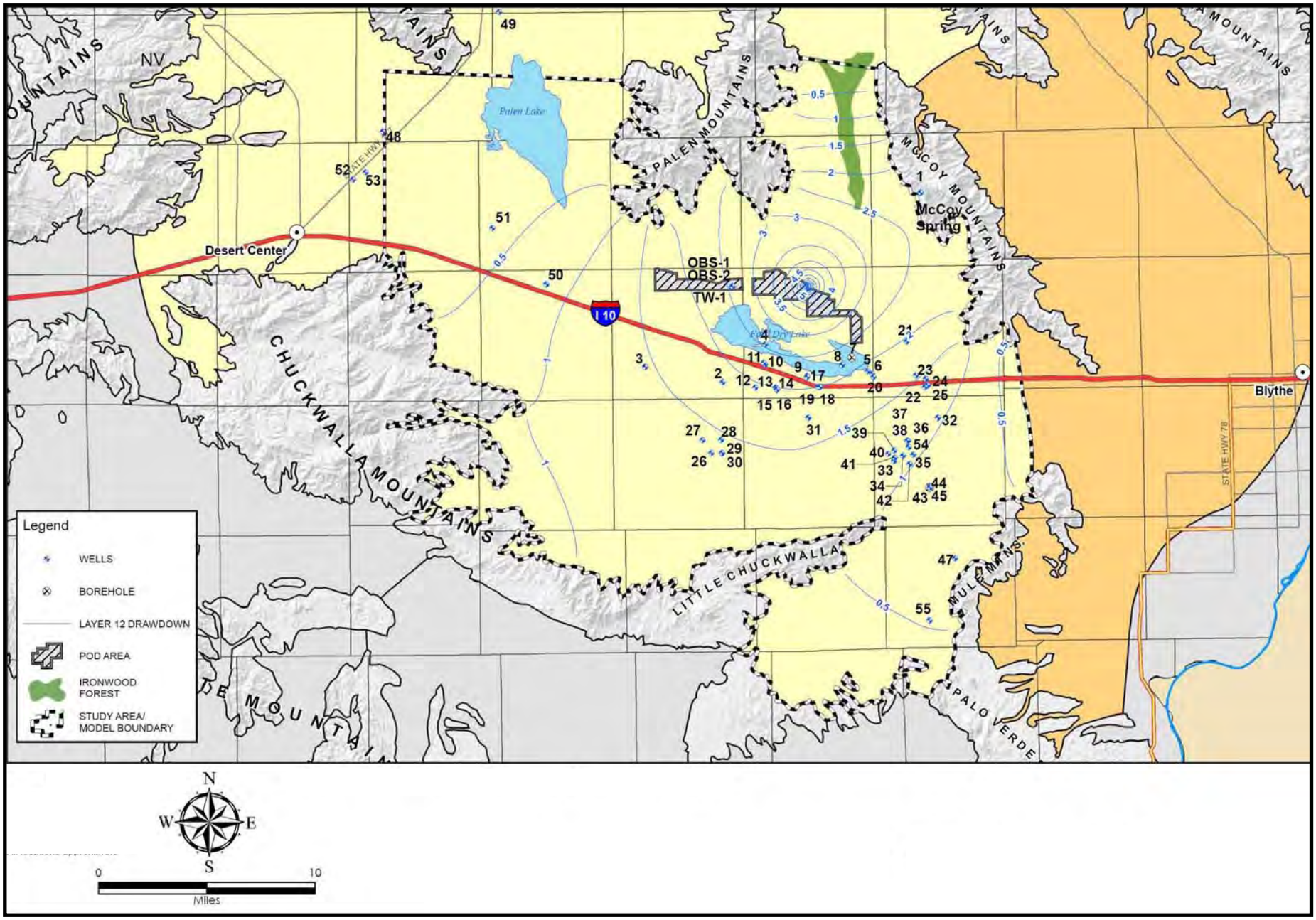
SOURCE: GSEP 2009f

SOIL AND WATER - FIGURE 17

Genesis Solar Energy Project - Predicted Drawdown in the Pumped Aquifer (Layer 12) after 33 Years



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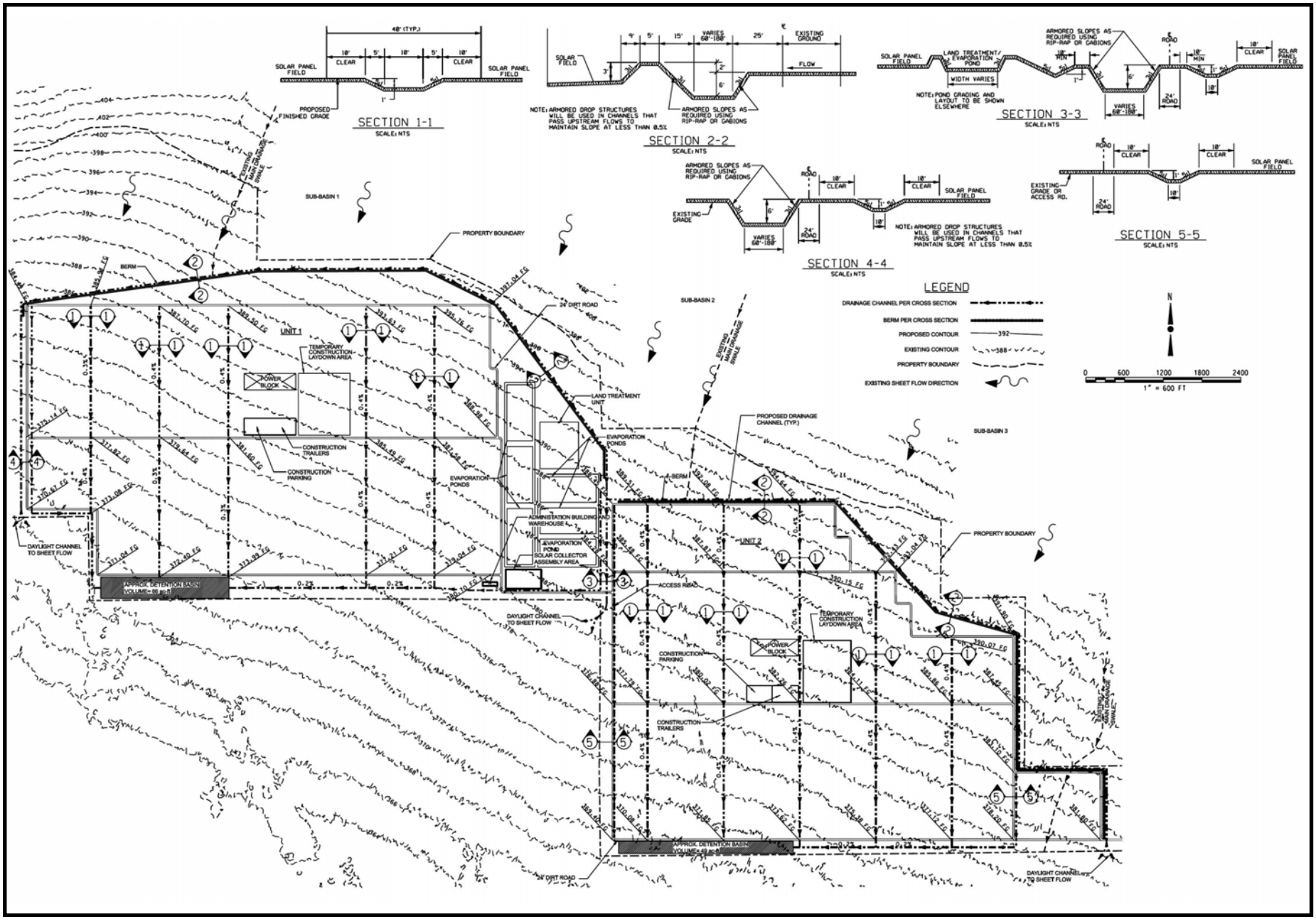
SOURCE: GSEP 2009f

SOIL AND WATER - FIGURE 18

Genesis Solar Energy Project - Drainage Concept Map



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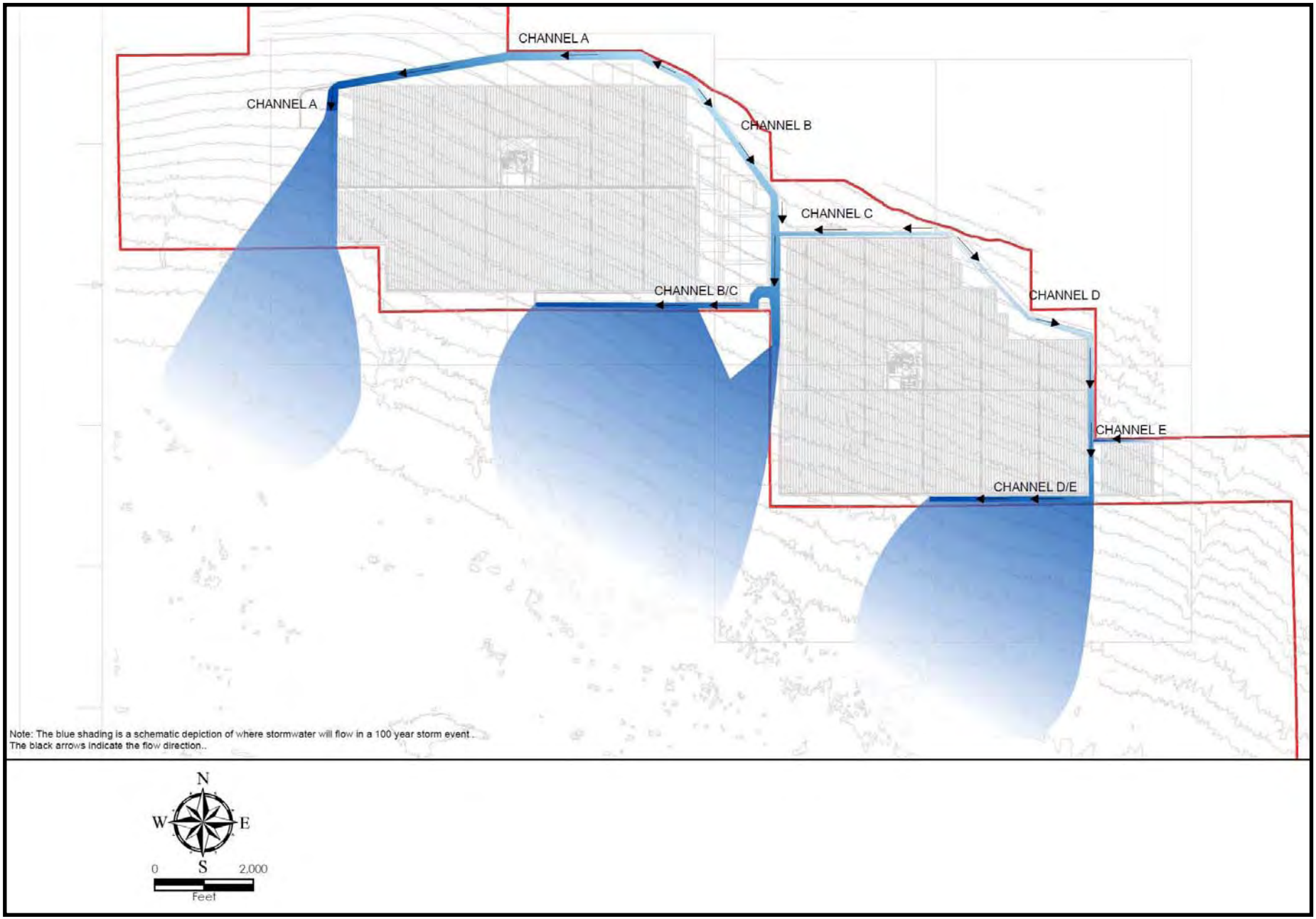
SOURCE: GSEP 2009f

SOIL AND WATER - FIGURE 19

Genesis Solar Energy Project - Post Development Flow Patterns



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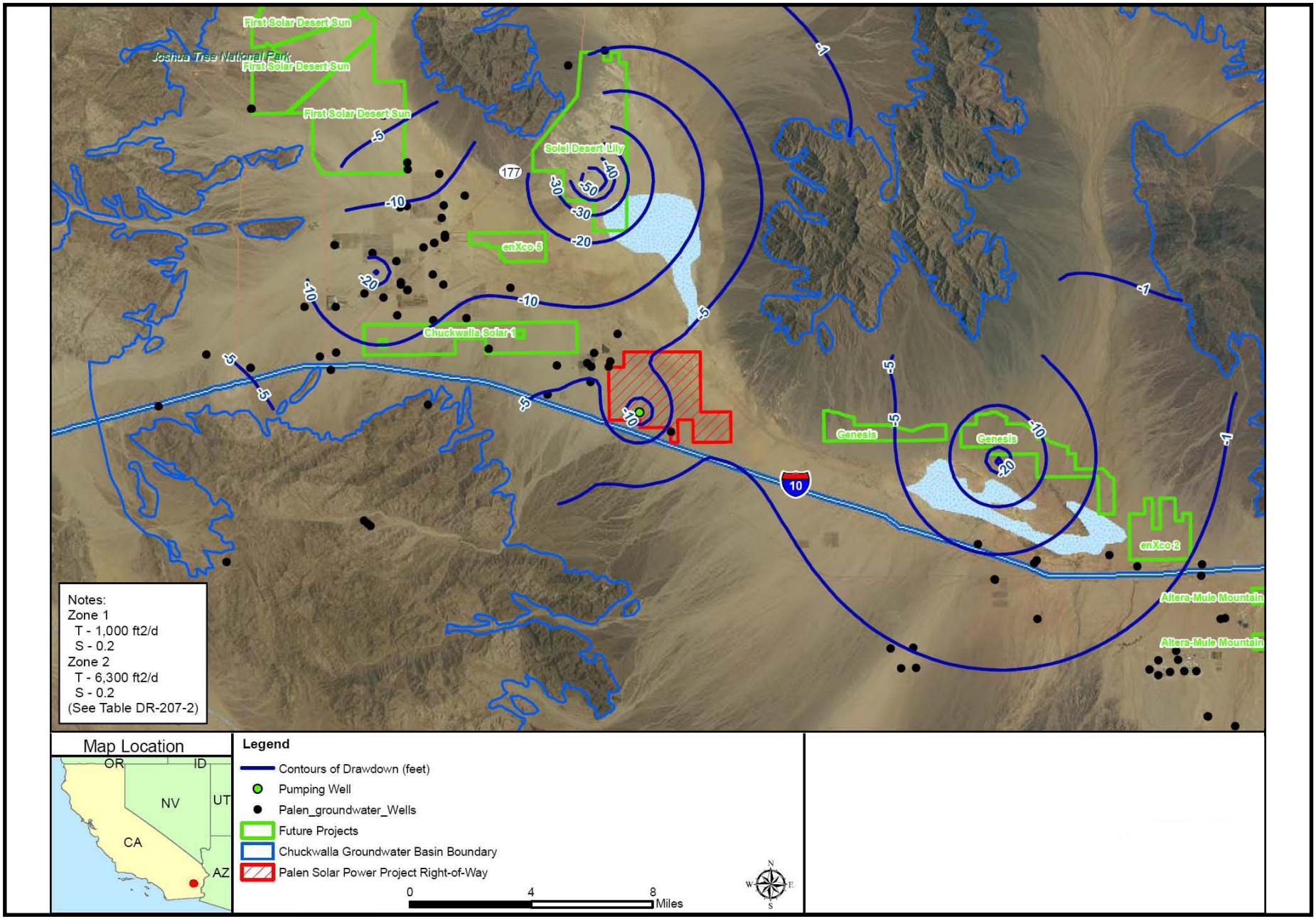
SOURCE: GSEP 2009f

SOIL AND WATER - FIGURE 20

Genesis Solar Energy Project - Predicted Drawdown for Cumulative Foreseeable Projects after 33 Years



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SOURCE: AECOM2010a