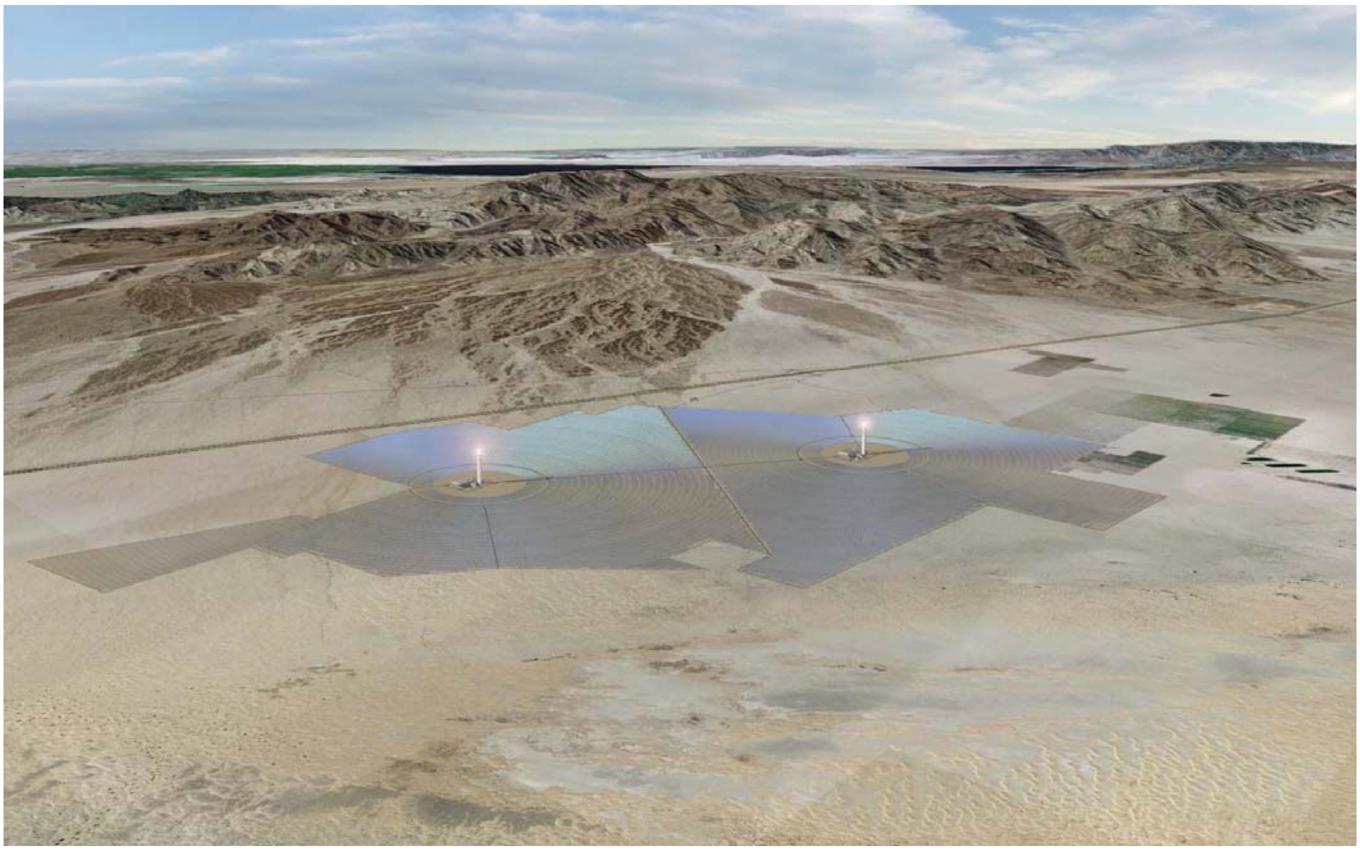
PALEN SOLAR ELECTRIC GENERATING SYSTEM

Preliminary Staff Assessment for the Palen Solar Electric Generating System,

Amendment to the Palen Solar Power Project



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PALEN SOLAR ELECTRIC GENERATING SYSTEM (09-AFC-7C)
PRELIMINARY STAFF ASSESSMENT
Amendment to the Palen Solar Power Project

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EXECUTIVE SUMMARY

Christine Stora

INTRODUCTION

This Preliminary Staff Assessment (PSA) is being published by California Energy Commission (Energy Commission) staff for the proposed amendment to the Palen Solar Power Project (PSPP). The modified project, owned by Palen Solar Holdings, LLC (PSH), is now called Palen Solar Electric Generating System (PSEGS) and proposes to change the solar thermal power-generating technology of the approved project from parabolic trough technology to solar power tower technology.

This PSA contains staff's independent, objective evaluation of PSH's Petition to Amend (09-AFC-7C). The analyses are similar to those normally contained in an Environmental Impact Report (EIR) required by the California Environmental Quality Act (CEQA).

For an amendment for an existing power plant over which it has regulatory oversight, the Energy Commission is the lead state agency under CEQA. The Energy Commission's certified regulatory program provides the environmental analysis that satisfies CEQA requirements. In fulfilling this responsibility, Energy Commission staff provides an independent assessment of the amendment's engineering design, evaluates its potential effects on the environment and on public health and safety, and determines whether the project, if modified, would remain in conformance with all applicable local, state, and federal laws, ordinances, regulations and standards (LORS). Energy Commission staff also recommends any needed modifications to existing mitigation measures (known as conditions of certification) in the Energy Commission Final Decision and proposes additional conditions of certification to mitigate any significant adverse environmental effects of the proposed modifications.

For the ease of the reader, this PSA provides a description of the environmental setting of the entire project. However, because this is an amendment to an existing Energy Commission license, staff's analysis focuses on the technology change proposed for the PSEGS in the Petition to Amend. These specific changes are explained in detail in the **PROJECT DESCRIPTION** section. A summary of the PSEGS project is provided below.

This PSA is not the decision document for these proceedings, nor does it contain findings of the Energy Commission related to environmental impacts or the project's compliance with local, state, and federal LORS. Rather, the PSA is a precursor to the Final Staff Assessment (FSA), which will serve as staff's testimony in evidentiary hearings to be held by the assigned Committee of two Energy Commissioners and a Hearing Officer. In the evidentiary hearings, the Committee will consider the recommendations presented by staff, the applicant, intervenors, governmental agencies, tribes, and the public prior to submitting its proposed decision (Presiding Member's Proposed Decision (PMPD)) to the full Commission. Following a public hearing(s), the full Energy Commission will make a final decision on the proposed modifications.

PROPOSED PROJECT LOCATION AND DESCRIPTION

On December 17, 2012, the project owner filed a Petition to Amend with the Energy Commission requesting to modify the PSPP. (http://www.energy.ca.gov/sitingcases/palen/compliance/) The PSPP, as licensed by the Energy Commission on December 15, 2010, is a 500-megawatt (MW) solar thermal power-generating facility utilizing parabolic trough technology. The project site is approximately 3,794 acres in size and is located approximately 0.25 mile north of Interstate 10, approximately 10 miles east of Desert Center and approximately halfway between the cities of Indio and Blythe, in Riverside County, California.

The modifications proposed in the 2012 Petition to Amend include replacing the parabolic trough solar collection system and associated heat transfer fluid with BrightSource's solar tower technology. Heliostats—elevated mirrors guided by a tracking system mounted on a pylon—focus the sun's rays on a solar receiver steam generator (SRSG) located atop a 750-foot tower near the center of each solar field to create steam to drive a turbine that generates electricity.

The modified project, the PSEGS, would be comprised of two adjacent solar fields and associated facilities with a total combined nominal output of approximately 500 MW. The project owner proposes to develop PSEGS in two operational phases. Each phase would consist of one solar field and power block with approximately 250 MW of generation capacity. Each solar field would have an array of approximately 85,000 heliostats for a total of 170,000 heliostats for the project. Each phase would also share common facilities, including an administration building, warehouse, evaporation ponds, maintenance complex with a meter/valve station for incoming natural gas service to the site, an on-site switchyard, and a single-circuit 230-kV generation tie-line to deliver power to the electricity grid. Other on-site facilities would include access and maintenance roads (either dirt, gravel, or paved), perimeter fencing, tortoise fencing, and other ancillary security facilities.

The PSEGS amendment does not propose to change the generating capacity of the PSPP, or the site access, or the interconnection point at the Red Bluff Substation, although there would be a slight re-routing of the generation tie-line near the western end of the route and around the newly constructed Red Bluff Substation. A new natural gas pipeline is also proposed.

PURPOSE AND NEED FOR AN AMENDMENT

PSH acquired the PSPP site in order to develop BrightSource's proprietary solar thermal tower technology on the site. This change in technology could not have been anticipated during the original permitting process because at the time of the original licensing the project was owned by Solar Millennium and was to use parabolic trough technology. The Energy Commission approved the change in ownership for the PSPP project on July 11, 2012.

U.S. BUREAU OF LAND MANAGEMENT COORDINATION

The PSEGS is proposed to be located entirely on public land managed by the Bureau of Land Management (BLM). A Record of Decision (ROD) and Right of Way (ROW) grant from BLM, in addition to an Energy Commission license, would be required before the proposed project could commence construction. During the PSPP proceeding in 2009 and 2010, Energy Commission staff and BLM staff worked closely together on the review and analysis of the PSPP. The Energy Commission and BLM staff issued a joint Draft Environmental Impact Statement/Staff Assessment (DEIS/SA) for the PSPP on March 18, 2010. The DEIS/SA contained the Energy Commission staff's and BLM's environmental, public health, and engineering evaluation of the PSPP.

During the original licensing case, the Energy Commission and BLM determined that they would develop and publish separate final documents. On May 13, 2011, the BLM Published a Notice Of Availability (NOA) of the Final Environmental Impact Statement for the PSPP in the Federal Register. BLM has not made a final decision on the PSPP, and neither a ROD nor a ROW grant has been issued.

On February 8, 2013, the BLM received a Revised Plan of Development for the PSEGS from PSH and is currently preparing the Draft EIS (DEIS) for the PSEGS. DEIS is an amendment to the environmental documents that BLM had previously prepared for the PSPP. If the BLM approves PSEGS, the agency would ultimately issue a ROD.

Currently the project owner is preparing a draft Reclamation & Decommissioning Plan for the project and will submit the plan to BLM prior to release of the Final EIS. This document in conjunction with the **General Conditions** provided in this PSA, will outlined the requirements for facility closure of PSEGS.

Although the Energy Commission and BLM are not publishing a joint document for the PSEGS, the Energy Commission and the BLM continue to share staff expertise, information, and documentation in order to promote intergovernmental coordination at the local, state, and federal levels.

CUMULATIVE IMPACTS

See **ATTACHMENT A** at end of the section.

ENVIRONMENTAL JUSTICE

Environmental justice communities are commonly identified as those where residents are predominantly minorities or low-income; where residents have been excluded from the environmental policy setting or decision-making process; where they are subject to a disproportionate impact from one or more environmental hazards; and where residents experience disparate implementation of environmental regulations, requirements, practices, and activities in their communities. Environmental justice efforts attempt to address the inequities of environmental protection in these communities.

An environmental justice analysis is composed of three parts:

1. identification of areas potentially affected by various emissions or impacts from a proposed project;
2. a determination of whether there is a significant population of minority persons or persons below the poverty level living in an area potentially affected by the proposed project; and
3. a determination of whether there may be a significant adverse impact on a population of minority persons or persons below the poverty level caused by the proposed project alone, or in combination with other existing and/or planned projects in the area.

CALIFORNIA RESOURCES AGENCY

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" (Gov. Code §65040.12; Pub. Resources Code, §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 or taking actions that affect the environment;
- providing funding for activities affecting the environment; and
- interacting with the public on environmental issues.

DEMOGRAPHIC SCREENING ANALYSIS

For all siting cases, Energy Commission staff uses a demographic screening tool (Socioeconomic Figure 1) as part of its CEQA analysis. Based on 2010 census block data, Socioeconomic Figure 1 shows the percentage of the minority population within the six-mile buffer of the project site. The Council on Environmental Quality's *Environmental Justice: Guidance Under the National Environmental Policy Act*, dated December, 1997, defines minority individuals as members of the following groups: American Indian or Alaskan Native; Asian or Pacific Islander; Black, not of Hispanic origin; or Hispanic.

The *Final Guidance for Incorporating Environmental Justice Concerns in USEPA's National Environmental Policy Act (NEPA) Compliance Analysis*, dated April, 1998, considers a minority population to be present when the minority population of the potentially affected area is greater than 50 percent or when the minority population percentage is meaningfully greater than the minority population in the general population or other appropriate unit of geographic analysis. That guide also provides staff with information on outreach and public involvement.

PROJECT ALTERNATIVES

Project alternatives are being developed for this amendment because of the magnitude of changes proposed for the PSEGS. The alternatives discussion will be in the FSA and will include an evaluation of the following alternatives:

1. Solar Photovoltaic Alternative with Single-Axis Tracking Technology,
2. Parabolic Trough Alternative, and
3. Reduced Acreage Alternative.

SUMMARY OF ENVIRONMENTAL CONSEQUENCES AND MITIGATION

Below is a summary of environmental consequences and mitigation proposed in this PSA. This section also provides a summary of outstanding information that will be analyzed in the FSA.

Executive Summary - Table 5
Environmental and Engineering Assessment

Technical Area	Complies with LORS	Impacts Mitigated	Additional Information Required
Air Quality/Greenhouse gases	Undetermined	Undetermined	**Yes**
Biological Resources	Undetermined	Undetermined	**Yes**
Cultural Resources	Undetermined	Undetermined	**Yes**
Hazardous Materials	Yes	Yes	No
Land Use	Yes	Yes	No
Noise and Vibration	Yes	Yes	No
Public Health	Yes	Yes	No
Socioeconomics	Yes	Yes	**Yes**
Soil and Water Resources	Yes	Yes	No
Traffic & Transportation	Undetermined	Undetermined	**Yes**
Transmission Line Safety/Nuisance	Yes	Yes	No
Visual Resources	**No**	**No**	No
Waste Management	Yes	Yes	**Yes**
Worker Safety and Fire Protection	Yes	Yes	**Yes**
Facility Design	Yes	Yes	No
Geology & Paleontology	Undetermined	Undetermined	**Yes**
Power Plant Efficiency	N/A	Yes	No
Power Plant Reliability	Yes	Yes	No
Transmission System Engineering	Yes	Yes	No
Alternatives	**To be provided in FSA**		

AIR QUALITY/GREENHOUSE GASES

For the PSA, staff analyzed construction-related air quality impacts only. Please see **ADDITIONAL INFORMATION THAT ENERGY COMMISSION STAFF REQUIRES FROM THE PROJECT OWNER IN ORDER TO COMPLETE THE FINAL STAFF ASSESSMENT**, below, for more information.

For construction-related impacts, staff concludes that with the adoption of staff's recommended Air Quality Conditions of Certification, the proposed PSEGS would comply with all applicable laws, ordinances, regulations, and standards and would not result in any significant air quality impacts. The recommended conditions of certification meet the Energy Commission's responsibility to comply with CEQA. Staff proposes to retain conditions from the approved project—AQ-SC1 through AQ-SC5—with some modifications and updates that have been made for more recent solar projects. The PSEGS would emit substantially lower greenhouse gas emissions per megawatt-hour than fossil-fueled electric generation resources in California. PSEGS, as a renewable energy generation facility, is determined by rule to comply with the Greenhouse Gas Emission Performance Standard requirements of SB 1368.

BIOLOGICAL RESOURCES

Staff has identified biological resources data needs, as outlined below in **ADDITIONAL INFORMATION THAT ENERGY COMMISSION STAFF REQUIRES FROM THE PROJECT OWNER TO COMPLETE THE FINAL STAFF ASSESSMENT THAT** will need to be addressed before the FSA can be completed.

The PSEGS would have significant impacts to biological resources, impacting all of the Sonoran creosote bush scrub, sand dunes, desert washes, and other native plant and wildlife communities within the approximately 3,794-acre site, as well as along the natural gas pipeline corridor, and the proposed and approved generation tie-line corridor. PSH proposes leaving the majority of the vegetation within the PSEGS heliostat fields intact, while adding roads and other improvements only where necessary for project development and operation. The PSEGS would also eliminate development of engineered channels and maintain most of the natural drainage features, Any grading required would be designed to promote sheet flow where possible. However, staff is assuming a total loss of the function and value of the vegetation and habitats within the project site because perimeter fencing would exclude most terrestrial animals, and ongoing disturbance, noise, and other anthropogenic activities at the site may continue to degrade habitat functions within the project footprint. Wildlife and plants that are tolerant to disturbance may continue to occupy the site; however, staff does not consider leaving the vegetation on site a benefit to these species due to ongoing risk of injury or mortality by construction equipment or other project construction or operational work efforts. Below is a summary of biological impacts by area of concern.

Avian and Bat

Birds and bats may be vulnerable to operational impacts, including collision with heliostats or other project facilities, and injury or mortality from exposure to solar flux. This impact is unavoidable, and may be significant even after implementation of mitigation. Staff does not have sufficient information to make this determination at this time, but will be receiving necessary information from the project applicant and will be prepared to make this determination in the FSA.

No special-status bats are expected to roost on-site, but several species could forage over the site or fly across the site en route between roosting areas in the Mule Mountains and agricultural lands to the east. Staff concludes that with the proposed mitigation measures provided in the **BIOLOGICAL RESOURCES** section of this PSA, impacts to special-status bats would effectively mitigated.

Burrowing Owl

Construction and operation of the PSEGS would result in disturbance or habitat loss for this species. Staff has proposed conditions to reduce this impact, but additional, off-site compensatory mitigation land may be required, pending completion of additional surveys of the new natural gas pipeline corridor and the modified generation tie-line corridor.

Burrowing Mammals

American badgers and desert kit fox occur throughout the project area, and construction activities could crush or entomb kit fox and American badger. Staff's proposed conditions requiring development of an American Badger and Desert Kit Fox Mitigation and Monitoring Plan that includes, but is not limited to, procedures and impact avoidance measures for conducting pre-construction surveys, and avoidance measures to protect badgers and kit fox during construction and operation, would avoid this potential impact.

Sand Dunes/Mojave Fringe-toed Lizards

The PSEGS project footprint is within the footprint of the approved PSPP footprint, outside of the sand-transport corridor. Therefore, the PSEGS would not result in unmitigated significant impacts to the Mojave Fringe-toed lizard.

Desert Tortoise

Construction and operation of the PSEGS would result in direct and indirect, impacts to desert tortoise, listed as a threatened species by federal and state wildlife agencies). To offset the loss of 3,947 acres of desert tortoise habitat, staff's proposed Condition of Certification **BIO-12** recommends habitat compensation at a 1:1 ratio for areas outside of critical habitat, and at a 5:1 ratio for disturbance to habitat in the Chuckwalla Critical Habitat Unit. The PSEGS project would require 4,863 acres of compensatory mitigation for desert tortoise. A Raven Management and Monitoring Plan to address project-related increases in ravens, a desert tortoise predator, would also be required.

Ephemeral Streams

Approximately 32 acres of ephemeral streams located downstream of the project would be indirectly impacted, but to a limited degree. Condition of Certification **BIO-21** would minimize and offset direct and indirect impacts to state waters to less-than-significant levels.

Groundwater-Dependent Ecosystems

The modified project would use less groundwater during both construction and operation than the approved PSPP would have. With implementation of the mitigation measures presented in the **BIOLOGICAL RESOURCES** section of this PSA, the project impacts to groundwater-dependent plant communities would be reduced to less-than-significant levels.

Special-Status Plants

Staff requires the final results of all additional spring surveys in time to be included in the FSA. Fall 2010 surveys were completed for the PSPP. However, Fall 2013 botanical surveys would be required for the new areas of impact for the PSEGS project, including the proposed generation tie-line and natural gas pipeline corridor. Staff will include a final assessment of special status plants in the FSA.

Cumulative Effects to Biology

Construction and operation of the PSEGS, as proposed, would have cumulatively considerable impacts to many biological resources within the Chuckwalla Valley and the Northern and Eastern Colorado Desert Coordinated Management Plan (NECO) area. These include:

- desert washes;
- Mojave fringe-toed lizard;
- desert tortoise;
- movement and connectivity;
- special status birds, such as bald and golden eagle, Swainson's hawk, Leconte's thrasher, and burrowing owl;
- American badger and desert kit fox; and
- Chuckwalla Valley dune system, desert wash woodland, groundwater-dependent ecosystems, and other natural communities and special-status plants.

Staff's proposed conditions of certification, in the **BIOLOGICAL RESOURCES** section of this PSA, address impacts that might be individually minor but cumulatively considerable.

The PSEGS's contribution to cumulative impacts to birds and bats, due to exposure to elevated solar flux or collision with facility structures such as heliostats, has yet to be determined, and staff will wait to review the results of on-site data collection prior to the FSA.

CULTURAL RESOURCES

Staff has identified cultural resources data needs, as outlined below in **ADDITIONAL INFORMATION THAT ENERGY COMMISSION STAFF REQUIRES FROM THE PROJECT OWNER TO COMPLETE THE FINAL STAFF ASSESSMENT THAT** will need to be addressed before the FSA can be completed.

Staff's research on and analysis of the geographic area encompassed by staff's draft revision to the Project Area of Analysis (PAA) is currently incomplete. Staff, variously in collaboration and consultation with the project owner, a number of local Native American communities, and cultural resources specialists at BLM's California Desert District and Palm Springs-South Coast field offices, and at Joshua Tree National Park, has been steadfastly engaged in an effort to identify and to evaluate the historical significance of the cultural resources in the draft revised PAA since early January, 2013. However, as a result of protracted deliberations about the scope and character of the investigations necessary to produce an adequate resource inventory and evaluation data, data were not available in time for staff to prepare the **CULTURAL RESOURCES** section of this PSA. Therefore, this PSA only addresses the broad contextual framework for the supplemental cultural resources analysis of the PSEGS. Staff anticipates being able to develop the full analysis for the FSA.

Staff has analyzed cultural resources data currently available for the PSEGS and has concluded that the proposed modified project would have a significant direct impact on 49 resources either recommended eligible or assumed eligible for the National Register of Historic Places (NRHP) and/or the California Register of Historical Resources (CRHR). These impacts include:

- Direct impacts to nine prehistoric archaeological sites, all potential contributors to the Prehistoric Trails Network Cultural Landscape (PTNCL);
- Direct impacts to 40 historic-period archaeological sites, some of which are potential contributing elements to the Desert Training Center Cultural Landscape (DTCCL); and
- Cumulative impacts to the PTNCL and the DTCCL, resulting from the PSEGS's impacts to contributors to these register-eligible resources.

Staff concludes that the PSEGS construction impacts, when combined with impacts from past, present, and reasonably foreseeable projects, would be cumulatively considerable for cultural resources at both the local I-10 Corridor and regional levels. This analysis estimates that more than 800 sites within the I-10 Corridor, and 17,000 sites within the Southern California Desert Region, would potentially be destroyed. Mitigation can reduce the impact of this destruction, but not to a less-than-significant level. At this time minor changes are proposed to most of the cultural resources conditions of certification, and a new **CUL-8** condition has been developed to address current construction monitoring and cultural resources discovery protocols. Staff recommends that the Energy Commission strike **CUL-16**, because the condition is largely a result of disjointed Energy Commission and BLM environmental analysis schedules in 2010 and has the potential to inadvertently impede constructive collaboration on historic preservation issues relative to the Energy Commission's and the BLM's respective statutory and regulatory contexts.

In staff's opinion, the difference in the visual profiles between the PSPP and the PSEGS is significant and is, consequently, the primary focus of the cultural resources analysis for the PSEGS. The archaeological analysis for the proposed amendment would take into account whether, and the degree to which, the PSEGS's solar power towers and SRSGs may compromise the ability of archaeological resources to convey the significance of their associative or design values. If the project owner is able to submit, or staff is otherwise able to acquire, results of the new field research beyond the facility site, staff's analysis of any such visual effects would be incorporated into the FSA for the amendment.

Staff has yet to fully identify, document, and assess eligibility of the ethnographic resources identified to date. For the PSA, staff has identified 11 potential Traditional Cultural Properties near or within which the PSEGS project is located (Palen Dunes/Palen Lake, Ford Dry Lake, McCoy Spring, Mule Tank, Corn Spring, North Chuckwalla Mountains Petroglyph District, North Chuckwalla Mountains Prehistoric Quarry District, Long Tank, Alligator Rock, Dragon Wash, and San Pascual Well). Recommendations concerning the eligibility of these resources for inclusion in the CRHR will be completed for the FSA, as will an analysis of impacts to these resources and recommended mitigation measures. Compliance with LORS and whether all impacts to cultural resources will be mitigated is undetermined at this time and will be fully evaluated in the FSA.

Due to modifications proposed in the Petition to Amend, the PAA has been expanded, and additional historic-period resources are being examined, including the community of Desert Center and agricultural complexes in the Chuckwalla Valley. Other potential resource types include roads/trails, transmission lines, and mining operations. The research and evaluation of historic-period, built-environment resources are ongoing, and the results will be included in the FSA. At this time staff cannot determine if the project modifications would result in additional impacts to built-environment resources.

HAZARDOUS MATERIALS

The potential for off-site impacts resulting from hazardous materials use at the PSEGS is less than significant due to the nature of the materials used and the engineering and administrative controls that would be implemented to prevent and control accidental releases of hazardous materials. There is little possibility that vapor plumes could combine with other hazardous chemicals nearby to produce an airborne concentration that would present a significant risk should an accidental release occur.

Because the project now proposes to use natural gas, staff proposes revised Condition of Certification **HAZ-4** to address the use of natural gas and prohibit its use to clear pipes.

LAND USE

Staff concludes the modifications proposed for the PSEGS would not disrupt or divide an established community, or convert farmland to non-agricultural use or forest land to non-forest use. Staff has made minor clarifying edits to the single land use Condition of Certification from the Energy Commission PSPP Final Decision.

NOISE AND VIBRATION

Because construction and operational noise for PSEGS would be the same or less than for the PSPP, staff does not propose any changes to the noise and vibration Conditions of Certification.

PUBLIC HEALTH

According to the results of staff's health risk assessment, emissions from PSEGS would not contribute significantly to morbidity or mortality in any age or ethnic group residing in the project area. No changes to the public health Conditions of Certification are proposed.

SOCIOECONOMICS

Staff has additional socioeconomic data needs as outlined below in **ADDITIONAL INFORMATION THAT ENERGY COMMISSION STAFF REQUIRES FROM THE PROJECT OWNER TO COMPLETE THE FINAL STAFF ASSESSMENT**. Although staff still needs some information prior to publishing the FSA, staff can preliminarily conclude that the construction and operation of the PSEGS would not cause a significant adverse direct or indirect impact or contribute to a cumulative socioeconomic impact on the area's housing, schools, law enforcement services, or parks. Staff also concludes that the project would not induce a substantial population growth or displacement of population, or induce substantial increases in demand for housing, parks, or law enforcement services.

Staff concludes the population in the six-mile project buffer does not constitute an environmental justice population, as defined by *Environmental Justice: Guidance Under the National Environmental Policy Act*, and would not trigger further scrutiny for purposes of an environmental justice analysis.

SOIL & WATER RESOURCES

Staff determined that construction, operation, and decommissioning of the proposed modified PSEGS could potentially impact soil and water resources. The PSEGS 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. Five PSPP conditions of certification were deleted because of changes to the drainage design for the PSEGS. A Draft Drainage, Erosion, and Sedimentation Control Plan (DESCP) have been developed, by the project owner, to mitigate the potential storm water and sediment project-related impacts by implementing Best Management Practices (BMPs) during construction and operations. A new condition of certification was also added for the PSEGS to address potential impacts from storm damage to the heliostats.

The PSEGS project would use less water during construction and operation than the PSPP, and the PSPP conditions of certification have been updated to reflect these changes. Changes to the conditions reduce the maximum limit of water usage and construction duration to match the PSEGS project description. The waste discharge requirements for wastewater disposal to lined evaporation ponds have also been revised to reflect the smaller ponds now needed for the reduced wastewater volume. The requirements for a Land Treatment Unit would also be removed since no heat transfer fluid requiring bioremediation would be used for PSEGS operation.

TRAFFIC & TRANSPORTATION

Staff has outstanding traffic and transportation data needs as outlined below in **ADDITIONAL INFORMATION THAT ENERGY COMMISSION STAFF REQUIRES FROM THE PROJECT OWNER TO COMPLETE THE FINAL STAFF ASSESSMENT**.

Staff has determined that PSEGS operations traffic would cause less than significant impacts to traffic levels of service (LOS). In the absence of additional information, requested in Data Request Set No. 3, staff has not been able to fully determine potential glint and glare impacts to motorists and pilots from the project’s heliostats and SRSGs. Staff will include discussion of this information in the FSA and will conclude in the FSA whether the PSEGS would cause discomfort or disability glare for motorists or pilots. In this PSA, based on prior studies prepared for the Rio Mesa and Hidden Hills solar power tower projects, staff has only concluded that neither the heliostats nor the SRSGs would cause retinal damage to motorists or pilots.

In the FSA, once all requested data are provided, staff will include a more thorough discussion of the potential construction traffic impacts and potential glint and glare impacts. At that time, staff will also be able to reach a conclusion as to whether the PSEGS would comply with all applicable LORS related to traffic and transportation.

TRANSMISSION LINE SAFETY AND NUISANCE

Since the proposed PSEGS transmission line would be operated to minimize health, safety, and nuisance impacts and would be routed through an area with no residences in its immediate vicinity, staff considers the proposed design, maintenance, and construction plan as complying with the applicable LORS. Staff does not propose any changes to the PSPP conditions of certification for the proposed PSEGS modifications.

VISUAL RESOURCES

Staff concludes that the PSEGS would result in a substantial adverse impact to existing scenic resource values, as seen from several viewing areas and Key Observation Points in the project vicinity and Chuckwalla Valley area, including:

- Eastbound and westbound Interstate 10 (I-10), which is located immediately south of the project site and transmission line;

- State Route 177, to the west and northwest of the project site;
- Joshua Tree National Park to the west and northwest of the project site;
- Palen McCoy Wilderness to the northeast of the project site;
- Chuckwalla Mountains Wilderness to the south of the project site; and
- Corn Springs Road in the immediate vicinity of the project site.

Staff concludes that these visual impacts would be significant in terms of three of the four criteria of CEQA Appendix G, could not be mitigated to less than significant levels, and would thus result in significant and unavoidable impacts under CEQA. Staff also concludes that the project's contribution to significant cumulative visual effects would be cumulatively considerable when combined with the effects of other renewable and development projects along the I-10 corridor, within the Chuckwalla Valley, and within the California Desert Conservation Area as a whole.

In addition, staff concludes that the project would not be consistent with several applicable goals and policies of the Riverside County Integrated Plan. Staff proposes modification to the PSPP conditions of certification to minimize PSEGS impacts to the greatest feasible extent.

WASTE MANAGEMENT

Staff has outstanding waste management data needs as outlined below in **ADDITIONAL INFORMATION THAT ENERGY COMMISSION STAFF REQUIRES FROM THE PROJECT OWNER TO COMPLETE THE FINAL STAFF ASSESSMENT**. This information is not anticipated to change staff's analysis, but staff will verify this with the updated information. Staff anticipates that all PSPP waste management Conditions of Certification will still apply.

The available landfill capacity is sufficient to accommodate PSEGS construction and operation, and the project would be consistent with the applicable waste management laws, ordinances, regulations, and standards if the PSPP conditions of certification are implemented. No cumulative waste management impacts would occur.

WORKER SAFETY AND FIRE PROTECTION

Staff has additional worker safety and fire protection data needs as outlined below in **ADDITIONAL INFORMATION THAT ENERGY COMMISSION STAFF REQUIRES FROM THE PROJECT OWNER TO COMPLETE THE FINAL STAFF ASSESSMENT**.

Staff has considered the position of PSEGS and the Riverside County Fire Department (RCFD) and all relevant information, as well as past and current experience at other solar power plants in California, and has determined that the project would cause a significant direct and cumulative impact on local fire protection services. Therefore, staff is proposing mitigation to reduce these impacts to less than significant by requiring payment to the RCFD for capital improvements and annual support (see modified Condition of Certification **WORKER SAFETY-7**). Staff is also proposing a new condition (**WORKER SAFETY-10**) that would clarify the requirement for the project owner to submit plans for all fire detection and suppression systems to the RCFD and to pay the fire department's usual and customary fee for those reviews.

In order to comply with the requirements of LORS, staff proposes modification to Condition of Certification **WORKER SAFETY-6** that would require the project owner to provide at least two secondary access gates for emergency vehicles to enter the site from around the perimeter in the event the main access road is blocked.

Lastly, in order to protect workers from potential exposure to Valley Fever, staff proposes Condition of Certification **WORKER SAFETY-8,** which requires enhanced dust control measures.

Staff also concludes that the operation of this power plant, with mitigation, would not significantly impact the provision of emergency services.

FACILITY DESIGN

Staff concludes that the design, construction, and eventual closure of the PSEGS and its linear facilities would comply with applicable engineering laws, ordinances, regulations, and standards. The proposed PSEGS modifications, as described in the Petition to Amend, would not change staff's analysis or the conditions of certification in the December 2010 Energy Commission Final Decision for the approved PSPP.

GEOLOGY AND PALEONTOLOGY

Staff believes that the potential is low for significant adverse impacts to the proposed project from geologic hazards during its design life. The potential for significant adverse impacts to potential geologic and mineralogic resources from the construction, operation, and closure of the proposed project is also low.

In areas where soils are exposed by conventional excavation operations, potential impacts to paleontologic resources would be mitigated through worker training and monitoring by qualified paleontologists, as required by the existing PSPP conditions. Existing studies indicate the soils beneath the solar field are likely to contain Pleistocene-age vertebrate fossils. In areas where heliostats are to be supported by pylons that are vibro-inserted into the ground, impacts to paleontological resources cannot be determined without thorough characterization of the soil to be penetrated by the pylons. Based on existing information, the proposed method of construction would create an unmitigable significant impact to paleontological resources in the area where heliostat pylons are proposed. To make a final determination, staff has additional data needs, as outlined below in **ADDITIONAL INFORMATION THAT ENERGY COMMISSION STAFF REQUIRES FROM THE PROJECT OWNER TO COMPLETE THE FINAL STAFF ASSESSMENT**.

If the project owner can provide appropriate characterization and interpretation, as discussed in the **GEOLOGY AND PALENTOLOGY** section, it is staff's opinion that the proposed PSEGS facility could be designed and constructed in accordance with all applicable laws, ordinances, regulations, and standards, and in a manner that both protects environmental quality and assures public safety, to the extent practical.

POWER PLANT EFFICIENCY

The PSEGS would use solar energy to generate a minimum 98 percent of its annual electrical energy production. Fossil fuel, in the form of natural gas, would be used only to reduce startup time and to keep the temperature of the steam generation system above freezing. Compared to the project's expected overall production rate of approximately 1,412,300 MWh (megawatt-hours) per year, and compared to a typical fossil fuel-fired power plant of equal capacity, the amount of the annual power production from fossil fuel is insignificant, at less than 2 percent.

The project would decrease reliance on fossil fuel and would increase renewable energy generation. It would not create significant adverse effects on fossil fuel energy supplies or resources, would not require additional sources of energy supply, and would not consume fossil fuel energy in a wasteful of inefficient manner. No efficiency standards apply to this project. Staff therefore concludes that this project would present no significant adverse impacts on fossil fuel energy resources.

The PSEGS, as proposed, would occupy approximately 7.6 acres per MW of capacity, which approximates that of other solar power technologies.

POWER PLANT RELIABILITY

Staff concludes that the PSEGS would be built and would operate in a manner consistent with industry norms for reliable operation. The project owner predicts an availability factor of between 92 and 98 percent for the modified project, which staff believes is achievable and comparable to that of the PSPP. No conditions of certification are proposed.

TRANSMISSION SYSTEM ENGINEERING

The proposed interconnection facilities, including the PSEGS 230-kV switchyard, generator, 230-kV overhead gen-tie line, and its termination at the new SCE Red Bluff substation, are acceptable and would comply with applicable LORS. No changes to the PSPP conditions of certification are proposed.

ADDITIONAL INFORMATION THAT ENERGY COMMISSION STAFF REQUIRES FROM THE PROJECT OWNER TO COMPLETE THE FINAL STAFF ASSESSMENT

Below is a list, arranged by technical area, of outstanding information staff requires prior to issuing an FSA.

AIR QUALITY/GREENHOUSE GASES

The project owner has submitted a new permit application to the South Coast Air Quality Management District (SCAQMD) and this is currently under review. Staff needs the information in the Preliminary Determination of Compliance to complete staff's analysis. Operational impacts will be discussed in the FSA once SCAQMD finalizes the Preliminary Determination of Compliance for the PSEGS.

BIOLOGICAL RESOURCES

Staff will require the following information from the PSEGS project owner in order to complete the FSA. A list of this information is provided below:

1. Results of bird and bat surveys conducted during 2013, per Data Request Set No. 3;
2. Results of Spring 2013 avian point count surveys, Spring 2013 raptor surveys;
3. Results of rare plant surveys conducted in Spring 2013. A summary was sent on May 21, but this did not include all information requested in Data Request Set No. 1, and staff needs the remaining information to complete the analysis. This includes a complete survey report consistent with California Department of Fish and Wildlife (CDFW) and BLM guidelines and including a complete floral inventory from the surveys. The results of surveys for cacti, yucca, and trees protected by the California Desert Native Plant Act are also expected, including species list and maps;
4. Results of vegetation and special habitat mapping, as well as weed mapping, as requested in Data Request Set No. 1, including calculations of acreages of permanent and temporary disturbance by vegetation type. The project owner has submitted preliminary information, and, per Data Response 1-5, vegetation was to be re-mapped during Spring 2013 surveys to verify changes since the original mapping (Palen 2013f);
5. A complete report of all spring wildlife survey efforts on the linear facility routes, including desert tortoise surveys, burrowing owl, and other special-status wildlife, including a full wildlife inventory, as is noted in summary;
6. Amended Lake and Streambed Alteration Agreement (LSAA) Notification to be submitted to CDFW, as discussed during the April 17 workshop and requested via email to Alice Karl on April 18 and April 24;
7. Amended 2081 Permit Application (Incidental Take Permit), as the project owner documented would be provided in early 2013 in the Petition to Amend;
8. Bat survey methods write-up covering the work efforts performed during the week of May 6, and discussed at staff's May 6, 2013 workshop;
9. Staff also expects a complete sand transport study, as requested in Data Request Set No. 2, and acknowledges that a summary report was docketed within Data Response Set 2; staff is awaiting receipt of the final and full report;
10. Results of supplemental burrowing owl surveys conducted to support the linear facilities; and
11. Results of all NECO plan-required surveys, including Couch's spadefoot toad surveys, per the protocol included in Data Response 1-5.

CULTURAL RESOURCES

Cultural Resources still is awaiting the majority of information requested in Data Request Set 2 and Set 3:

From Set 2, Energy Commission staff is still awaiting responses to Data Request #24 (Class II Pedestrian Archaeological Survey of the original project area, considering the new development footprint), and Data Request #25 (an accompanying Technical Report for the completed Class II Survey). Also, the project owner has yet to provide evidence of completing an archaeological and ethnographic field survey of certain identified areas of the Coxcomb and Palen Mountains as described in Data Request #27, and an accompanying Technical Report as described in Data Request #28. It is Energy Commission staff's understanding that completion of all four of these items first requires approval of a study work plan and issuance of a Fieldwork Authorization (FA) from the Bureau of Land Management (BLM). These items have been approved, but BLM has subsequently required a minimum 1-week waiting period before issuing a Notice to Proceed (NTP) for work to commence. The waiting period theoretically would expire end of week July 1st-5th. Lastly, Energy Commission staff received responses to Data Request #29 (Records Search of any historic built structures in the expanded project area of analysis (PAA) and #30 (Ethnographic-Ethno-Historic Records Search of expanded PAA) were received on the date this PSA was finalized for publication, and is in the initial stages of review.

From Set 3, Energy Commission staff received a partial response to Data Request #54 (listing of all historical buildings and structures in the expanded PAA) on the date this PSA was finalized, and this information is in the initial stages of review. Energy Commission staff has received no responses to Data Request #55 (mapping of historic structures in the expanded PAA), Data Request #56 (Evaluation Report for historic structures in Desert Center) or Data Request #57 (Evaluation Report of any other historic structures in the expanded PAA not included in the report requested in Data Request #56.

SOCIOECONOMICS

To fully determine impacts from the PSEGS construction workforce, staff still needs to identify all of the construction workforce by craft so that each specialty craft can be identified with the labor supply in the Employment Development Department employment projections and labor by skill in the Riverside/San Bernardino/Ontario Metropolitan Statistical Area (MSA). Staff will formally request that the project owner provide this information in Data Request Set No. 4 (to be published shortly after releasing this PSA), so staff can determine whether there would be a need to supply the PSEGS with workers by craft from outside the Riverside/San Bernardino/Ontario MSA.

TRAFFIC AND TRANSPORTATION

Staff needs additional information as requested in Data Request Set No. 1, #14, to determine whether the proposed PSEGS's construction traffic impacts would cause significant impacts to traffic level of service (LOS) on nearby roadways and intersections.

WASTE MANAGEMENT

Staff is awaiting updated PSEGS information, including: an updated Environmental Site Assessment; the estimated type and volume of hazardous and non-hazardous waste expected to be generated by construction and operation of the proposed project; and an updated summary of the anticipated operation waste streams, estimated waste volumes, and generation frequency and proposed management methods. This information is expected to be available for analysis in the FSA.

WORKER SAFETY AND FIRE PROTECTION

Recent incidences at a solar tower power plant in California have raised concerns about operating procedures within the tower, worker conditions, and emergency response to incidents in the solar power tower. Staff needs further information and clarification regarding how the project owner proposes to operate the two proposed PSEGS towers to properly assess worker safety and fire protection at the PSEGS. This information will be requested in Data Request Set No.4, which will be released shortly after the PSA is published.

GEOLOGY AND PALEONTOLOGY

Staff recommends that PSEGS site characterization of the paleontological resources be conducted prior to the FSA. The characterization should be planned and conducted under the direction of a qualified paleontologist who is familiar with the site region, in accordance with the BLM's Potential Fossil Yield Classification (PFYC) system. The results of the characterization would enable staff to make a recommendation to the Committee regarding the extent and abundance of the resources, their significance, whether impacts can be mitigated, and the scope of any proposed mitigation. Without site-specific characterization, the significance of impacts to paleontological resources cannot be determined and, based on existing information, the project would create an unmitigable significant impact.

REFERENCES

OPR 2013—The Governor's Office of Planning and Research (OPR), CEQAnet Database. Accessed May, 2013. On-line http://www.ceqanet.ca.gov/

Riverside County 2013—Riverside County Planning Department. Accessed May, 2013. On-line http://www.tlma.co.riverside.ca.us/planning/

Solar Millennium2009a—Solar Millennium (tn: 52939). Application for Certification for the Palen Solar Power Plant, Vols.1 & 2, dated August 24, 2009.

ATTACHMENT A

CUMULATIVE IMPACTS

Preparation of a cumulative impact analysis is required under CEQA. In the CEQA Guidelines, “a cumulative impact consists of an impact which is created as a result of the combination of the project evaluated in the EIR together with other projects causing related impacts” (14 Cal. Code Regs., §15130(a)(1)). Cumulative impacts must be addressed if the incremental effect of a project, combined with the effects of other projects is “cumulatively considerable” (14 Cal. Code Regs., §15130(a)). Such incremental effects are to be “viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects” (14 Cal. Code Regs., §15164(b)(1)). Together, these projects comprise the cumulative scenario which forms the basis of the cumulative impact analysis.

CEQA also states that both the severity of impacts and the likelihood of their occurrence are to be reflected in the discussion, “but the discussion need not provide as great detail as is provided for the effects attributable to the project alone. The discussion of cumulative impacts shall be guided by standards of practicality and reasonableness, and shall focus on the cumulative impact to which the identified other projects contribute rather than the attributes of other projects which do not contribute to the cumulative impact” (14 Cal. Code Regs., §15130(b)).

DEFINITION OF THE CUMULATIVE PROJECT SCENARIO

Cumulative impacts analysis is intended to identify past, present, and probable future actions that are closely related either in time or location to the project being considered, and consider how they have harmed or may harm the environment. Most of the projects listed in the cumulative projects tables (**Executive Summary Tables 1, 2, 3,** and **4)** have, are, or will be required to undergo their own independent environmental reviews under CEQA. The cumulative project list was developed by staff in the fall of 2012 during the Rio Mesa Solar Electric Generating Facility AFC process and will be updated in the FSA.

Executive Summary Table 1
Existing Projects

Project Name	Location	Ownership	Status	Project Description	Approximate Distance From Project Site (Miles)
Interstate 10	Linear interstate highway running from Santa Barbara to Blythe	Caltrans	Existing	Interstate 10 is a major east-west route for trucks delivering goods to and from California. It is a four-lane, divided highway in the project region	77.24
Chuckwalla Valley State Prison	19025 Wiley's Well Rd., Blythe, CA	CA Dept. of Corrections & Rehabilitation	Existing	State prison providing long-term housing and services for male felons classified as medium and low-medium custody inmates jointly located on 1,720 acres of state owned property	19.95
Ironwood State Prison	19005 Wiley's Well Rd., Blythe, CA	CA Dept. of Corrections & Rehabilitation	Existing	ISP jointly occupied with Chuckwalla Valley State Prison 1,720 acres of state-owned property, of which ISP encompasses 640 acres. The prison complex occupies approximately 350 acres with the remaining acreage used for erosion control, drainage ditches, and catch basins	18.81
Blythe Energy Project	City of Blythe, north of I-10, 7 miles west of the CA/AZ border	Blythe Energy, LLC	Existing	520 MW combined-cycle, natural gas-fired electric-generating facility. Project is connected to the Buck Substation owned by the Western Area Power Administration (Western)	30.78
West-wide Section 368 Energy Corridors	Riverside County, parallel to DPV corridor	BLM, Department of Energy (DOE), U.S. Forest Service	Approved by BLM and U.S. Forest Service	Designation of corridors on federal land in the 11 western states, including California, for oil, gas, and hydrogen pipelines and electricity transmission and distribution facilities (energy corridors). One of the corridors runs along the southern portion of Riverside County	16.02

Project Name	Location	Ownership	Status	Project Description	Approximate Distance From Project Site (Miles)
Eagle Mountain Pumping Plant	Eagle Mountain Rd, west of Desert Center	Metropolitan Water District of Southern California (MWD)	Existing	144-foot pumping plant that is part of MWD's facilities	15.56
Recreational Opportunities	Eastern Riverside County	BLM	Existing	BLM has numerous recreational opportunities on lands in eastern Riverside County along the I-10 corridor, including the Corn Spring's Campground, Wiley's Well Campground, Coon Hollow Campground, and Midland Long-Term Visitor Area	
Kaiser Mine	Eagle Mountain, north of Desert Center	Kaiser Ventures, Inc	Existing	Kaiser Street mined iron ore at Kaiser Mine in Eagle Mountain and provided much of the Pacific Coast steel in the 1950s. Mining project also included the Eagle Mountain Railroad, 51 miles long. Closed in 1980s	23.84
Blythe Energy Project Transmission Line	From the Blythe Energy Project to Julian Hinds Substation	Blythe Energy, LLC	Existing	Transmission line modifications including upgrades to Buck Substation, approximately 67.4 miles of new 230-kV transmission line between Buck Substation and Julian Hinds Substation, upgrades to the Julian Hinds Substation, and installation of 6.7 miles of new 230-kV transmission line between Buck Substation and SCE's DPV1 500-kV transmission line	4.54
Blythe PV Project	Blythe	First Solar	Existing	21-MW solar photovoltaic (PV) project on 200 acres	27.82
Chuckwalla Valley Raceway	Desert Center Airport	Developer Matt Johnson	Approved by County of Riverside	5.8-mile racetrack on 400 acres of land that used to belong to Riverside County and was used as the Desert Center Airport	8.12

Executive Summary Table 2
Foreseeable Projects in the Project Area

Project Name	Location	Ownership	Status	Project Description	Approximate Distance From Project Site (Miles)
Four Commercial Projects	Blythe	Various	Approved	Four commercial projects have been approved by the Blythe Planning Department, including the Agate Road Boat& RV Storage, Riverway Ranch Specific Plan, Subway Restaurant and Motel, and Agate Senior Housing Development. Dates of construction are unknown at this time	36.48
Intake Shell	Blythe	Shell Oil	Under Construction	Reconstruction of a Shell facility located at Intake & Hobson Way	37.44
Three Residential Developments	Blythe	Various	Under Construction	3 residential development projects are under construction: River Estates at Hidden Beaches, The Chanslor Place, Mesa Bluffs. 125 single-family homes are currently being built	35.53
Twelve Residential Developments	Blythe	Various	Approved or under construction	12 residential development projects have been approved by the Blythe Planning Department: Vista Palo Verde, Van Weelden, Sonora South, Ranchette Estates, Irvine Assets, Chanslor Village, St. Joseph's Investments, Edgewater Lane, The Chanslor Place Phase IV, Cottonwood Meadows, Palo Verde Oasis. A total of 1,005 single-family residences are proposed	36.18

Project Name	Location	Ownership	Status	Project Description	Approximate Distance From Project Site (Miles)
Devers-Palo Verde No. 2 (DPV2) Trans-mission Line Project	From the Midpoint Substation to Devers Substation	SCE	California Public Utility Commission (CPUC) approved petition to modify request to construct CA-only portion, 11/2009	New 500-kV transmission line parallel to the existing DPV1 from Midway Substation, approximately 10 miles southeast of Blythe, to the SCE Devers Substation, near Palm Springs. The ROW for the 500-kV transmission line would be adjacent to the existing DPV ROW	26.77
Colorado River Substation Expansion	10 miles southwest of Blythe	SCE	Approved 7/2011	500/230-kV substation, constructed in an area approximately 1,000 ft by 1,900 ft	35.72
Desert Southwest Transmission Line	118 miles in length, primarily parallel to DPV	Imperial Irrigation District	Approved	118-mile 500-kV transmission line from a new substation/switching station near the Blythe Energy Project to the existing Devers Substation, located approximately 10 miles north of Palm Springs	27.64
Eagle Mountain Pumped Storage Project	Eagle Mountain iron ore mine, north of Desert Center	Eagle Crest Energy	Federal Energy Regulatory Commission (FERC) draft EIS published in 12/2010	1,300-MW pumped storage energy-generation project on 2,200 acres of public and private land, designed to store off-peak energy to use during peak hours	19.78
SCE Red Bluff Substation	South of I-10 at Desert Center	SCE	Approved	A proposed new 500/220-kV substation, 2 new parallel 500-kV transmission lines, each about 2,500–3,500 feet long	5.50
Desert Center 50	Desert Center	US Solar Holdings	Under review	A planned 49.5-MW fixed, flat-panel solar PV project	7.95
Sol Orchard	Desert Center	Sol Orchard	Approved	A planned 1.5-MW fixed, flat-panel solar PV project north of I-10, east of SR-177, west of Desert Center Airport	107.01
Blythe Mesa Solar I	Blythe	Renewable Resources Group	Under review	A planned 485-MW solar PV project on private land in Blythe	32.78

Project Name	Location	Ownership	Status	Project Description	Approximate Distance From Project Site (Miles)
Blythe Solar Power Generation Station 1	Blythe	South-western Solar Power	Approved	A planned 4.76-MW solar PV project, including 69 PV panels that stand 50 feet tall and 72 feet wide	32.61
Eagle Mountain Landfill Project	Eagle Mountain, North of Desert Center	Mine Reclamatio n Corporation and Kaiser Eagle Mountain	Court of Appeals	Project proposed for a 4,000acre portion of the Kaiser Eagle Mountain Mine in Riverside County	16.71
Wiley's Well Communica-tion Tower	East of Wiley's Well Road just south of I-10	Riverside County	Final EIR	Approximately 20 communication sites to provide voice and data transmission for Riverside County's fire and law enforcement agencies	18.86
Eagle Mountain Wind Project Met Towers	South of Eagle Mountain, north of Joshua Tree National Park	LH Renewable	Wind testing pending	Meteorological towers for wind testing	17.71
Blythe Energy Project Transmission Line	From the Blythe Energy Project to Devers Substation	Blythe Energy	Under Construction	67.4 miles of new 230-kV transmission line between Buck Substation and Julian Hinds Substation	4.54
Green Energy Express Transmission Line Project	Eagle Mountain Substation to Southern California	Green Energy Express	Approved	70-mile, double-circuit, 500kV transmission line from Eagle Mt. Substation to Southern California	29.54
Yuma Crude Oil Refinery	100 miles southwest of Phoenix and 48 miles east of Yuma	Arizona Clean Fuels Yuma	Under review	Oil refinery on 1,400 acres	105.79

Executive Summary Table 3
Foreseeable Projects in the California Desert

Project Name	Location	Ownership	Status	Project Description	Approximate Distance From Project Site (Miles)
Blythe Energy Project II	Near Blythe Airport	Blythe Energy	Approved	520-MW, combined-cycle power plant, on 30 acres within the Blythe Energy Project's 76-acre site	30.82
Blythe Solar Power Project	North of I-10, north of Blythe Airport	Solar Millennium	Approved	1,000-MW solar trough facility on 7,540 acres	26.33
NextEra/ Florida Power & Light (FPL) McCoy	13 miles northwest of Blythe	McCoy Solar	Notice of Intent (NOI) to prepare an EIS, 8/29/11	Up to 750-MW solar PV project on 7,700 acres of BLM land and 470 acres of private land, with a 16-mile gen-tie	24.82
McCoy Soleil Project	10 miles northwest of Blythe	EnXco	Plan of Develop-ment (POD) submitted to Palm Springs BLM	300-MW solar power tower project located on 1,959 acres; Requires a 14-mile transmission line to the proposed SCE Colorado River Substation south of I-10	24.96
Genesis Solar Energy Project	North of I-10, 25 miles west of Blythe, 27 miles east of Desert Center	NextEra (FPL)	Approved, under construction	250-MW solar power project on 1,950 acres north of Ford Dry Lake, with 6-mile natural gas pipeline and 5.5-mile gen-tie line to the Blythe Energy Center-Julian Hinds transmission line	12.47
Silverado Power I, II, III	West of SR-177, North of I-10	Silverado Power	On hold	3 solar PV projects with a 400-MW total capacity.	342.12

Project Name	Location	Ownership	Status	Project Description	Approximate Distance From Project Site (Miles)
Rice Solar Energy Project	Rice Valley, Eastern Riverside County	Rice Solar Energy	Approved, construction date unknown at this time	150-MW solar power tower project with liquid salt storage; located on 1,410 acres; includes a 650 foot-tall power tower, an approximately 10-mile-long interconnection tie-line to the Western Parker-Blythe transmission line	34.55
Blythe Airport Solar I Project	Blythe Airport	Riverside County	Approved	100-MW solar PV project on 640 acres of Blythe airport land	29.12
Desert Quartzite	South of I-10, 8 miles southwest of Blythe	First Solar	Plan of Develop-ment submitted to BLM	600-MW solar PV project on 7,724 acres, adjacent to DPV1 transmission line and SCE Colorado River Substation	27.55
Desert Sunlight Project	6 miles north of Desert Center	First Solar	Approved	550-MW solar PV project on 4,144 acres of BLM land, requiring a 12-mile transmission line to the planned Red Bluff Substation	13.53
Eagle Mountain Wind Project Met Towers	South of Eagle Mountain, north of Joshua Tree National Park	LH Renewable	Wind testing pending	Meteorological towers for wind testing	17.71
Gestamp Asetym Solar	Northwest of Blythe	Gestamp Asetym Solar	Environment al Protection Agency (EPA) review	37-MW solar power plant	352.62
EnXco	North of Wiley's Well Rd, east of Genesis Solar Energy Project	EnXco	POD submitted to BLM	300-MW solar PV project	17.21
Desert Lily Soleil Project	6 miles north of Desert Center	EnXco	POD submitted to BLM	100-MW solar PV project on 1,216 acres of BLM land	6.87
Big Maria Vista Solar Project	North of I-10, 12 miles nw Blythe	Bullfrog Green Energy	POD submitted to BLM	500-MW solar PV project on 2,684 acres	28.69

Project Name	Location	Ownership	Status	Project Description	Approximate Distance From Project Site (Miles)
Chuckwalla Solar I	1 mile north of Desert Center	Chuckwalla Solar I	POD submitted to BLM	200-MW solar PV project on 4,083 acres	6.40
Mule Mountain Solar Project	South of I-10, 4 miles west of Blythe	Bullfrog Green Energy	POD submitted to BLM	500-MW solar PV project on 2,684 acres	22.04
Quartzsite Solar Energy	10 miles north of Quartzsite	Solar Reserve	Draft EIS released	100-MW, 653-foot-tall power tower on 1,500 acres of BLM land	57.14
Desert Harvest	6 miles north of Desert Center	EnXco	DEIS published	100-MW solar PV project on 930 acres	11.78
Ocotillo Sol	9 miles southwest of El Centro	San Diego Gas & Electric (SDG&E)	NOI published	18MW solar PV project on 115 acres	73.57
Mount Signal Solar Farm #1	Calexico	82LV 8ME	(Environment-al Assessment) pending	600-MW solar PV project on 1,440 acres	50.84
Imperial Solar Energy Center West	El Centro	CSOLAR Development	ROW granted	250-MW solar facility on 65 acres of BLM land	73.11
Ocotillo Wind Energy Facility	5 miles west of Ocotillo	Ocotillo Express	ROW approved	115-MW wind facility on 12,436 acres of BLM land	80.09
Starwood Solar 1	75 miles west of Phoenix	Lockheed Martin	Under Construction	290-MW concentrated solar power plant	120
Agua Caliente PV	Between Yuma and Phoenix	First Solar	Under Construction	290-MW solar PV on 2,400 acres	111.67

Executive Summary Table 4
Projects Submitted and On Hold

Project Name	Location	Ownership	Status	Project Description	APPROXIMATE DISTANCE FROM PROJECT SITE (MILES)
Ogilby Solar	Chocolate Mountain	Pacific Solar Investments	Revised POD 8/26/11	1,500-MW Solar Thermal Trough	53.37
Mule Mountain III	Chuckwalla Valley	Enxco	Pending	200-MW Solar PV	22.04
La Posa Solar Thermal	Stone Cabin, AZ	Pacific Solar Investments	Pending	2,000-MW Solar	60.04
Nextlight Quartzsite	Quartzsite, AZ	Nextlight Renewable Power	Pending	50-MW concentrated solar power plant, trough	57.91
Wildcat Quartzsite	Quartzsite, AZ	Wildcat Quartzsite Solar	Pending	800-MW concentrated solar power plant, tower	62.34
Oro Valley Wind	Black Mountain, CA	Oro Valley Power	Pending	180-MW Wind Project	47.58
Imperial Wind	Black Mountain, CA	Imperial Wind	Authorized	48–65-Mw	46.87
Lh Renewables Riverside County Type II	Eagle Mountain, CA	Lh Renewables	Pending	Unknown	17.71
Milpitas Wash	Chuckwalla Valley	John Deere Renewables	Authorized	Unknown	19.96
Graham Pass Wind Project	Riverside County	Graham Pass, Inc	Pending	175-MW Wind Project	14.6
Palo Verde Mesa Solar Project	Northwest of Blythe	Renewable Resources Group	(NOP) Filed	486-MW Solar	29.26

Under CEQA, there are two acceptable and commonly used methodologies for establishing the cumulative impact setting or scenario: the “list approach” and the “projections approach.” The first approach would use a “list of past, present, and probable future projects producing related or cumulative impacts.” (14 Cal. Code Regs., §15130(b)(1)(A)). The second approach is to use a “summary of projections contained in an adopted general plan or related planning document, or in a prior environmental document which has been adopted or certified, which described or evaluated regional or area wide conditions contributing to the cumulative impact.” (14 Cal. Code Regs., §15130(b)(1)(B)). This PSA uses the “list approach” for purposes of state law to provide a tangible understanding and context for analyzing the potential cumulative effects of the proposed project.

In order to provide a basis for cumulative analysis for each discipline, this section provides information on other projects in both maps and tables. All projects used in the Cumulative Impacts Analysis for this PSA are provided in cumulative projects tables.

Executive Summary Figure 1, presented at the end of this section, shows projects within 50 miles of the PSEGS site. However, within the desert region, the specific area of cumulative effect varies by resource. For this reason, each discipline has identified the geographic scope for the discipline's analysis of cumulative impacts, which may exceed the 50-mile buffer shown in Figure 1.

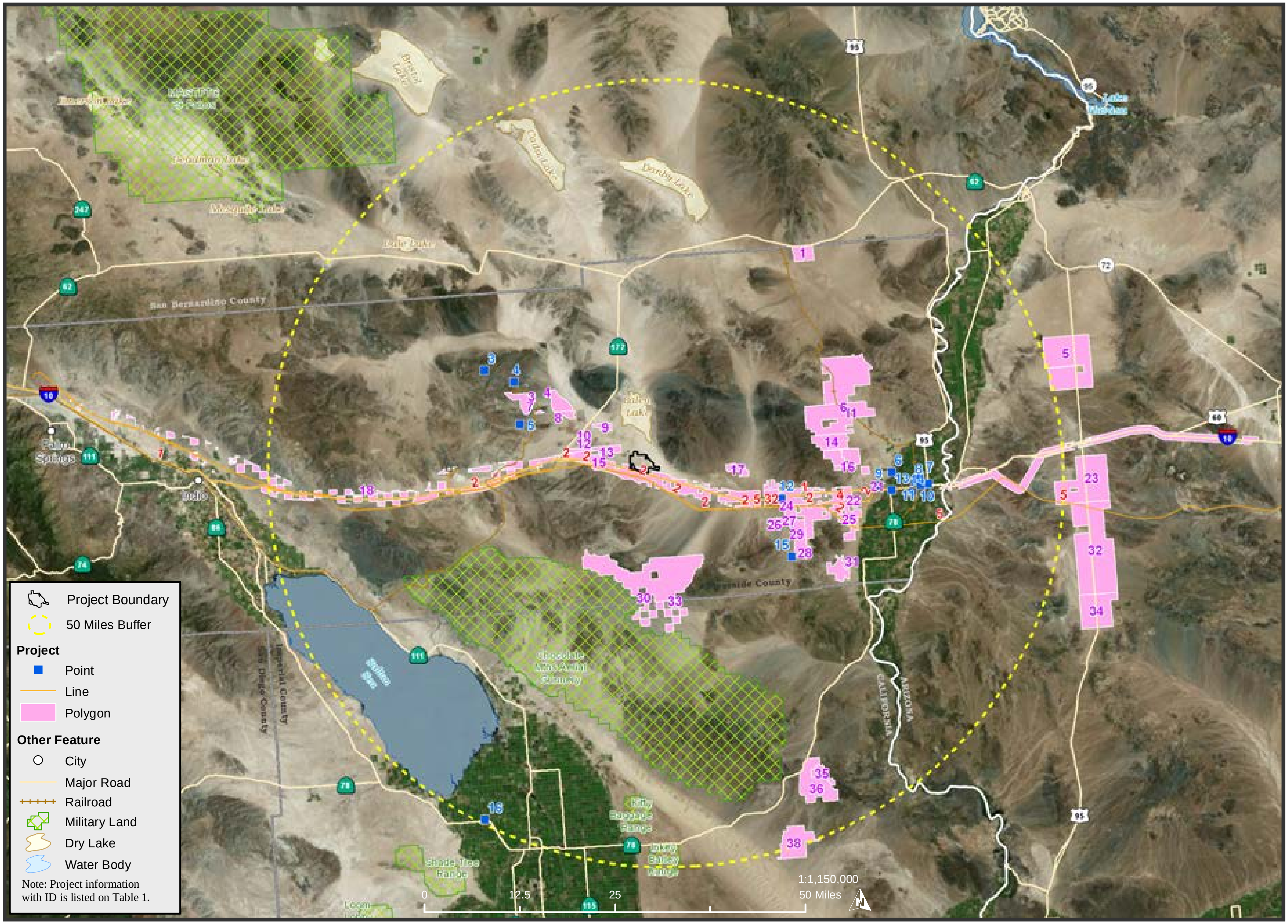
APPROACH TO CUMULATIVE IMPACT ANALYSIS

This PSA evaluates cumulative impacts within the analysis of each resource area, following these steps:

- Define the geographic scope of cumulative impact analysis for each discipline, based on the potential area within which impacts of the PSEGS could combine with those of other projects.
- Evaluate the effects of the PSEGS in combination with <u>past and present</u> (existing) <u>projects</u> within the area of geographic effect defined for each discipline.
- Evaluate the effects of the PSEGS with <u>foreseeable future projects</u> that occur within the area of geographic effect defined for each discipline. This section is divided into Foreseeable Future Projects and Foreseeable Renewable Projects in the California Desert for ease of the reader.

EXECUTIVE SUMMARY - FIGURE 1

Palen Solar Electric Generating System - Cumulative Impacts



CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: Microsoft Bing Aerial, BrightSource, OpenStreetMap - May 2013, Bureau of Land Management - May 2013

EXECUTIVE SUMMARY - FIGURE 1 - TABLE 1

Palen Solar Electric Generating System - Cumulative Impacts

POINT

LABEL	PROJECT	STATUS	DISTANCE (Mile)
1	Gestamp Asetym Solar	Foreseeable	352.62
2	Silverado Power I, II, III	Foreseeable	342.12
3	Kaiser Mine	Existing	23.84
4	Eagle Mountain Pumping	Foreseeable	19.78
5	Eagle Mountain Landfill	Foreseeable	16.71
6	Blythe Solar Power Generation Station 1	Foreseeable	32.61
7	Twelve Residential Developments	Foreseeable	36.18
8	Colorado River Substation Expansion	Foreseeable	35.72
9	Blythe Energy Project	Existing	30.78
10	Intake Shell	Foreseeable	37.44
11	Four Commercial Projects	Foreseeable	36.48
12	Wileys Well Communication Tower	Foreseeable	18.86
13	Blythe Mesa Solar I	Foreseeable	32.78
14	Three Residential	Foreseeable	35.53
15	Recreational Opportunities	Existing	23.07
16	Mount Signal Solar Farm #1	Foreseeable	50.84
17	Yuma Crude Oil Refinery	Foreseeable	105.79

LINE

LABEL	PROJECT	STATUS	DISTANCE (Mile)
1	Interstate 10	Existing	77.24
2	Blythe Energy Project Transmission Line	Foreseeable	4.54
3	Green Energy Express Transmission Line Project	Foreseeable	29.54
4	Desert Southwest Transmission Line Project	Foreseeable	27.64
5	Devers-Palo Verde No. 2 Transmission Line Project	Foreseeable	26.77

POLYGON

LABEL	PROJECT	STATUS	DISTANCE (Mile)
1	Rice Solar Energy Project	Foreseeable	34.55
2	L.H. Renewables Riverside County Type II	Pending	17.71
3	Eagle Mountain Wind Project	Foreseeable	17.71
4	Desert Sunlight Project	Foreseeable	13.53
5	Quartzsite Solar	Pending	57.14
6	Big Maria Vista Solar	Foreseeable	28.69
7	Eagle Mountain Pumping Plant	Existing	15.56

POLYGON

LABEL	PROJECT	STATUS	DISTANCE (Mile)
8	Desert Harvest	Foreseeable	11.78
9	Desert Lily Soleil Project	Foreseeable	6.87
10	Chuckwalla Valley Raceway	Existing	8.12
11	McCoy Soleil Project	Foreseeable	24.96
12	Desert Center 50	Foreseeable	7.95
13	Power Partners SW - Chuckwalla Solar I	Foreseeable	6.40
14	NextEra (FPL) McCoy	Foreseeable	24.82
15	SCE Red Bluff Substation	Foreseeable	5.80
16	Blythe Solar Power Project	Foreseeable	26.33
17	Genesis Solar Energy Project	Foreseeable	12.47
18	West-wide Section 368 Energy Corridors	Existing	16.02
19	Blythe Airport Solar I Project	Foreseeable	29.12
20	EnXco	Foreseeable	17.21
21	Blythe Energy Project II	Foreseeable	30.82
22	Blythe PV Project	Existing	27.82
23	Nextlight Quartzsite	Pending	57.91
24	Sonoran West	Pending	23.00
25	Desert Quartzite	Foreseeable	27.55
26	Ironwood State Prison	Existing	18.81
27	Chuckwalla State Prison	Existing	19.95
28	Mule Mountain III	Pending	22.04
29	Mule Mountain Solar Project	Foreseeable	22.04
30	Graham Pass Wind Project	Pending	14.60
31	Palo Verde Mesa Solar Project	Pending	29.26
32	La Posa Solar Thermal	Pending	60.04
33	Milpitas Wash	Pending	19.96
34	Wildcat Quartzsite	Pending	62.34
35	Imperial Wind	Pending	46.87
36	Oro Valley Wind	Pending	47.58
37	Sol Orchard	Foreseeable	107.01
38	Ogilby Solar	Pending	53.37
39	Imperial Solar Energy Center West	Foreseeable	73.11
40	Ocotillo Wind	Foreseeable	80.09
41	Ocotillo Sol	Foreseeable	73.57

INTRODUCTION

Christine Stora

On December 17, 2012, Palen Solar Holdings, LLC (PSH), filed the petition with the California Energy Commission requesting to modify the Palen Solar Power Project (PSPP). The PSPP, as licensed by the Energy Commission on December 15, 2010 (Order No. 10-1215-19, the “Final Decision,” 09-AFC-7), was a 500-megawatt (MW) solar thermal power-generating facility utilizing parabolic trough technology. The PSPP encompassed approximately 4,366 acres located approximately one-quarter mile north of Interstate 10, approximately 10 miles east of Desert Center, and approximately halfway between the cities of Indio and Blythe, in Riverside County, California.

The modifications proposed in the petition include replacing the parabolic trough solar collection system with BrightSource’s solar tower technology. Heliostats—elevated mirrors guided by a tracking system mounted on a pylon—focus the sun’s rays on a solar receiver steam generator tower near the center of each solar field to create steam to drive a turbine that provides electricity.

In the petition, PSH also requested that the project name be changed from Palen Solar Power Project to Palen Solar Electric Generating System (PSEGS). In this document, the acronym, “PSPP,” refers to the approved project, and the acronym, “PSEGS,” refers to the proposed modified project.

AMENDMENT PROCESS

The purpose of the Energy Commission’s review process is to assess the impacts of the proposed PSEGS on environmental quality and public health and safety. The Energy Commission will evaluate the impacts caused by the proposed changes to the approved project and will determine if the PSEGS would remain in compliance with applicable laws, ordinances, regulations, and standards (LORS) (Title 20, Calif. Code of Regulations, section 1769).

The petition will be processed as an amendment to the PSPP Final Decision.

PURPOSE OF THIS REPORT

This Preliminary Staff Assessment (PSA) is being published by the Energy Commission and is staff’s independent analysis of the petition to amend the Palen Solar Power Project (PSPP). This PSA is a staff document. It is neither a Committee document, nor a draft Decision. The PSA describes the following:

- the proposed modified project (PSEGS);
- the updated existing environment from the original decision;
- whether the modified facilities can be constructed and operated safely and reliably in accordance with applicable LORS;
- the environmental consequences of the modified project in conjunction with other existing and known planned developments;

- the potential cumulative impacts of the modified project in conjunction with other existing and known planned developments;
- modified and/or new conditions of certification proposed by the project owner, staff, interested agencies, local organizations, tribes, and intervenors which may lessen or eliminate potential impacts of the PSEGS;
- modified and/or new conditions of certification under which the project should be construction and operated, if the modified project is certified; and,
- project alternatives.

The analyses contained in this PSA are based upon information from the: 1) Petition to Amend and Supplements to the Petition to Amend provided by the project owner, 2) responses to energy commission staff data requests, 3) supplementary information from local, state, and federal agencies, interested organizations and individuals, 4) existing documents and publications including the record from the approved PSPP, 5) independent research, 6) comments at public workshops, and 7) other docketed communications. The analyses for most technical areas include discussions of proposed modifications to conditions of certification and new conditions of certification. Each condition of certification is followed by a proposed means of "verification." All changes to conditions to certification in the original decision are shown in this document so the reader can easily identify the changes being made to the project license. Deleted text to the conditions of certification is shown as ~~strikethrough~~, new text is **<u>bold and underlined</u>**.

The PSA presents preliminary conclusions about potential environmental impacts and conformity with LORS of the modified project, as well as modified and/or new conditions that apply to the design, construction, operation and closure of the facility.

This document is intended to be a complete review of the modified project and in many cases relies on analysis that was prepared for the original PSPP. This information has been reviewed and updated to reflect current conditions and the setting that exists today. Although this document provides a full analysis of the project as a whole, this petition will be processed as an amendment to the PSPP Final Decision. Thus a Decision will only be made by the Energy Commission on the proposed changes to the existing PSPP license.

ORGANIZATION OF THE PRELIMINARY STAFF ASSESSMENT

The sections in this PSA include an Executive Summary, Introduction, Project Description, and a Project Analysis. The Project Analysis contains an Environmental Assessment, Engineering Assessment, Alternatives and General Conditions. The Environmental Assessment contains the following chapters: 1) air quality; 2) biology resources; 3) cultural resources; 4) hazardous materials management; 5) land use; 6) noise and vibration; 7) public health, socioeconomic resources; 8) soil and water resources; 9) traffic and transportation; 10) transmission line safety and nuisance; 11) visual resources; 12) waste management; and 13) worker safety and fire protection. The Engineering Assessment contains the following sections: 14) facility design; 15) geology and paleontology; 16) power plant efficiency; 17) power plant reliability; and 18) transmission system engineering. The Environmental Assessment, Engineering Assessment and General Conditions are followed by a discussion of facility closure, project construction, and operation compliance monitoring plans and a list of staff that assisted in preparing this report.

All of the sections under the Environmental Assessment, Engineering Assessment, and the General Conditions sections include a discussion of: laws, ordinances, regulations and standards (LORS); the regional and site-specific setting; the modified project specific and cumulative impacts; proposed mitigation measures; conclusions and recommendations; and modified and/or new conditions of certification for both construction and operation (if applicable).

AGENCY AUTHORITIES AND RESPONSIBILITIES

The Energy Commission has the exclusive authority to certify the construction, modification, and operation of thermal electric power plants 50 megawatts (MW) or larger within California. The Energy Commission certification is in lieu of any permit required by state, regional, or local agencies and by federal agencies to the extent permitted by federal law (Pub. Resources Code, § 25500 et. seq.). The Energy Commission must evaluate the impacts caused by the proposed changes to the approved project and will determine if the PSEGS would remain in compliance with applicable laws, ordinances, regulations, and standards (LORS) (Title 20, Calif. Code of Regulations, section 1769). However, the Energy Commission typically seeks comments from and works closely with other regulatory agencies that administer LORS that are applicable to the proposed project. The following paragraphs describe the agency coordination that has occurred throughout this amendment process.

U.S. BUREAU OF LAND MANAGEMENT (BLM)

The PSEGS is proposed to be located entirely on land managed by the Bureau of Land Management (BLM) and will require a Right of Way grant from BLM in addition to the certification from the Energy Commission. During the original PSPP proceeding in 2009 and 2010, Energy Commission staff and BLM staff worked closely together on the review and analysis of the project. The Energy Commission and BLM staff issued a joint Draft Environmental Impact Statement/Staff Assessment (DEIS/SA) for the Palen Solar Project on March 18, 2010. The DEIS/SA contained the Energy Commission staff's and BLM's environmental, public health and engineering evaluation of the proposed Palen Solar Project. On May 13, 2011, the BLM Published a Notice Of Availability (NOA) of the Final EIS for the Palen Solar Project in the Federal Register.

During the original licensing case, both the Energy Commission and BLM determined that they would develop and publish separate final documents. The Energy Commission released a Presiding Member's Proposed Decision on November 12, 2010 and approved the Application for Certification on December 15, 2010. BLM has not made a final decision on the project and neither a Record of Decision (ROD) nor a Right of Way (ROW) grant has been issued.

The BLM is in the process of preparing a Draft Environmental Impact Statement (DEIS) for this project. If the project is approved by the BLM, the BLM will issue a ROD for the PSEGS.

Although the Energy Commission and BLM are not publishing a joint document, the Energy Commission and the BLM continue to share staff expertise, information and documentation to promote intergovernmental coordination at the local, state, and federal levels.

U.S. FISH AND WILDLIFE SERVICE (USFWS)

The U.S. Fish and Wildlife Service (USFWS) has jurisdiction to protect threatened and endangered species under the Endangered Species Act (ESA) [16 U.S.C. § 1531 et seq.] and the Migratory Bird Treaty Act [16 U.S.C. §§ 703-712]. Formal consultation with the USFWS under Section 7 of the ESA is required for any federal action that may adversely affect a federally-listed species. This consultation will be initiated through a request by the lead federal Agency – BLM – to initiate formal consultation and the submittal of a Biological Assessment (BA) which determines that the proposed project is likely to adversely affect a listed species. The BLM has already received a biological opinion (BO) for the original PSPP project. Following review of the BA, the USFWS is expected to issue a Revised Biological Opinion for the modified project, which will specify reasonable and prudent measures which must be implemented for the desert tortoise.

THE CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE (CDFW)

The California Department of Fish and Wildlife (CDFW) has the authority to protect water resources of the State through regulation of modifications to streambeds. (Fish and Game Code, Section 1602). The Energy Commission, BLM, and the project owner have provided information to CDFW to assist in their determination of the impacts to streambeds, and their identification of permit and mitigation requirements. The project owner previously filed a Streambed Alteration Agreement with CDFW for the original PSPP project. The project owner has agreed to undertake surveys of the gas pipeline and transmission line alignments, and provide the CDFW an updated Application for Streambed Alteration Agreement for the modified project. The requirements of the Streambed Alteration Agreement will be included as a recommended Condition of Certification/Mitigation Measure.

CDFW also has the authority to regulate potential impacts to species that are protected under the California Endangered Species Act (CESA) [Fish and Game Code Sections 2050-2116]. The Energy Commission certification is in-lieu of streambed alteration agreement and incidental take permits for state-listed species usually granted by CDFW.

NATIVE AMERICAN TRIBES

Tribes were invited to participate in the review of the project and an ethnographic study, based upon a list of 16 affiliated tribes, organizations, and an individual provided by the Native American Heritage Commission and the Bureau of Land Management (BLM).

The Energy Commission staff has held six meetings with interested tribes to discuss the project, tribal concerns and the draft ethnographic report.

ENERGY COMMISSION'S PUBLIC ADVISER'S OFFICE

The Public Adviser advises the public on how to participate in the Energy Commission process, but does not represent members of the public. The Public Adviser's Office attended and presented information at the February 20, 2013 Informational Hearing and Site Visit. The Public Adviser also attended the workshops held on April 17, 2013, and May 1, 2013. The Public Adviser also attended the Tribal Consolation Meeting held on March 22, 2013.

COMMENTS

Written comments received during the amendment process are included in the PSA in the technical sections they apply to. Below is a table summarizing the comments that were received to date.

Table 1- Agency, Intervenor, and Public Comments for PSEGS

Palen Solar Electric Generating System 09-AFC-7C

DATE	DOCUMENT	Air Quality	Alternatives	Biological Resources	Cultural Resources	Efficiency	Facility Design	Funding/Cost	General Opposition	Geological Hazards	Hazardous Materials	Land Use	Noise	Paleontological Resources	Project Overview	Public Health	Reliability	Socioeconomics	Soils	Suggestions/Requests	Support of the Project	Traffic and Transportation	Trans Line Safety & Nuisance	Transmission System Design	Visual Resources	Waste Management	Water Resources	Worker Safety & Fire Protection
1/21/2013	Alfredo Acosta Figueroa Opposition Comment Letter				X																							
2/6/2013	County of Riverside's Comment Letter																											x
3/15/2013	La Cuna de Aztlan Sacred Dites Protection Circle's Opposition to the Petition to amend for Palen Solar				X																							
3/26/2013	Agua Caliente Band Cahuilla Indians Letter re Invitation to Participate in CEC Tribal Consultation				X																							
3/29/2013	Center for Biological Diversity's Status Report		X		X															X								
4/11/2013	Soboba Band of Luiseno Indians Cultural Resources Department Letter of Requests				X																							
4/22/2013	Veena Doijido - Public Comment											X																
5/1/2013	Email from Kevin Emmerich of Basin and Range Watch	X														X												
5/8/2013	Intervenor Center for Biological Diversity's Second Status Report			X	X							X																
5/8/2013	Intervenor Basin and Ranch Watch's Status Report Number Two	X	X	X												X									X			

REFERENCES

CEC 2010b – California Energy Commission/A. Solomon (TN 58252). Revised Staff Assessment Part 1, dated September 1, 2010. Submitted to CEC/Docket Unit on September 1, 2010

CEC 2010c – California Energy Commission/A. Solomon (TN 58497). Revised Staff Assessment Part II, dated September 16, 2010. Submitted to CEC/Docket Unit September 16, 2010

CEC 2013a – California Energy Commission/C. Stora (TN 69756). CEC Staff's Data Request No. 1-18, dated March 1, 2013. Submitted to Applicant/Galati Blek LLP, Scott Galati on March 1, 2013

CEC 2013b – California Energy Commission/C. Stora (TN 70214). Status Update No. 1, dated April 4, 2013. Submitted to CEC/K. Douglas, D. Hochschild, R. Renaud on April 4, 2013

CEC 2013c – California Energy Commission/C. Stora (TN 70404). Data Request Set 2 (Nos. 19-39), dated April 19, 2013. Submitted to Scott Galati on April 19, 2013

CEC 2013d- California Energy Commission/C. Stora (TN 70824). Data Request Set 3 (Nos. 40-39), dated May 15, 2013. Submitted to Scott Galati on May 15, 2013

CEC 2013e – California Energy Commission/C. Stora (TN 70827). Status Update No. 2, dated May 15, 2013. Submitted to CEC/K. Douglas, D. Hochschild, Kenneth Celli on May 15, 2013

Palen 2012a – Palen Solar Holdings, LLC/Galati Blek, Scott Galati (TN 68910). Palen Solar Holdings LLC's Petition for Amendment, dated December 17, 2012. Submitted to CEC/C. Stora on December 18, 2012

PROJECT DESCRIPTION

Christine Stora

PROJECT LOCATION

The PSEGS would be in the same location as the PSPP, but is reduced in size to approximately 3,794 acres, entirely on public land managed by the Bureau of Land Management (BLM) (Right-of-Way No. CACA-048810). The project site is located approximately ¼ mile north of Interstate 10, approximately ten miles east of Desert Center and approximately halfway between the cities of Indio and Blythe, in Riverside County, California. (See **Project Description Figure 1**).

APPROVED PROJECT DESCRIPTION AND PROPOSED MODIFICATIONS

PALEN SOLAR POWER PROJECT APPROVED BY THE ENERGY COMMISSION ON DECEMBER 15, 2010

The 2010 Final Decision for the PSPP approved a solar thermal generating facility that would consist of two separate units of 250-MW solar parabolic trough technology, with a total nominal capacity of 500 MW. With this technology, arrays of parabolic mirrors focus the sunlight on a receiver tube to create and collect heat energy. The receiver tube is located at the focal point of the trough's parabola. A heat transfer fluid (HTF) is heated to 750°F as it circulates through the receiver tubes. The HTF is then piped through a series of heat exchangers to generate high pressure steam. The steam is then fed to a traditional steam turbine generator where electricity is produced. Individual components of the PSPP included:

- Graded Solar Field & Power Block #1 (east);
- Graded Solar Field & Power Block #2 (west);
- Access road from Corn Springs Road;
- Warehouse/maintenance building, assembly hall, and laydown area;
- Telecommunications lines;
- Liquified petroleum gas (LPG) tank;
- Concrete batch plant;
- Fuel depot;
- On-site transmission facilities, including central internal switchyard;
- Single-circuit, 230-kV transmission line interconnecting to Southern California Edison's (SCE) Red Bluff Substation;
- Groundwater wells used for water supply;
- Four evaporation ponds for wastewater;

- Septic systems for sanitary wastewater; and
- Land treatment plots for remediating spills of Therminol HTF.

During the Energy Commission's licensing process, technical staff concluded that the PSPP as originally proposed would result in unmitigable significant adverse impacts to biological resources associated with sand transport interference. Two other site configuration alternatives were submitted by the original applicant in an effort to accommodate staff's and other biological agencies' concerns. The alternative configurations (Reconfigured Alternatives 2 and 3) moved the project facilities westerly in order to prevent the project footprint from interfering with the area with the greatest sand transport potential. Reconfigured Alternative 2 incorporated into the project boundary 240 acres of private land near the southeast corner of the site, over which the PSPP owner did not have control. Reconfigured Alternative 3 did not incorporate private land. Because of the lack of ownership of the private land used in Reconfigured Alternative 2, the Energy Commission approved use of either Reconfigured Alternative 2 or Reconfigured Alternative 3. (See **Project Description Figures 2 and 3**)

PROPOSED MODIFICATIONS

The PSEGS proposal includes replacing the parabolic trough solar collection system and associated HTF with solar tower technology. The solar tower technology would create steam to run an electricity generator by using a field of 85,000 elevated mirrors known as heliostats—each approximately 12 feet tall, mounted on pylons and guided by a sun-tracking system to focus the sun's rays on a solar receiver steam generator (SRSG) on top of a 750-foot solar tower located near the center of each solar field. Access to the site would be the same as the PPSP with an access road from Corn Springs Road. The project would continue to interconnect to the regional transmission grid at SCE's Red Bluff Substation, which is currently under construction. The PSEGS would be comprised of two adjacent solar fields and associated facilities with a total combined nominal output of approximately 500 MW. PSH proposes to develop the PSEGS in two operational units, each consisting of one solar field, one tower, and a power block capable of producing approximately 250 MW of electricity. (See Project Description Figures 4, 5, 6, and 7).

Two natural gas-fired auxiliary boilers are proposed for each power block, for a total of four for the project. A startup boiler would be used during the morning startup cycle to assist the power generation equipment in coming up to operating temperature more quickly and for augmenting the solar operation when solar energy diminishes or during transient cloudy conditions. Each solar field also includes a night preservation boiler to provide steam to the gland systems of the steam turbine and boiler feedwater pump turbine to prevent air ingress overnight and during other shutdown periods when steam is not available from the SRSG. This boiler would also provide pegging steam to the generator during these shutdowns.

The two units would share common facilities, including an on-site switchyard, a single-circuit, 230-kV generation tie-line, and a common area containing an administration building, warehouse, evaporation ponds, maintenance complex, and a meter/valve station for incoming natural gas service to the site. Other on-site facilities would include access and maintenance roads (either dirt, gravel, or paved), perimeter fencing, tortoise fencing, and other ancillary security facilities.

The PSEGS footprint is smaller by 572 acres than the original footprint of the PSPP. While the PSPP included the use of a private parcel (of approximately 40 acres) located in the northeast portion of the site, the PSEGS would not include any development within this private parcel. The PSPP also had Energy Commission approval to develop the private parcels (approximately 240 acres) located in the southeastern portion of the site, if the project owner acquired the parcels. The PSEGS owner would not develop these private parcels.

The primary modifications to the PSPP are as follows:

- Two 250-MW power-generating units, each consisting of a dedicated field of approximately 85,000 heliostats, a 750-foot solar tower and receiver, and a power block;
- An approximately 15-acre common facilities area located in the southwestern corner of the site, with an administrative/warehouse building and two 2-acre evaporation ponds (reduced from four 2-acre evaporation ponds for the PSPP);
- An approximately 203-acre temporary construction laydown area located in the southwestern portion of the site immediately north of the common facilities area;
- Re-routing of the generation tie-line near the western end of the route and around the newly constructed Red Bluff Substation; the purpose of this re-routing is to align the PSEGS generation tie-line route immediately adjacent to the NextEra Desert Sunlight generation tie-line to minimize crossings over Interstate 10 and to ensure easy entry into the Red Bluff Substation nearest the PSEGS breaker position;
- Removal of the secondary emergency access road and addition of two secondary access gates for emergency vehicles to enter the site;
- Re-routing of the redundant telecommunication line along the generation tie-line route;
- Natural gas delivery from a new extension of the existing Southern California Gas (SoCal Gas) distribution system to the project boundary;
- Reduction of the project footprint from 4,366 acres to 3,794 acres;
- Reduction of the amount of grading by 4.3 million cubic yards because the heliostat technology does not require an entirely flat surface;
- Reduction of the amount of water used by 99 acre-feet per year (AFY); and
- An increase in NOx emissions from the use of the auxiliary boilers.

COMMON FACILITIES AREA

A 15-acre common facilities area would be established on the southwestern corner of the site to accommodate an administration, warehouse, and maintenance complex, and an asphalt-paved visitor and employee parking area. The common facilities area also includes two 2-acre evaporation ponds. The administration complex would be served by power from the local 12.47-kV distribution system, and by water from wells located in the common facilities area. The common facilities area would also be used for a temporary construction laydown area.

ACCESS ROADS AND DRIVE ZONES

Primary access to the site during both construction and operation would be a new 1,350-foot-long, 24-foot-wide, paved road entering from Corn Springs Road. The access road would be constructed from a point just north of the I-10 Corn Springs Road entrance/exit ramps east to the project site entrance, as described in the Final Decision. This road would include a 12-foot-wide, gravel-surfaced shoulder for truck staging, to preclude traffic interferences.

The PSEGS would contain internal roadway and utility corridors for each power-generating unit (comprised of heliostat field, solar tower, and power block). Each unit would be accessible from a 20-foot-wide, paved or hardscaped access road running from the entrance of the PSEGS site to the power block, and then around the power block.

In addition to the paved or hardscaped access road to the power block of each unit, 12-foot-wide, unpaved roads would radiate out from each power block to provide access through the heliostat fields to a 12-foot-wide, unpaved perimeter road, running 5 feet inside of and parallel to the boundary fence. PSEGS personnel would use this road to monitor and maintain perimeter security and tortoise exclusion fencing. This road would be grubbed, bladed, and smoothed to facilitate safe use, with minimal grading where necessary to cross washes. Within each heliostat field, 10-foot-wide, dirt roads would be located concentrically around the power block to provide access to the heliostat mirrors for maintenance and cleaning. These concentric roads would be approximately 152 feet apart and would be grubbed to remove vegetation and smoothed.

LIGHTING

The lighting system would provide personnel with illumination for operation under normal conditions, for egress under emergency conditions, and emergency lighting to perform manual operations during an outage of the normal power source. The system also would provide 120-volt AC convenience outlets for portable lamps and tools. Exterior light fixtures would utilize technologies to reduce light pollution.

TEMPORARY CONSTRUCTION LAYDOWN AREA

The 203-acre temporary construction laydown area on the west side of the site would be used for equipment laydown, construction parking, construction trailers, a tire cleaning station, heliostat assembly, a temporary concrete batch plant, and other construction support facilities. The surface areas within the temporary construction area that are used frequently would be stabilized with a layer of crushed stone in areas subject to heavy daily traffic.

PROCESS DESCRIPTION

In each plant, one Rankine-cycle steam turbine would receive steam from the SRSG to generate electricity. The solar field and power generation equipment would start each morning after sunrise and would shut down (unless augmented by the auxiliary boiler) when insolation drops below the level required to keep the turbine on-line. Each plant would have two natural gas-fired auxiliary boilers that could also be used to extend daily power generation. However, on an annual basis, the natural gas used as a supplement to power generation would be limited to below 2 percent of the annual energy output of the PSEGS.

Each plant would use an air-cooled condenser (ACC) for the main steam cycle. A wet surface air cooler (WSAC) would be used for auxiliary equipment cooling. Raw water would be drawn daily from on-site wells located in each power block and in the common area adjacent to the administration building. Groundwater would be treated in on-site treatment systems and would be used for mirror washing, WSAC makeup, and process water makeup.

Each of the power blocks would be connected via underground electrical cables to the on-site switchyard in the northern area of the site. Each power block would also have a gas metering set. Permanent parking areas would be provided at each power block for operations and maintenance personnel.

POWER CYCLE

Solar energy is reflected by the heliostats onto the SRSG where the energy heats water into superheated steam. The steam is then routed to the steam turbine generator (STG) where the energy in the steam is converted to electrical energy.

Following expansion through the steam turbine, exhaust steam is directed to the air-cooled condenser. The ACC blows ambient air across a heat transfer surface area to cool and condense the steam. The condensed steam is collected in a condensate tank and returned to the SRSG via a series of feedwater heaters and pumps.

SOLAR FIELD

Each of the heliostat assemblies is composed of two mirrors, each approximately 12 feet high by 8.5 feet wide, with a total reflecting surface of 204.7 square feet. Each heliostat assembly is mounted on a single pylon along with a computer-programmed aiming-control system that directs the motion of the heliostat to track the movement of the sun. Pylon height may vary due to specific site conditions, but they are generally 6.23 feet tall. Communication between the heliostats and the operations center would be done via surface-mounted anchored cable or a wireless remote system.

GENERATING UNITS

The following provides further details regarding the two 250-MW units.

- The solar power tower structure height is approximately 620 feet tall.
- The SRSG located at the top of the solar power tower is approximately 130 feet tall, resulting in an overall tower height of approximately 750 feet (not including a lighting appurtenance).
- No heliostat would be built closer than 260 feet from the solar power tower location.
- For Unit 1, the distance between the solar power tower and the farthest heliostat in the solar field is approximately 8,456 feet to the northeast section of the heliostat array. For Unit 2, the longest distance between the solar power tower and the farthest heliostat in the solar field is approximately 8,966 feet to the east section of the heliostat array. Generally, this is due to the higher efficiency of heliostats in the northern section in the northern hemisphere. With the sun predominantly in the southern sky, the cosine effect of incidence and reflection angles is less in the northern heliostats than in the southern ones. The converse (lower collection efficiency in the southern section) is also true and, therefore, the maximum southern arc radius is the shortest.

STEAM TURBINE GENERATOR AND AIR-COOLED CONDENSER

Each unit would contain a non-reheat, Rankine-cycle, condensing steam turbine generator (STG) with gland steam system, lubricating oil system, hydraulic control system, and steam admission/induction valving. High pressure (HP) steam from the SRSG superheater enters the HP steam turbine section and expands through multiple stages of the turbine, driving a generator to produce electricity. On exiting the Low Pressure (LP) turbine, the steam is directed into the ACC.

The turbine would consist of high/intermediate pressure and low pressure sections. Superheated steam enters the HP turbine casing at 2,466 pounds per square inch absolute (psia) and 1,085 degrees Fahrenheit (°F) at the Normal Continuous Rating.

Following expansion through the HP turbine, the steam is conveyed to the inlet of the intermediate pressure (IP) turbine. Exhaust steam from the turbine is directed to the ACC. The ACC blows ambient air across a heat transfer surface area to cool and condense the steam. The condensed steam is gathered in a condensate tank and provided to the feedwater circuit through a condensate pump. The ACC normally operates at a pressure of 3.25 inches of mercury absolute (approximately 1.6 psia).

NATURAL GAS BOILERS

Each unit would include two natural gas-fired boilers to assist with daily startup of the power generation equipment and to preserve energy in the steam cycle overnight. Each unit would contain the following boiler equipment:

- One 249-MMBtu/hr[1] packaged natural gas-fired auxiliary boiler for startup and cycle augmentation, capable of producing 185,000 pounds per hour (lb/hr) at 770°F and 650 psia;
- One 10-MMBtu/hr natural gas-fired, “night preservation” boiler to maintain system temperatures overnight, capable of producing 10,000 lb/hr at 500°F and 175 psia.

MAJOR ELECTRICAL EQUIPMENT AND SYSTEMS

The bulk of the electric power produced by the facility would be transmitted to the grid. Approximately 22 MW of electric power would be used on-site to power auxiliaries such as the ACC, pumps and fans, control systems, and general facility loads, including lighting, heating, and air conditioning. Some power would also be converted from alternating current (AC) to direct current (DC) and stored in batteries, which would be used as backup power for the plant control systems and essential uses. Emergency power would be provided by two diesel generator sets (one in each power block), each with 2,500-kW output capacity and one diesel generator set in the common area (with a 250-kW output capacity).

MIRROR WASHING

Regular mirror washing will be performed by a small mirror washing machine. To maintain heliostat performance, heliostat washing is projected to occur up to 24 hours per day (including nighttime mirror washing), covering the entire solar field weekly. The frequency of mirror washing activities for PSEGS is anticipated to be greater than at other BrightSource facilities currently undergoing permitting.

NATURAL GAS SUPPLY

The PSPP did not include a natural gas supply pipeline, but rather was approved to use LPG for its auxiliary fuel. The PSEGS would use natural gas to fire its auxiliary and nighttime preservation boilers. The natural gas supply for PSEGS would be provided by SoCal Gas via a new pipeline that would extend southward from the site and interconnect with an existing SoCal Gas transmission pipeline located just south of I-10. The new gas pipeline, approximately 8 inches in diameter and 2,956 feet long, would be constructed within a previously-surveyed corridor as shown on applicant’s Figure 2.1-6, dated and docketed on March 15, 2013. SoCal Gas would construct, own, and operate the new gas pipeline as part of its extensive gas supply system.

WATER SUPPLY AND USE

Primary water uses consist of replacing boiler blowdown, providing supplemental cooling for plant auxiliary systems, and water for washing the heliostats to ensure they function at full performance. The Final Decision allowed the PSPP to use up to 1,917 AFY of water, from up to 10 groundwater wells, during construction (for a total of 5,750 acre-feet during the 39-month-long construction period) and 300 AFY during operation.

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[1] = Million Metric British thermal units per hour

The PSEGS would utilize the same number of groundwater wells but would only use up to 400 acre-feet during construction (for a total of 1,130 acre-feet during the construction period) and up to 201 AFY during operation. The well water would be used for process make-up, mirror washing, and domestic uses.

Each unit would have a raw water tank with a capacity of 800,000 gallons. A portion of the raw water (200,000 gallons) is for plant use, while the majority would be reserved for fire water. The common area would also contain a combined service water/firewater tank with a capacity of 480,000 gallons. The water treatment plant would operate continuously in order to minimize water treatment system size and capital cost.

WATER REQUIREMENTS

A breakdown of the estimated average daily quantity of water required for PSEGS operation is presented in **Project Description Table 1**. The daily water requirements shown are estimated quantities based on PSEGS operating at full load.

Project Description Table 1
Average Daily Water Requirements (Both Units)

Use	Average Daily Use*		Annual Average Use
	gpm	gpd	AFY
Process Uses	63	90,873	102
Mirror Washing	44	63,408	71
Potable Water	2.1	2,995	3.4
Dust Suppression	15	21,802	24.4
Total	124	179,078	201

*Average Daily Use is based on annual operating hours of 3,500 hours/year
gpd = gallons per day
gpm = gallons per minute
AFY = acre-feet per year

PLANT COOLING SYSTEMS

The cycle heat rejection system for the main steam cycle would consist of an ACC system. The heat rejection system would receive exhaust steam from the low-pressure section of the steam turbine and feedwater heaters and condense it back to water for reuse. The condenser would remove heat from the condensing steam up to a maximum of 1,140 MMBtu/hr, depending on ambient temperature and plant load.

A WSAC would cool the generator, steam turbine generator lubrication oil, boiler feed pump lubricating oil, SRSG circulating water pumps, and other equipment requiring cooling. The WSAC would use reverse osmosis (RO) brine mixed with filtered well water for cooling. A 40 percent propylene glycol/60 percent demineralized water mixture would be used in the closed cooling water loop to provide freeze protection.

WASTE MANAGEMENT

Waste management is the process whereby all wastes produced at the project site are properly collected, treated (if necessary), and disposed of. Project wastes would consist primarily of non-hazardous solid and liquid wastes, with lesser amounts of hazardous wastes and universal wastes. The non-hazardous solid wastes would be construction and office wastes, as well as solid wastes from the water treatment system. The non-hazardous solid wastes would be trucked to a nearby Class II or III landfill. Non-hazardous liquid wastes would consist primarily of domestic sewage and wastewater streams such as RO system reject water, boiler blowdown, and auxiliary cooling tower blowdown. A septic tank and leach field system would be installed to manage domestic sewage. All other waste streams would be either recycled or sent to the evaporation ponds.

FIRE PROTECTION

The fire protection system would be designed in accordance with applicable regulations, standards and codes to protect personnel and limit property loss and plant downtime in the event of a fire. The primary source of fire protection water would be the service/firewater storage tank located at each power block and the firewater storage tank in the common area. An electric jockey pump and electric motor-driven main fire pump would be provided for the common area and for each power block to maintain the water pressure in the fire main at the level required to serve all fire-fighting systems. In addition, a back-up, 204-hp, diesel engine-driven fire pump would be provided for the common area and each power block to pressurize the fire loop if the power supply to the electric motor-driven main fire pump fails. A fire pump controller would be provided for each fire pump.

The fire pumps would discharge to a dedicated underground firewater loop piping system. Normally, the jockey pumps would maintain pressure in the firewater loop. Both the fire hydrants and the fixed-suppression systems would be supplied from the firewater loop. Fixed fire suppression systems would be installed at determined fire-risk areas, such as the transformers and turbine lube oil equipment. Sprinkler systems would also be installed in the administration complex buildings and fire pump enclosure as required by National Fire Protection Association (NFPA) and local code requirements. Handheld fire extinguishers of the appropriate size and rating would be located in accordance with NFPA 850 throughout the power block and common area. Generator step-up transformers and other oil-filled transformers would be contained and provided with a deluge system. On-site personnel would be trained in the use of fire protection equipment and would be the first responders to an incident.

The PSEGS is located such that it would fall under the jurisdiction of the Indio Office of the Riverside County Fire Department. Based on the requirements of Riverside County Ordinance No. 787.1, the piping system supplying the fire hydrants must be sized to convey a potential firewater flowrate of 5,000 gpm. Minimum firewater storage volume in each power block would be 600,000 gallons. Firewater would be supplied from a combined service water/firewater storage tank located at each power block. One electric primary and one diesel-fueled backup firewater pump, each with a capacity of 5,000 gpm, would deliver water to the fire protection piping network. Fire protection for the solar fields is not required since no combustible materials would be present in the solar field areas.

The common area fire protection system would be sized to comply with LORS and would consist of one electric primary pump and one diesel-fueled backup firewater pump. Firewater would be supplied from the combined service water/firewater storage tank with a storage volume of 480,000 gallons.

SUMMARY OF CONSTRUCTION ACTIVITIES AND METHODS OF THE PSEGS

The PSEGS would have an average construction workforce of 998 and a peak workforce of approximately 2,311. Construction is expected to take a little over two years. The PSEGS would require much less grading than the PSPP because the heliostat technology does not require an entirely flat surface.

The site fence will be installed concurrently with the desert tortoise's survey process. Project construction would commence with the building of site roads and the installation of temporary construction facilities, including office trailers, parking areas, material laydown areas, a concrete batch plant, and a heliostat assembly facility. The construction of each generating unit would begin with grading and construction of earthen berms around the power block areas to divert storm water, followed by the excavation and placement of foundations and other underground facilities. Superstructures and equipment would then be placed on the foundations. Major items include the 750-foot-tall solar power tower and SRSG, the STG pedestal and STG, and the ACC. Once the mechanical equipment is in place, construction would continue with the installation of the piping, electrical equipment, and cables necessary to connect and power the equipment. Upon completion of construction, the checkout, testing, startup, and commissioning of the various plant systems would begin, resulting in a fully operational generating unit.

After required grading in the heliostat fields, the heliostats would be installed in two steps. Initially, the support pylons would be installed using vibratory technology to insert the pylons into the ground (pre-augering prior to the installation of the pylon may be required). Depths would not be expected to be greater than 12 feet. The heliostat assembly (mirrors, support structure, and aiming system) would be mounted on the pylon. Pylons would be delivered to their locations by an all-terrain vehicle. Installation of the heliostat assemblies would be accomplished with a rough terrain crane.

The majority of the project site would maintain the original grades and natural drainage features; therefore, no additional storm drainage control is proposed. The stormwater management design for the I-10 freeway includes three drainage culverts to allow rain to flow from south to north underneath the freeway. To minimize wind and water erosion, open spaces would be preserved and left undisturbed, maintaining existing vegetation to the extent possible with respect to site topography and access requirements. If needed, stone filters and check dams would be strategically placed throughout the project site to provide areas for sediment deposition and to promote the sheet flow of stormwater prior to leaving the project site boundary. During construction, trenches would be excavated for the installation of electrical transmission system conductors and the on-site natural gas system. Typical trench would be 2–3 feet wide at the base and 3–6 feet deep. A few trenches may have widths and/or depths up to 12 feet.

SUMMARY OF PSEGS OPERATIONS

The proposed PSEGS would employ up to 100 full-time employees: 30 at Unit 1 (including mirror washing machine operators), 30 at Unit 2 (including mirror washing machine operators), and 40 at the administration complex. The facility would operate seven days a week. Heliostat washing is projected to occur up to 24 hours per day (including nighttime mirror washing), covering the entire solar field weekly.

A detailed operation and maintenance program has not yet been developed. The facility would be operated in one of the following modes:

- The facility would be operated at its maximum continuous output for as many hours per year as solar input allows, or as limited by contractual terms and conditions; or
- A full shutdown would occur if forced by equipment malfunction, transmission or gas line disconnect, or scheduled maintenance.

FACILITY CLOSURE

Facility closure can be temporary or permanent. Temporary closure is defined as a shutdown for a period exceeding the time required for normal maintenance, including closure for overhaul or replacement of the steam turbine. Causes for temporary closure include a disruption in the supply of natural gas or damage to the plant from earthquake, fire, storm, or other natural acts. Permanent closure is defined as a cessation in operations with no intent to restart operations, owing to plant age, damage to the plant beyond repair, economic conditions, or other reasons.

TEMPORARY CLOSURE

For a temporary facility closure, where there is no release of hazardous materials, security of the facilities would be maintained on a continuous basis. The Commission would be notified. Other responsible agencies would also be notified as necessary and appropriate. Depending on the length of shutdown necessary, a contingency plan for the temporary cessation of operations would be implemented. The contingency plan would be conducted to ensure conformance with all applicable LORS and the protection of public health, safety, and the environment. The plan, depending on the expected duration of the shutdown, may include the draining of all chemicals from storage tanks and other equipment and the safe shutdown of all equipment. All wastes would be disposed of according to applicable LORS.

Where the temporary closure includes damage to the facility, and there is a release or threatened release of regulated substances or other hazardous materials into the environment, procedures would be followed as set forth in a Risk Management Plan and a Hazardous Materials Business Plan to be developed as described in the Final Decision Conditions of Certification. Procedures would include methods to control releases, notification of responsible authorities and the public, emergency response, and training for plant personnel in responding to and controlling releases of hazardous materials. Once the immediate problem is solved, and the regulated substance/hazardous material release is contained and cleaned up, temporary closure would proceed as described above for a closure where there is no release of hazardous materials.

PERMANENT CLOSURE

When the facility is permanently closed, the closure procedure would follow a plan that would be developed. The removal of the facility from service, or decommissioning, may range from mothballing to the removal of all equipment and appurtenant facilities, depending on conditions at the time. Because the conditions that would affect the decommissioning decision are largely unknown at this time, these conditions would be presented to the Commission when more information is available and the timing for decommissioning is more imminent.

To ensure that public health and safety and the environment are protected during decommissioning, a decommissioning plan would be submitted to the Commission for approval prior to decommissioning. The plan would address the following:

- Proposed decommissioning activities for the facility and all appurtenant facilities constructed as part of the facility;
- Conformance of the proposed decommissioning activities to all applicable LORS and local/regional plans;
- Activities necessary to restore the site if the plan requires removal of all equipment and appurtenant facilities;
- Decommissioning alternatives other than complete restoration; and
- Associated costs of the proposed decommissioning and the source of funds to pay for the decommissioning.

In general, the decommissioning plan for the facility would attempt to maximize the recycling of all facility components. PSH would attempt to sell unused chemicals back to the suppliers or other purchasers or users. All equipment containing chemicals would be drained and shut down to ensure public health and safety and to protect the environment. All nonhazardous wastes would be collected and disposed of in appropriate landfills or waste collection facilities. All hazardous wastes would be disposed of according to all applicable LORS. The site would be secured 24 hours per day during the decommissioning activities.

REFERENCES

CEC 2010a – California Energy Commission/A. Solomon (TN 55988). Staff Assessment and Draft Environmental Impact Statement, dated March 19, 2010. Submitted to CEC/Docket Unit on March 19, 2010

CEC 2010b – California Energy Commission/A. Solomon (TN 58252). Revised Staff Assessment Part 1, dated September 1, 2010. Submitted to CEC/Docket Unit on September 1, 2010

CEC 2010c – California Energy Commission/A. Solomon (TN 58497). Revised Staff Assessment Part II, dated September 16, 2010. Submitted to CEC/Docket Unit September 16, 2010

GRENIER 2013a – Andrea, information received by e-mail from Andrea Grenier. (TN 70799), April 25, 2013.

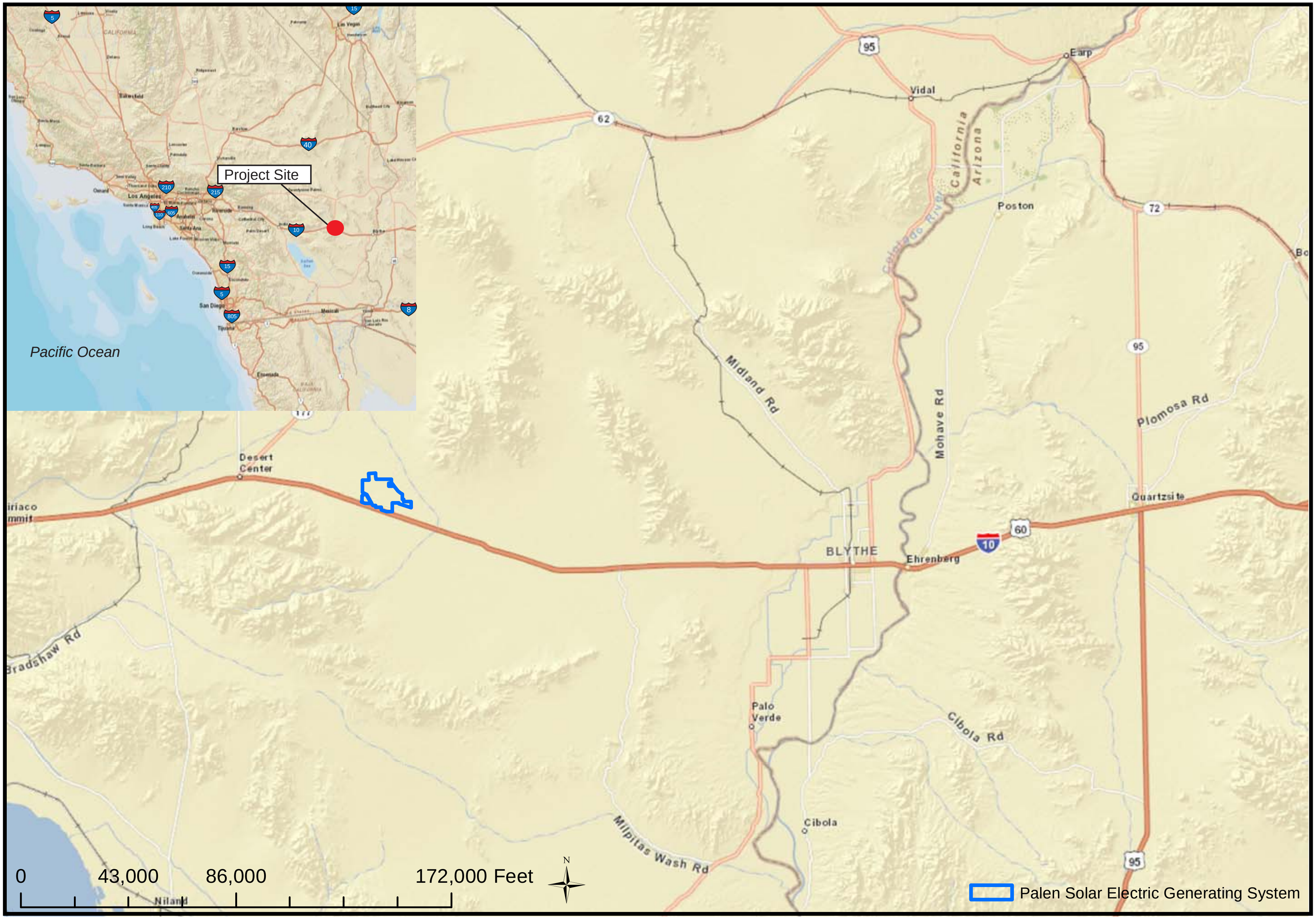
GRENIER 2013b – Andrea, information received by e-mail from Andrea Grenier. (TN 70912), May 15, 2013.

Palen 2012a – Palen Solar Holdings, LLC/Galati Blek, Scott Galati (TN 68910). Palen Solar Holdings LLC's Petition for Amendment, dated December 17, 2012. Submitted to CEC/C. Stora on December 18, 2012

Palen 2013d – Palen Solar/Galati Blek LLP, Marie Fleming (TN 69931). Palen Solar's Relocated Natural Gas Pipeline Drawing. Submitted to CEC/Docket Unit on March 15, 2013

PROJECT DESCRIPTION - FIGURE 1

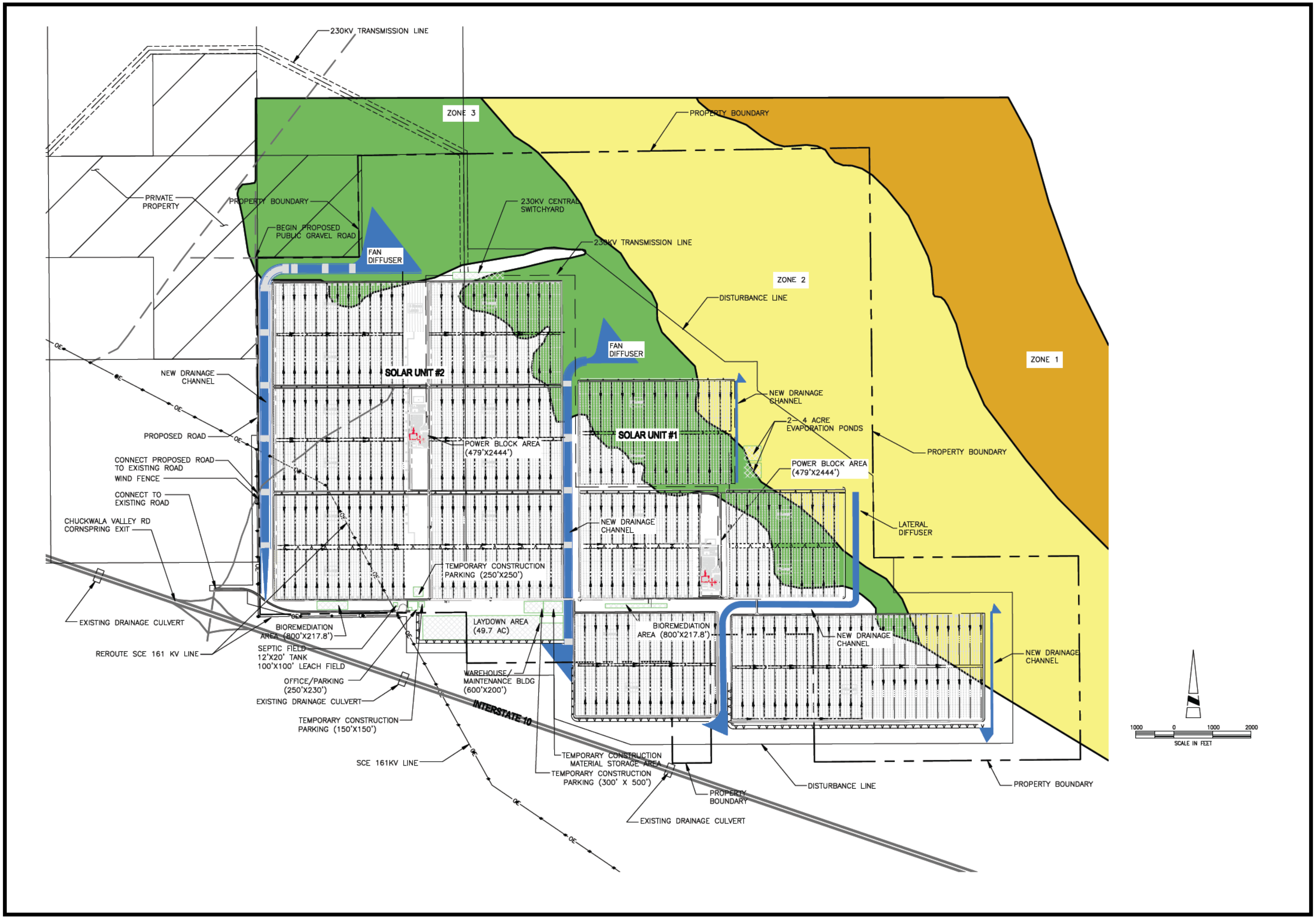
Palen Solar Power Project - Site Vicinity Map



CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: 09 - AFC - 07, Site Vicinity Map - Figure 2.1-1

PROJECT DESCRIPTION - FIGURE 2
Palen Solar Power Project - Approved Project Reconfigured Alternative 2



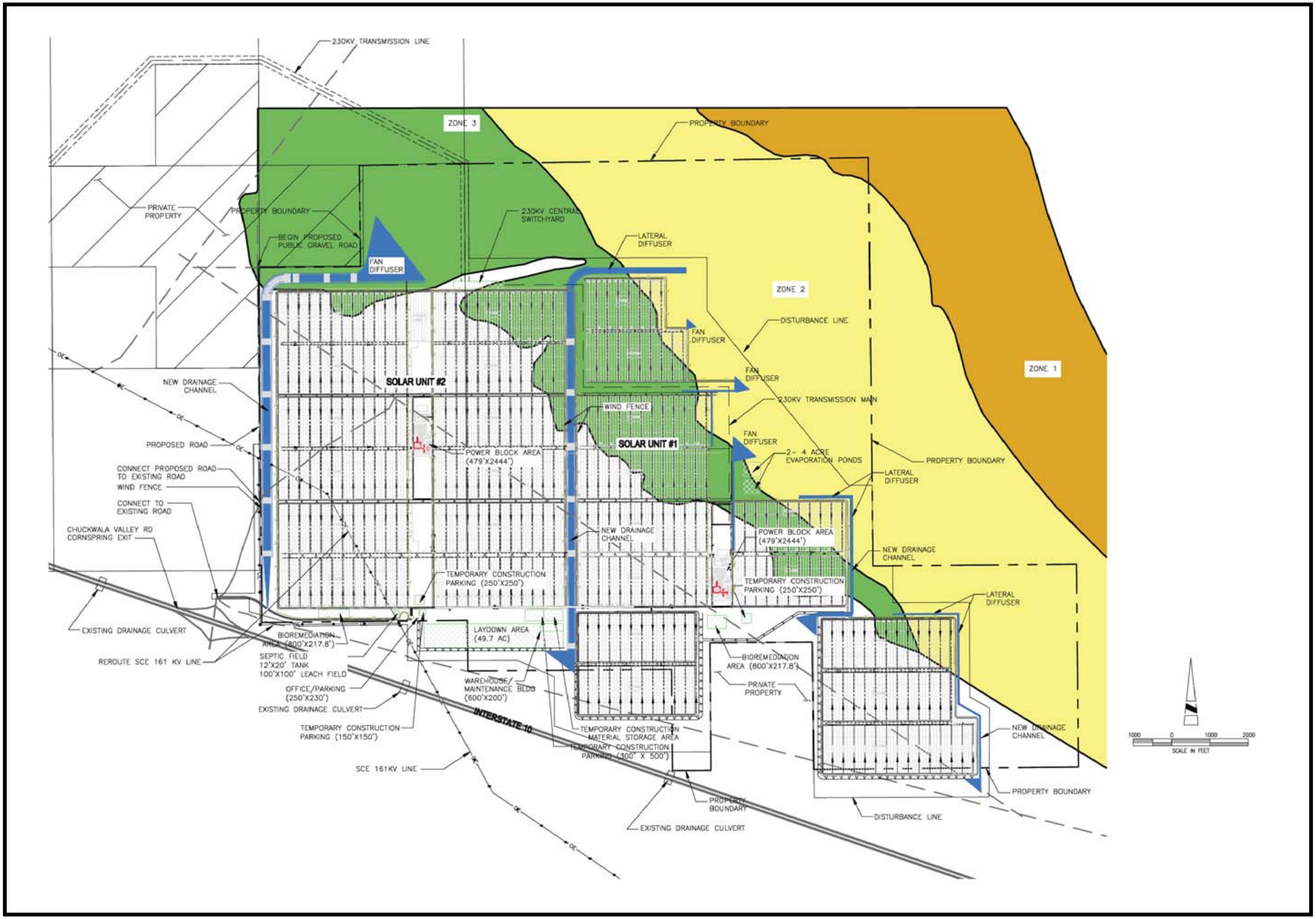
PROJECT DESCRIPTION

CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION
SOURCE: 09 - AFC - 07, Revised Staff Assessment Part 1, Alternatives - Figure 1B

PROJECT DESCRIPTION

PROJECT DESCRIPTION - FIGURE 3

Palen Solar Power Project - Approved Project Reconfigured Alternative 3

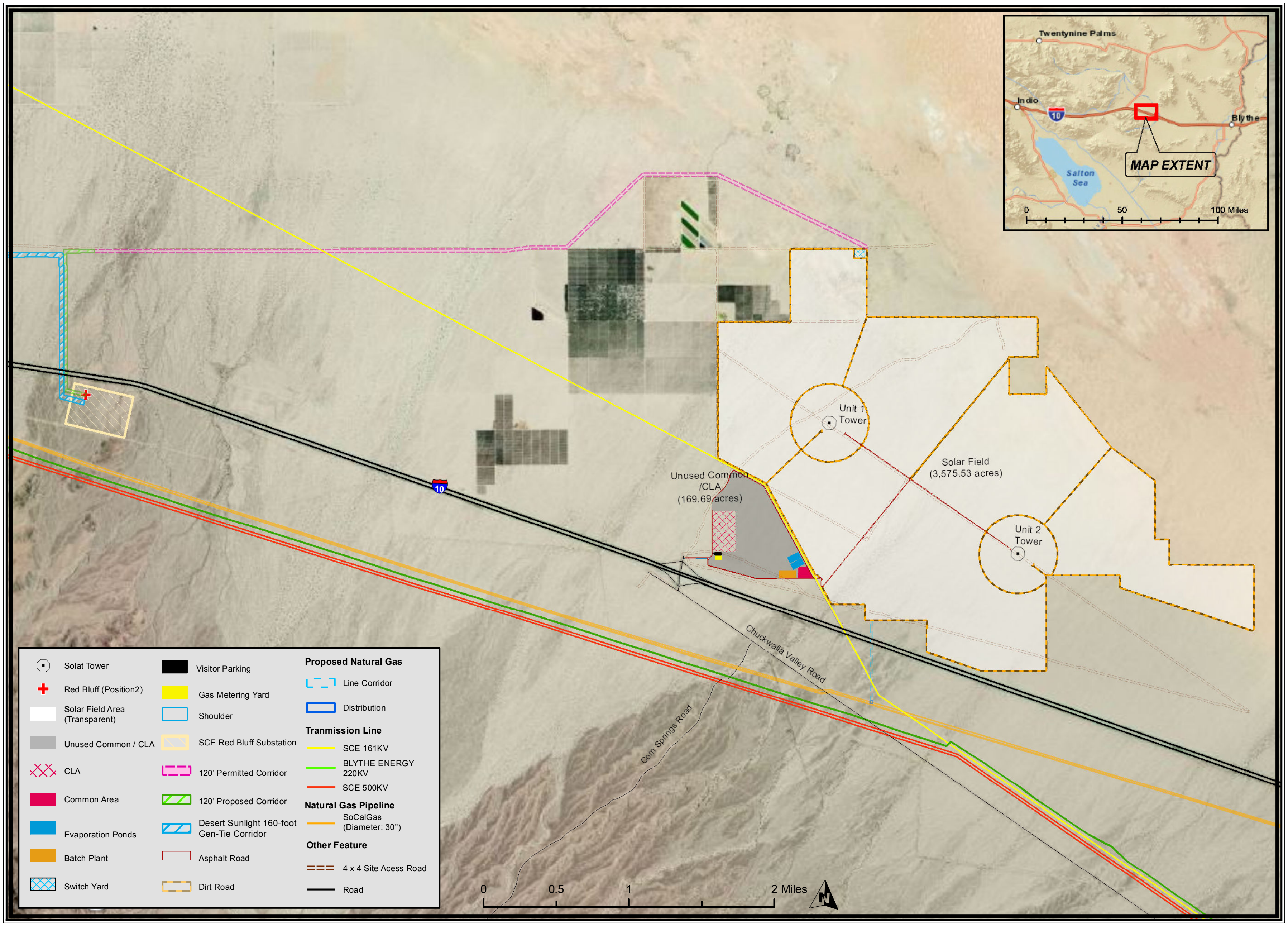


CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: 09 - AFC - 07, Revised Staff Assessment Part 1, Alternatives - Figure 1C

PROJECT DESCRIPTION - FIGURE 4

Palen Solar Power Project - Facility Boundary Map



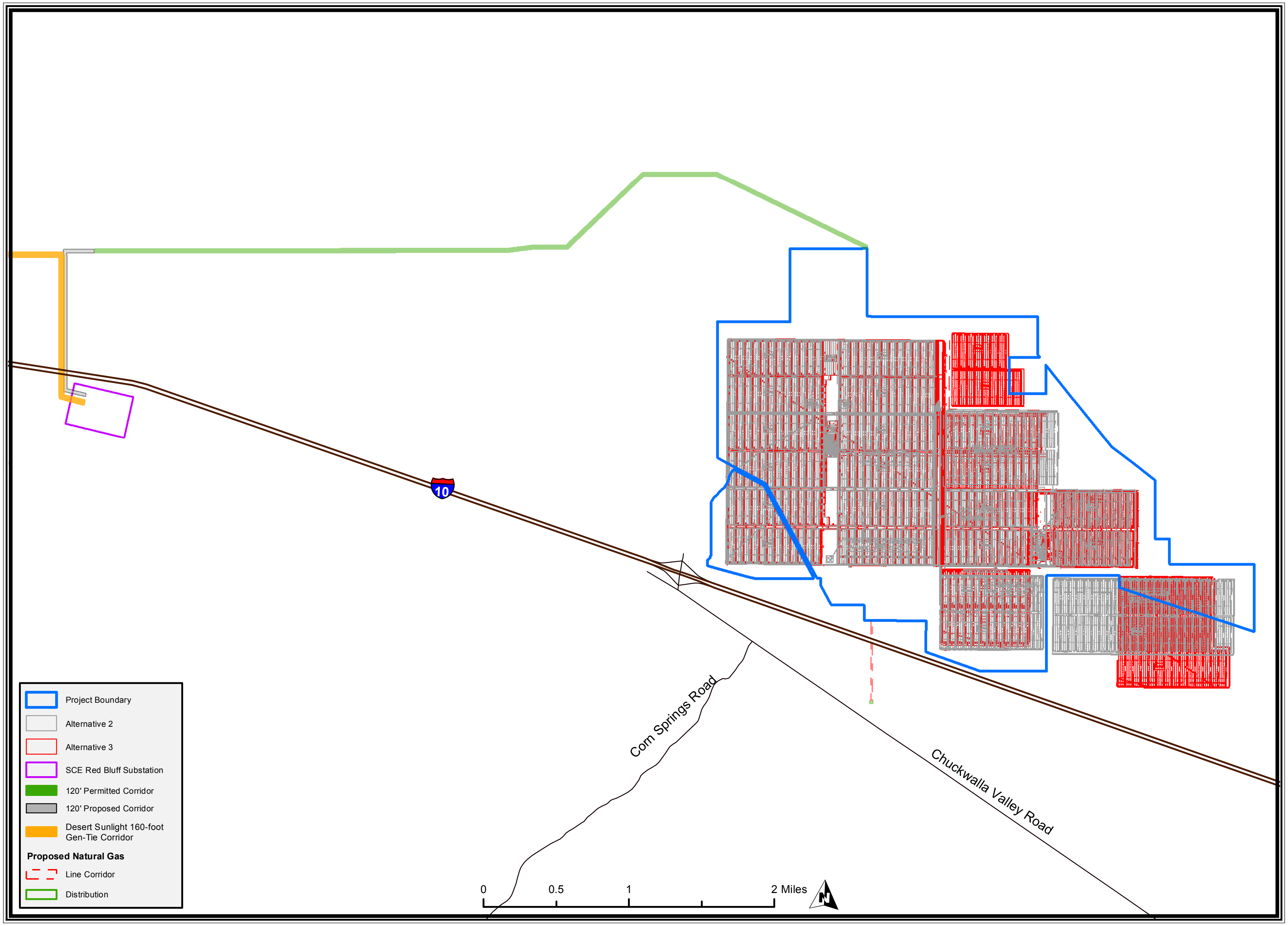
PROJECT DESCRIPTION

CALIFORNIA ENERGY COMMISSION, SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: 09 - AFC - 07 - Facility Boundary Map - Figure 2.1-3, BrightSource, OpenStreetMap 2013, BING Aerial

PROJECT DESCRIPTION - FIGURE 5

Palen Solar Power Project - Facility Overlay on Approved Project Reconfigured Alternatives 2 and 3 Footprint



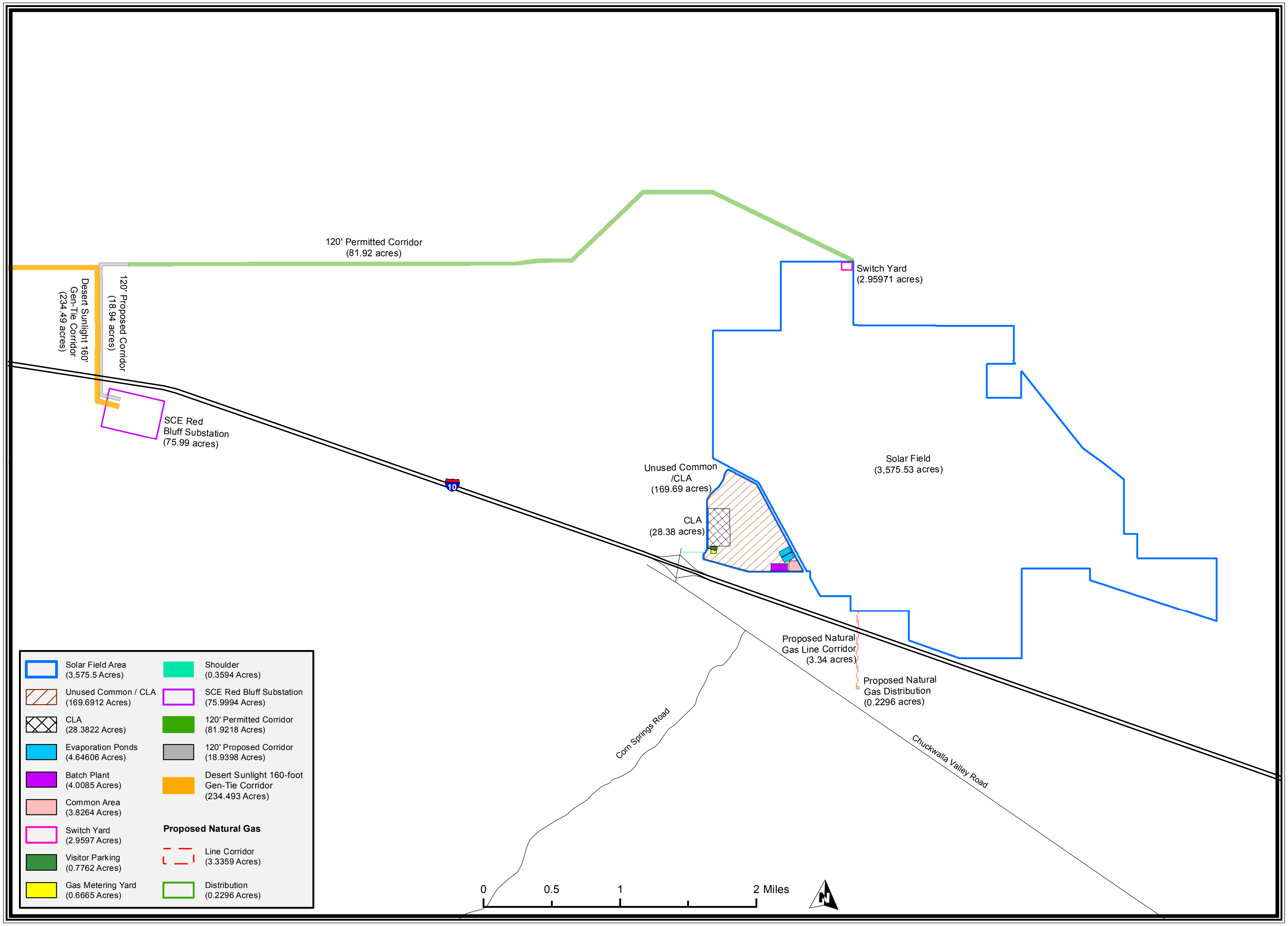
PROJECT DESCRIPTION

CALIFORNIA ENERGY COMMISSION, SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: 09 - AFC - 07 - Revised Staff Assessment Part 1, Alternatives Figure 1B & 1C, BrightSource, OpenStreetMap 2013

PROJECT DESCRIPTION - FIGURE 6

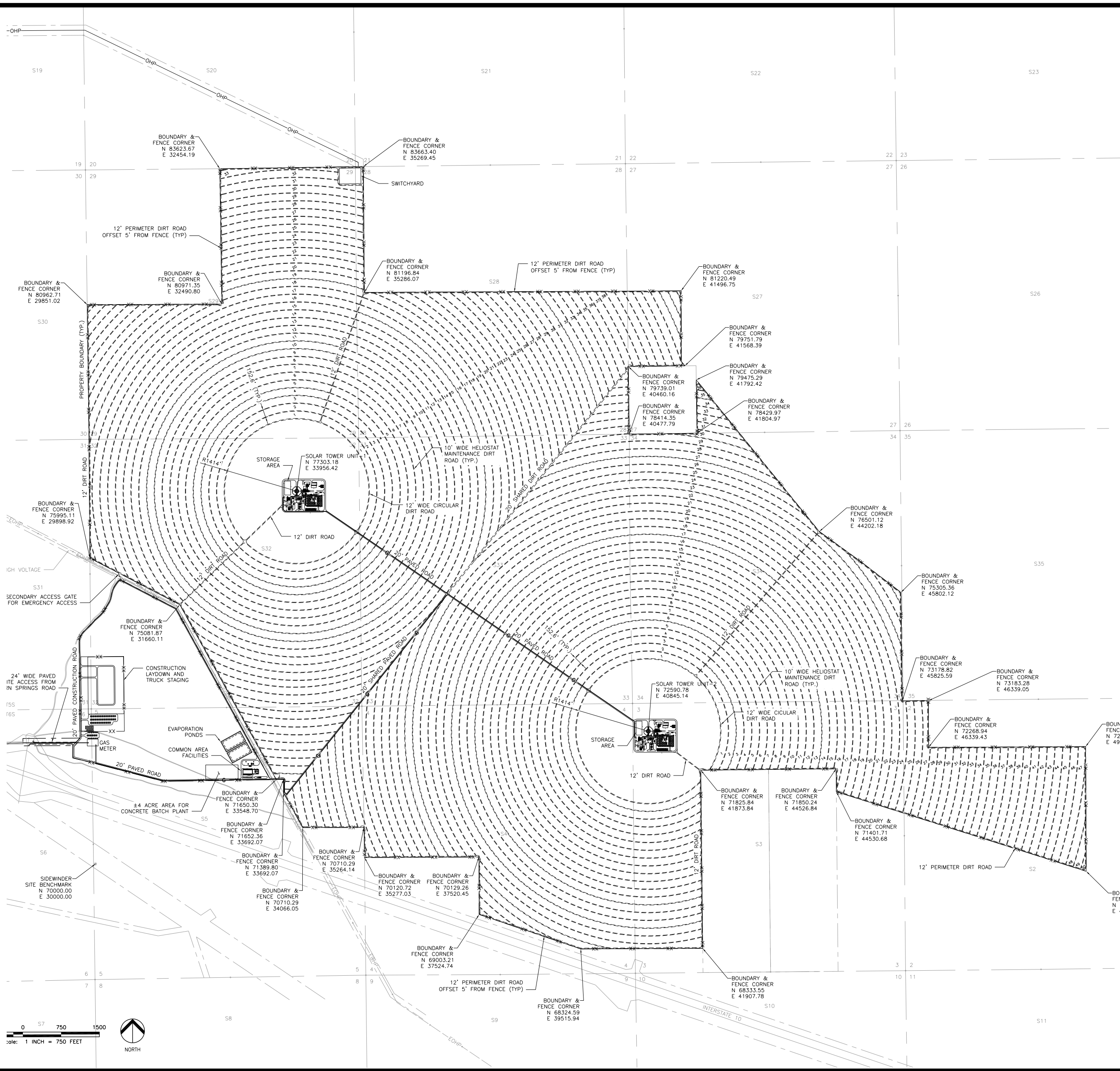
Palen Solar Power Project - Facility Acreage Estimates



SOURCE: 09 - AFC - 07 - Facility Acreage Estimates - Figure 2.1-4, BrightSource, OpenStreetMap 2013

PROJECT DESCRIPTION - FIGURE 7

Palen Solar Power Project - Solar Electric Generation Station



GENERAL NOTES:

1. FOR CIVIL PROJECT INFORMATION, ABBREVIATIONS AND LEGEND SEE SHEET C–0001.
2. ALL EXISTING SITE INFORMATION: TOPOGRAPHY, BUILDING LOCATIONS, ROADS & PAVEMENT LOCATIONS, SITE UTILITIES, AND PROPERTY LINE INFORMATION WERE OBTAINED FROM OWNER PROVIDED DOCUMENTS/DRAWINGS.
3. FOR CIVIL OVERALL GRADING AND DRAINAGE PLAN SEE SHEET C–2000.
4. ALL NECESSARY LICENSES SHALL BE OBTAINED PRIOR TO COMMENCEMENT OF WORK.
5. VERIFY ALL MEASUREMENTS AND DIMENSIONS PRIOR TO ORDERING ANY MATERIALS OR CONDUCTING ANY WORK.
6. ALL WORK SHALL BE PERFORMED IN A FINISHED AND WORKMAN LIKE MANNER AND CONSISTENT WITH THE BEST RECOGNIZED TRADE PRACTICES.
7. COORDINATES SHOWN ARE IN PALEN / PROJECT LOCAL GRID SYSTEM.
8. NO BOUNDARY SURVEY INFORMATION IS SHOWN OR IMPLIED ON THESE DRAWINGS.

*NOTE:

QUANTITIES SHOWN ARE FOR PRELIMINARY INTERNAL ESTIMATING AND NOT TO BE USED FOR BIDING PURPOSES. IT IS THE CONTRACTORS RESPONSIBILITY TO ESTABLISH THERE OWN QUANTITY TAKE–OFF'S FROM APPROVED PLANS.

*HARDSCAPE AREA DATA:

1. TOWER UNIT #1
   HEAVY DUTY ASPHALT PAVEMENT AREA: ±10,100 S.Y.
   LIGHT DUTY ASPHALT PAVEMENT AREA: ±900 S.Y.
   CONCRETE PAVEMENT AREA: ±2,850 S.Y.
   GRAVEL (INTERIOR ISLANDS) AREA: ±47,000 S.Y.
2. TOWER UNIT #2
   HEAVY DUTY ASPHALT PAVEMENT AREA: ±10,100 S.Y.
   LIGHT DUTY ASPHALT PAVEMENT AREA: ±900 S.Y.
   CONCRETE PAVEMENT AREA: ±2,850 S.Y.
   GRAVEL (INTERIOR ISLANDS) AREA: ±47,000 S.Y.
3. PAVED ROADS
   HEAVY DUTY ASPHALT PAVEMENT AREA: ±45,000 S.Y.
4. COMMON AREA
   HEAVY DUTY ASPHALT PAVEMENT AREA: ±8,900 S.Y.
   LIGHT DUTY ASPHALT PAVEMENT AREA: ±1,450 S.Y.
   CONCRETE PAVEMENT AREA: ±100 S.Y.
   GRAVEL (INTERIOR ISLANDS) AREA: ±5,300 S.Y.

*EARTHWORK QUANITITIES:

1. TOWER UNIT #1
   CUT: 9,260 CUBIC YARDS
   FILL: 45,589 CUBIC YARDS
   NET (FILL) 36,329 CUBIC YARDS
2. TOWER UNIT #2
   CUT: 3,169 CUBIC YARDS
   FILL: 95,925 CUBIC YARDS
   NET (FILL) 92,756 CUBIC YARDS
3. COMMON AREA–ADMIN/MAINTENANCE WAREHOUSE BLDG.
   CUT: 35,665 CUBIC YARDS
   FILL: 23,459 CUBIC YARDS
   NET (CUT) 12,206 CUBIC YARDS

CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: 09 - AFC - 07, Civil Overall Site Plan - Figure 2.1-5

Environmental Assessment

AIR QUALITY

Jacquelyn Leyva Record

SUMMARY OF CONCLUSIONS

At this time staff has evaluated only construction related air quality impacts from the modified project. The operational related impacts will be evaluated during the time of the Final Staff Assessment and once the South Coast Air Quality Management District (SCAQMD or District) has published a Determination of Compliance and California Energy Commission Staff (staff) can then recommend adoption of Air Quality Conditions of Certification.

For construction related air quality impacts, staff concludes that with the adoption of the attached Air Quality Conditions of Certification, the proposed Palen Solar Electric Generating System, would comply with all applicable laws, ordinances, regulations, and standards and would not result in any significant California Environmental Quality Act air quality impacts. These conditions of certification meet the Energy Commission's responsibility to comply with the California Environmental Quality Act. Staff proposes to retain conditions from the approved project – **AQ-SC1** through **AQ-SC5** – with some modifications and updates that have been used in more recent solar projects.

The PSEGS would emit substantially lower greenhouse gas[1] emissions per megawatt-hour than fossil-fueled generation resources in California. PSEGS, as a renewable energy generation facility, is determined by rule to comply with the Greenhouse Gas Emission Performance Standard requirements of SB 1368 (Chapter 11, Greenhouse Gases Emission Performance Standard, Article 1, Section 2903 [b][1]).

INTRODUCTION

On December 17, 2012, Palen Solar Holdings, LLC (PSH), filed a petition with the Energy Commission requesting to modify the Palen Solar Power Project (PSPP). The PSPP, as licensed on December 15, 2010, by the California Energy Commission (Energy Commission) (Order No. 10-1215-19, the Final Decision, 09-AFC-7), was a 500-megawatt (MW) solar thermal power-generating facility utilizing parabolic trough technology. The PSPP project encompassed approximately 4,366 acres located approximately 0.25 mile north of Interstate 10, approximately 10 miles east of Desert Center, and approximately halfway between the cities of Indio and Blythe, in Riverside County, California.

In the petition, PSH (or project owner) requested that the project name be changed from Palen Solar Power Project (PSPP) to Palen Solar Electric Generating System (PSEGS). In this document, the acronym PSPP refers to the approved project and the acronym PSEGS refers to the proposed modified project. Please see the section titled **PROPOSED MODIFIED PROJECT** for more detail about proposed modifications.

[1] Greenhouse gas (GHG) emissions are not criteria pollutants, but they affect global climate change. In that context, staff evaluates the GHG emissions from the proposed modified project (Appendix Air-1), presents information on GHG emissions related to electricity generation, and describes the applicable GHG standards and requirements.

The PSEGS proposal includes replacing the parabolic trough solar collection system and associated Heat Transfer Fluid (HTF) with solar tower technology. The solar tower technology would create steam to run an electricity generator by using a field of heliostats—elevated mirrors, each approximately 12 feet tall, mounted on pylons and guided by a sun-tracking system—to focus the sun's rays on a solar receiver steam generator (SRSG) on top of a 750-foot solar tower located near the center of each solar field.

This analysis evaluates the expected air quality impacts from the emissions of criteria air pollutants from both the construction and operation of the PSEGS (or proposed modified project). Criteria air pollutants are defined as air contaminants for which the state and/or federal governments, per the California Clean Air Act and the federal Clean Air Act, have established ambient air quality standards to protect public health.

The criteria pollutants analyzed within this section are nitrogen dioxide (NO_2), sulfur dioxide (SO_2), carbon monoxide (CO), ozone (O_3), and particulate matter (PM). Lead is not analyzed as a criteria pollutant, but lead and other toxic air pollutant emissions impacts are analyzed in the Public Health Section of this Preliminary Staff Assessment (PSA). Two subsets of particulate matter are inhalable particulate matter (less than 10 microns in diameter, or PM10) and fine particulate matter (less than 2.5 microns in diameter, or PM2.5). Nitrogen oxides (NOx, consisting primarily of nitric oxide [NO] and NO_2) and volatile organic compounds (VOC) emissions readily react in the atmosphere as precursors to ozone and, to a lesser extent, particulate matter. Sulfur oxides (SOx) readily react in the atmosphere to form particulate matter and are major contributors to acid rain. Global climate change and greenhouse gas (GHG) emissions from the proposed modified project are discussed in **APPENDIX AIR-1** and analyzed in the context of cumulative impacts.

In carrying out this analysis, Energy Commission staff evaluated the following major issues:

- whether PSEGS is likely to conform with applicable federal, state, and SCAQMD air quality laws, ordinances, regulations and standards (Title 20, California Code of Regulations, section 1744 (b));
- whether PSEGS is likely to cause new violations of ambient air quality standards or contribute substantially to existing violations of those standards (Title 20, California Code of Regulations, section 1743);
- whether mitigation measures proposed for PSEGS are adequate to lessen potential impacts under CEQA to a level of insignificance (Title 20, California Code of Regulations, section 1742 (b))

METHODOLOGY AND THRESHOLDS FOR DETERMINING ENVIRONMENTAL CONSEQUENCES

A significant impact is defined under CEQA as "a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project" (Cal. Code Regs., tit. 14 [hereinafter CEQA Guidelines] Section 15382). Questions used in evaluating significance of air quality impacts are based on Appendix G of the CEQA

Guidelines (CCR 2006). The specific approach used by staff in determining CEQA significance is discussed in more detail below.

LAWS, ORDINANCES, REGULATIONS AND STANDARDS (LORS)

The federal, state, and local laws and policies applicable to the control of criteria pollutant emissions and mitigation of air quality impacts for the PSEGS are summarized in **Air Quality Table 1**. Staff's analysis examines the proposed modified project's compliance with these requirements.

Air Quality Table 1
Laws, Ordinances, Regulations, and Standards

Applicable LORS	Description
Federal	
40 Code of Federal Regulations (CFR) Part 52	Nonattainment New Source Review (NSR) requires a permit and requires Best Available Control Technology (BACT) and Offsets. Permitting and enforcement delegated to South Coast Air Quality Management District (SCAQMD). Prevention of Significant Deterioration (PSD) requires major sources or major modifications to major sources to obtain permits for attainment pollutants. The PSEGS is a new source that does not have a rule listed emission source thus the PSD trigger levels are 250 tons per year for NOx, VOC, SO_2, PM2.5 and CO.
40 CFR Part 60	New Source Performance Standards (NSPS), Subpart Db, Dc Standards of Performance for Small Industrial-Commercial-Institutional Steam Generation Units. Establishes recordkeeping and reporting requirements for natural gas (including propane) fired steam generating units. Subpart IIII Standards of Performance for Stationary Compression Ignition Internal Combustion Engines. Establishes emission standards for compressions ignition internal combustion engines, including emergency generator and fire water pump engines.
40 CFR Part 93 General Conformity	Requires determination of conformity with State Implementation Plan for projects requiring federal approvals if project annual emissions are above specified levels.
40 CFR, Part 63	National Emissions Standards for Hazardous Air Pollutants (NESHAPS)
State	
Health and Safety Code (HSC) Section 40910-40930	Permitting of source needs to be consistent with Air Resource Board (ARB) approved Clean Air Plans.
HSC Section 41700	Restricts emissions that would cause nuisance or injury.
California Code of Regulations (CCR) Section 93115	Airborne Toxics Control Measure for Stationary Compression Ignition Engines. Limits the types of fuels allowed, established maximum emission rates, establishes recordkeeping requirements on stationary compression ignition engines, including emergency generator and fire water pump engines.
Title13 ,CCR, section 2423	Exhaust Emission Standards and Test Procedures: Heavy-Duty Off-Road Diesel Cycle Engines. Limits the tier levels of emissions from heavy-duty off-road diesel cycle engines, including emergency backup generators and emergency firewater pump engines.

Applicable LORS	Description
Local (South Coast Air Quality Management District)	
Rules 201, 203, and 212 – Permit to Construct, Permit to Operate, and Standards for Approving Permits and Issuing Public Notice	Establishes the requirements to obtain a Permit to Construct and Permit to Operate for emission sources.
Rule 401 – Visible Emissions	Limits visible emissions.
Rule 402 – Nuisance	Prohibits the discharge of air contaminants or other material which cause injury, detriment, nuisance, or annoyance to the public or which endanger the comfort, response, health or safety of the public or which cause injury or damage to business or property.
Rule 403 – Fugitive Dust	Limits fugitive emissions from certain bulk storage, earthmoving, construction and demolition, and manmade conditions that may cause wind erosion.
Rule 404 – Particulate Matter Concentration	The rule limits particulate matter (PM) emissions. PM emission limits included in the rule are functions of the exhaust flow rate from the regulated device.
Rule 409 – Combustion Contaminants	Limits combustion contaminant discharge into the atmosphere from fuel burning equipment to 0.1 grain or less per cubic foot of gas calculated to 12% of carbon dioxide (CO_2) at standard conditions.
Rule 429 – NOx Exemptions for Startup/Shutdown	Provides NOx emission exemptions for boiler subject to Rule 1146 for periods of startup and shutdown.
Rule 431.1 – Sulfur Compounds of Gaseous Fuels	Limits discharge into the atmosphere of sulfur compounds from the burning of gaseous fuels.
Rule 431.2 – Sulfur Compounds of Liquid Fuels	Limits discharge into the atmosphere of sulfur compounds from the burning of liquid fuels.
Rule 463 – Organic Liquids Storage	Sets standards for storage of organic liquids with a true vapor pressure of 0.5 pounds per square inch or greater.
Rule 474–Fuel Burning Equipment–Oxides of Nitrogen	Limits the discharge of NO_2 to the atmosphere to the concentrations specified in the rule.
Regulation IX – New Source Performance Standard	Incorporates the Federal NSPS (Title 40 CFR 60) rules by reference.
Rule 1110.2 – Emissions From Gaseous and Liquid-Fueled Internal Combustion Engines	The purpose of this rule is to reduce NOx, VOCs, and CO from engines.
Rule 1121 – NOx Control from NG Fired Water Heaters	Limits NOx emissions from natural gas fired residential type water heaters and would apply to the administration building.
Rule 1146 – Emissions of Oxides of Nitrogen from Industrial, Institutional and Commercial Boilers, Steam Generators and Process Heaters	This rule limits NOx emissions from boilers, steam generators, and process heaters.
Rule 1166 – VOC Emissions from Decontamination of Soil	Establishes requirements to control VOC emissions from handling of VOC-contaminated soil.

Applicable LORS	Description
Regulation XIII – New Source Review	Establishes the pre-construction review requirements, including Best Available Control Technology and emission offset requirements for new, modified or relocated facilities to ensure that these facilities do not interfere with progress in attainment of the national ambient air quality standards.

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

Energy Commission staff assesses four kinds of primary and secondary[2] impacts: construction, operation, closure and decommissioning, and cumulative. Construction impacts result from the onsite and offsite emissions occurring during site preparation and construction of the proposed modified project. Operation impacts result from the emissions of the proposed modified project during operation, which includes all of the onsite auxiliary equipment emissions (boilers, emergency engines, etc.), the onsite maintenance vehicle emissions, and the offsite employee and material delivery trip emissions. Closure and decommissioning impacts occur from the onsite and offsite emissions that would result from dismantling the facility and restoring the site. Cumulative impacts analysis assesses the impacts that result from the proposed modified project's incremental effect viewed over time, together with other closely related past, present, and reasonably foreseeable future projects whose impacts may compound or increase the incremental effect of the proposed modified project. (Pub. Resources Code § 21083; Cal. Code Regs., tit. 14, §§ 15064(h), 15065(c), 15130, and 15355.)

METHODOLOGY AND THRESHOLD FOR DETERMINING CEQA SIGNIFICANCE

Energy Commission staff evaluate potential impacts per Appendix G of the CEQA Guidelines (CCR 2006). A CEQA significant adverse impact is determined to occur if potentially significant CEQA impacts cannot be mitigated through the adoption of Conditions of Certification. Specifically, staff uses health-based ambient air quality standards (AAQS) established by the Air Resources Board (ARB) and the U.S.Environmental Protection Agency (U.S. EPA) as a basis for determining whether a project's emissions will cause a significant adverse impact under CEQA. The standards are set at levels that include a margin of safety and are designed to adequately protect the health of all members of the public, including those most sensitive to adverse air quality impacts such as the aged, people with existing illnesses, children, and infants. Staff evaluates the potential for significant adverse air quality impacts by assessing whether the project's emissions of criteria pollutants (NO_2, VOC, PM10/PM2.5 and SO_2) and their precursors could create a new AAQS exceedance (emission concentrations above the standard), or substantially contribute to an existing AAQS exceedance.

Staff evaluates both direct and cumulative impacts. Staff will find that a project or activity will create a direct adverse impact when it causes an exceedance of an AAQS.

[2] Primary impacts potentially result from facility emissions of NOx, SOx, CO and PM10/2.5. Secondary impacts result from air contaminants that are not directly emitted by the facility but formed through reactions in the atmosphere that result in ozone, and sulfate and nitrate PM10/PM2.5.

Staff will find that a project's effects are cumulatively considerable when the project emissions in conjunction with ambient background, or in conjunction with reasonably foreseeable future projects, substantially contribute to ongoing exceedances of an AAQS. Factors considered in determining whether contributions to ongoing exceedances are substantial include:

1. the duration of the activity causing adverse air quality impacts;
2. the magnitude of the project emissions, and their contribution to the air basin's emission inventory and future emission budgets established to maintain or attain compliance with AAQS;
3. the location of the project site, i.e., whether it is located in an area with generally good air quality where non-attainment of any ambient air quality standard is primarily or solely due to pollutant transport from other air basins;
4. the meteorological conditions and timing of the project impacts, i.e., do the project's maximum modeled pollutant impacts occur when ambient concentrations are high (such as during high wind periods, or seasonally);
5. the modeling methods, and how refined or conservative the impact analysis modeling methods and assumptions were and how that may affect the determined adverse impacts;
6. the project site location and nearest receptor locations; and whether the identified adverse impacts would also occur at the maximum impacted receptor location; and,
7. potential for future cumulative impacts; and whether appropriate mitigation is being recommended to address the potential for impacts associated with likely future projects.

IMPACTS FROM CLOSURE AND DECOMMISSIONING

Impacts from closure and decommissioning, as a one-time limited duration event, are evaluated with the same methods as construction emissions as discussed above.

PROPOSED MODIFIED PROJECT

The PSEGS proposal includes replacing the parabolic trough solar collection system and associated HTF with solar tower technology. The PSEGS would be comprised of two adjacent solar fields and associated facilities with a total combined nominal output of approximately 500 MW. PSH proposes to develop the PSEGS in two operational units, each consisting of one solar field, one tower, and a power block capable of producing approximately 250 MW of electricity. The solar tower technology would create steam to run an electricity generator by using a field of heliostats—elevated mirrors, each approximately 12 feet tall, mounted on pylons and guided by a sun-tracking system—to focus the sun's rays on a solar receiver steam generator (SRSG) on top of a 750-foot solar tower located near the center of each solar field. Access to the site would use the same primary access road as the PSPP. The modified project would interconnect to the regional electrical transmission grid at SCE's Red Bluff Substation as proposed for PSPP; the Red Bluff Substation is currently under construction.

Two natural gas-fired auxiliary boilers are proposed for each power block, for a total of four for the project. A startup boiler would be used during the morning startup cycle to assist the power generation equipment in coming up to operating temperature more quickly and for augmenting the solar operation when solar energy diminishes or during transient cloudy conditions. Each solar field also includes a night preservation boiler also fueled with natural gas to provide steam to the gland systems of the steam turbine and boiler feedwater pump turbine to prevent air ingress overnight and during other shutdown periods when steam is not available from the SRSG. This boiler would also provide pegging steam to the generator during these shutdowns (**Project Description Figures 4**, **5,** and **6**).

The two units would share common facilities, including an on-site switchyard, a single-circuit, 230-kV generation tie-line, and a common area containing an administration building, warehouse, evaporation ponds, maintenance complex, and a meter/valve station for incoming natural gas service to the site. Other on-site facilities would include access and maintenance roads (either dirt, gravel, or paved), perimeter fencing, tortoise fencing, and other ancillary security facilities.

The PSEGS footprint is smaller by 572 acres than the original footprint of the PSPP. While the PSPP included the use of a private parcel (of approximately 40 acres) located in the northeast portion of the site, the PSEGS would not include any solar facility development within this private parcel. The PSPP also had Energy Commission approval to develop the private parcels (approximately 240 acres) located in the southeastern portion of the site, if the project owner acquired the parcels. The PSEGS owner would not acquire or develop these private parcels.

The primary modifications to the PSPP are as follows:

- Two 250-MW power-generating units, each consisting of a dedicated field of approximately 85,000 heliostats, a 750-foot solar tower and receiver, and a power block;
- An approximately 15-acre common facilities area located in the southwestern corner of the site, with an administrative/warehouse building and two 2-acre evaporation ponds (reduced from four 2-acre evaporation ponds for the PSPP);
- An approximately 203-acre temporary construction laydown area located in the southwestern portion of the site immediately north of the common facilities area.
- Re-routing of the generation tie-line near the western end of the route and around the under-construction Red Bluff Substation; the purpose of this re-routing is to align the PSEGS generation tie-line route so that it is immediately adjacent to the NextEra Desert Sunlight generation tie-line to minimize crossings over Interstate 10 and to ensure easy entry into the Red Bluff Substation nearest the PSEGS breaker position;
- Re-routing of the redundant telecommunication line along the generation tie-line route;
- Natural gas delivery from a new extension of the existing Southern California Gas (SoCal Gas) distribution system to the project boundary rather than using propane as proposed for PSPP;

- Reduction of the project footprint from 4,366 acres to 3,794 acres;
- Reduction of the amount of grading by 4.3 million cubic yards because the heliostat technology does not require an entirely flat surface;
- Reduction of the amount of water used by 99 acre-feet per year (AFY); and
- An increase in annual NOx emissions from the use of the auxiliary boilers. This will be evaluated in the FSA when the operational portion of the analysis is done.

SETTING AND EXISTING CONDITIONS

Climate and Meteorology

The Mojave Desert Air Basin (MDAB) is an assemblage of mountain ranges interspersed with long broad valleys that often contain dry lakes. Many of the lower mountains which dot the vast terrain rise from 1,000 to 4,000 feet above the valley floor. Prevailing winds in the MDAB are out of the west and southwest. These prevailing winds are due to the proximity of the MDAB to coastal and central regions and the blocking nature of the Sierra Nevada mountains to the north; air masses pushed onshore in southern California by differential heating are channeled through the MDAB (MDAQMD 2009). MDAB has a typical desert climate characterized by low precipitation, hot summers, mild winters, low humidity, and strong temperature inversions. Total rainfall in Desert Center (approximately 10 miles southwest of the project site) averages just less than 4 inches per year with about 50 percent of the total rainfall occurring during the December through March winter rainy season, and about 30 percent occurring during the August/September summer monsoon season (WC 2009). On average August is the wettest month.

The highest monthly average high temperature is 104°F in July and the lowest average monthly low temperature is 45°F in January and December (WC 2009). The project owner provided a wind rose from Blythe Airport Automated Surface Observing System (ASOS) for the years 2002 to 2006. This wind data indicates the highest annual wind direction frequencies are from the south through the southwest. Due to the topography of the particular site, staff would expect a more westerly wind direction. Calm conditions occur approximately 16 percent of the time, with the annual average wind speed approximately 3.66 meters per second (m/s) or 8.19 miles per hour (mph).

Sensitive Receptors

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. In addition, the location of the population in the area surrounding a project site may have a large bearing on health risk. There are no sensitive receptors identified within a 3-mile buffer zone around the project site. The nearest sensitive receptor (Eagle Mountain Elementary School) is approximately 10 miles west of the boundary of the proposed modified project in the City of Blythe. There are agricultural fields and residences located northwest of the project site[3].

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[3] According to Socioeconomics Figure 1 as of April 1, 2010 there were no people counted as part of the Decennial Census.

Existing Ambient Air Quality

The Federal Clean Air Act and the California Clean Air Act both require the establishment of standards for ambient concentrations of air pollutants, called ambient air quality standards (AAQS). The state AAQS, established by the California Air Resources Board, are typically lower (more protective) than the federal AAQS, which are established by the U.S.EPA. The state and federal air quality standards are listed in **Air Quality Table 2**. The averaging times for the various air quality standards, the times over which they are measured, range from one hour to an annual average. The standards are read as a concentration, in parts per million (ppm), or as a weighted mass of material per a volume of air, in milligrams or micrograms of pollutant in a cubic meter of air (mg/m^3 or $\mu g/m^3$, respectively).

Since the March 2010 Staff Assessment, the implementation of new Ambient Air Quality Standards (AAQS) has led to changes in the categorization of air quality in the PSEGS project area. A new 1-hour nitrogen dioxide (NO_2) National Ambient Air Quality Standard (NAAQS) became effective on April 12, 2010. Besides, a new 1-hour SO_2 NAAQS was established and the existing 24-hour and annual primary NAAQS were revoked on June 2, 2010.

Air Quality Table 2
Federal and State Ambient Air Quality Standards

Pollutant	Averaging Time	Federal Standard	California Standard
Ozone (O_3)	8 Hour	0.075 ppm[a] (147 $\mu g/m^3$)	0.070 ppm (137 $\mu g/m^3$)
	1 Hour	—	0.09 ppm (180 $\mu g/m^3$)
Carbon Monoxide (CO)	8 Hour	9 ppm (10 mg/m^3)	9.0 ppm (10 mg/m^3)
	1 Hour	35 ppm (40 mg/m^3)	20 ppm (23 mg/m^3)
Nitrogen Dioxide (NO_2)	Annual	0.053 ppm (100 $\mu g/m^3$)	0.03 ppm (57 $\mu g/m^3$)
	1 Hour	0.100 ppm[c]	0.18 ppm (339 $\mu g/m^3$)
Sulfur Dioxide (SO_2)	Annual	0.030 ppm (80 $\mu g/m^3$)	—
	24 Hour	0.14 ppm (365 $\mu g/m^3$)	0.04 ppm (105 $\mu g/m^3$)
	3 Hour	0.5 ppm (1300 $\mu g/m^3$)	—
	1 Hour	0.075 ppm (196 $\mu g/m^3$)[b]	0.25 ppm (655 $\mu g/m^3$)
Particulate Matter (PM10)	Annual	—	20 $\mu g/m^3$
	24 Hour	150 $\mu g/m^3$	50 $\mu g/m^3$
Fine Particulate Matter (PM2.5)	Annual	15 $\mu g/m^3$	12 $\mu g/m^3$
	24 Hour	35 $\mu g/m^3$	—
Sulfates (SO_4)	24 Hour	—	25 $\mu g/m^3$
Lead	30 Day Average	—	1.5 $\mu g/m^3$
	Calendar Quarter	1.5 $\mu g/m^3$	—
Hydrogen Sulfide	1 Hour	—	0.03 ppm (42 $\mu g/m^3$)
Vinyl Chloride	24 Hour	—	0.01 ppm (26 $\mu g/m^3$)
Visibility Reducing Particulates	8 Hour	—	In sufficient amount to produce an extinction coefficient of 0.23 per kilometer due to particles when the relative humidity is less than 70%.

Notes:
a - The 2008 standard is shown above, but as of September 16, 2009 this standard is being reconsidered. The 1997 8-hour standard is 0.08 ppm.
b - On June 2, 2010, the U.S. EPA established a new 1-hour SO_2 standard, effective August 23, 2010, which is based on the 3-year average of the annual 99th percentile of 1-hour daily maximum concentrations. The existing 0.030 ppm annual and 0.14 ppm 24-hour SO_2 NAAQS however must continue to be used until one year following U.S. EPA initial designations of the new 1-hour SO_2 NAAQS.
c - On April 12, 1010, the U. S. EPA adopted a new short-term NO2 standard, based upon a 3-yer average of the 98th percentile of daily maximum 1-hour values.
Source: ARB 2013a

In general, an area is designated as attainment if the concentration of a particular air contaminant does not exceed the standard. Likewise, an area is designated as non-attainment for an air contaminant if that contaminant standard is violated. In circumstances where there is not enough ambient data available to support designation as either attainment or non-attainment, the area can be designated as unclassified. The unclassified area is treated the same as an attainment area for regulatory purposes. An area could be attainment for one air contaminant while non-attainment for another, or attainment for the federal standard and non-attainment for the state standard for the same air contaminant.

The project site is located in the MDAB within the SCAQMD portion of Riverside County. This area is designated as non-attainment for the state ozone and PM10 standards and attainment or unclassified for all federal criteria pollutant ambient air quality standards and the state CO, NOx, SOx, and PM2.5 standards. **Air Quality Table 3** summarizes the project site area's attainment status for various applicable state and federal standards.

Air Quality Table 3
Federal and State Attainment Status – Project Site Area within Riverside County

Pollutant	Attainment Status[1]	
	Federal	State
Ozone	Attainment[2]	Moderate Nonattainment
CO	Attainment	Attainment
NO_2	Unclassifiable /Attainment[3]	Attainment
SO_2	Attainment	Attainment
PM10	Attainment[2]	Nonattainment
PM2.5	Attainment	Attainment

Notes:
1 - Attainment = Attainment or Unclassified, where Unclassified is treated the same as Attainment for regulatory purposes.
2 - Attainment status for the site area only, not the entire MDAB.
3 – On February 17, 2012, the U.S. Environmental Protection Agency designated all of the United States as “unclassifiable/ attainment” for the short-term federal NO_2 standard, effective February 29, 2012.
Source: ARB 2009b, U.S.EPA 2009a.

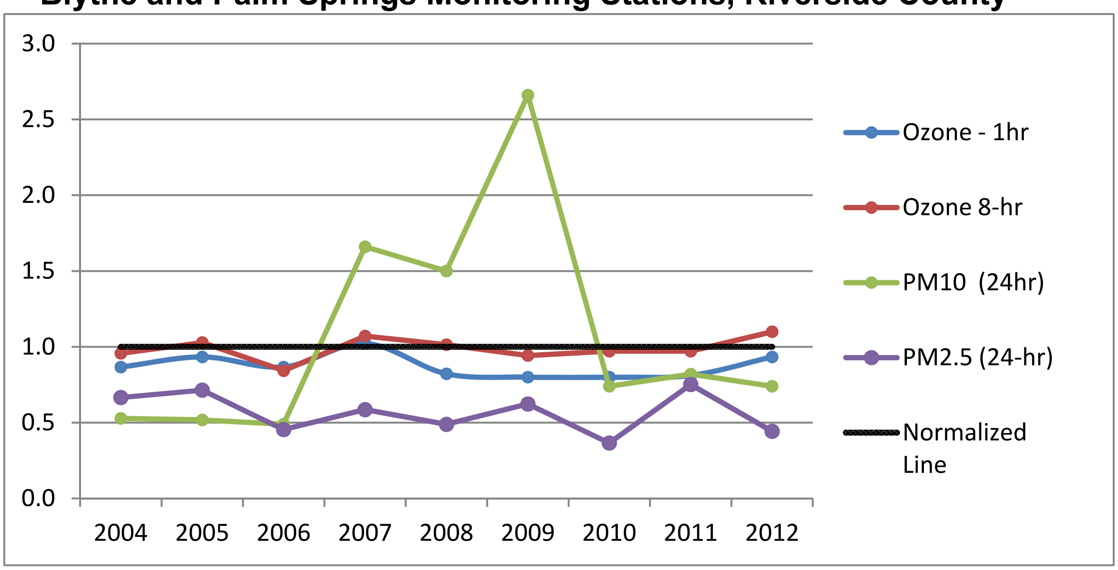
Ambient air quality monitoring data for ozone, PM10, PM2.5, CO, NO_2, and SO_2, compared to most restrictive applicable standards for the years between 2008 through 2012 at the most representative monitoring stations for each pollutant are shown in **Air Quality Table 4** and the 1-hour and 8-hour ozone, and 24-hour PM10 and PM2.5 data for the years 2004 through 2012 (PM10 and PM2.5) are shown in **Air Quality Figure 1**. Ozone data are from the Blythe–445 West Murphy Street monitoring station which is approximately 35 miles east of the project site, PM10, PM2.5, NO_2 and CO data are from the Palm Springs-Fire Station monitoring station located approximately 75 miles west of the project site, and SO_2 data are from the Victorville–14306 Park Avenue monitoring station which is located approximately 135 miles west northwest of the project site. These station locations were deemed to be the closest stations with data representative of the project site for the various averaging times.

Air Quality Table 4
Criteria Pollutant Summary
Maximum Ambient Concentrations (ppm or µg/m^3)

Pollutant	Monitoring Station	Averaging Period	Units	2008	2009	2010	2011	2012	Limiting AAQS[c]
Ozone	Blythe–445	1 hour	ppm	0.074	0.072	0.072	0.073	0.084	0.09
Ozone	Blythe–445	8 hours	ppm	0.071	0.066	0.068	0.068	0.077	0.07
PM10 [a,b]	Palm	24 hours	µg/m	75	**133.0**	37	41	37	50
PM10 [a,b]	Palm	Annual	µg/m	**23.2**	*	18.3	18.1	16.1	20
PM2.5 [a]	Palm	24 hours	µg/m	17.1	21.8	12.8	**26.3**	15.5	35
PM2.5 [a]	Palm	Annual	µg/m	**7.2**	*	5.9	6.0	6.5	12
CO	Palm	1 hour	ppm	1.3	2.3	1.6	**3.0**	0.90	20
CO	Palm	8 hours	ppm	0.54	**0.67**	0.50	0.60	0.50	9.0
NO_2	Palm	1 hour	ppm	**0.049**	0.048	0.046	0.045	0.045	0.18
NO_2	Palm	Federal 1	ppm	**0.045**	0.039	0.039	0.039	0.039	0.10
NO_2	Palm	Annual	ppm	**0.009**	0.008	0.009	0.008	*	0.03
SO_2	Victorville–	1 hour (3yr	ppm	0.005	0.006	**0.011**	0.007	0.005	0.075
SO_2	Victorville–	3 hour	ppm	0.006	**0.006**	0.006	0.005	0.005	0.5
SO_2	Victorville–	24 hours	ppm	0.002	0.005	**0.007**	0.007	0.003	0.04
SO_2	Victorville–	Annual	ppm	**0.0011**	0.000	0.000	0.001	*	0.03

Notes:
[a] - Exceptional PM concentration events, such as those caused by wind storms are not shown where excluded by U.S.EPA; however, some exceptional events may still be included in the data presented.
[b] - The PM10 data source is in the Coachella Valley that is classified as a serious PM10 nonattainment area.
[c] - The limiting AAQS is the most stringent of the CAAQS or NAAQS for that pollutant and averaging period.
* means there was insufficient data available to determine the value.
Bold values were used as staff's recommended background values in **AQ Table 5**.
Source: ARB 2013c, U.S.EPA 2013b, SCAQMD 2013.

Air Quality Figure 1
2004-2012 Historical Ozone and PM Air Quality Data
Blythe and Palm Springs Monitoring Stations, Riverside County [a, b, c]



Notes: a - The highest measured ambient concentrations of various criteria air contaminants were divided by their applicable standard and provided as a graphical point. Any point on the chart that is greater than one means that the measured concentrations of such air contaminant exceed the standard, and any point that is less than one means that the respective standard is not exceeded for that year. For example the 24-hour PM10 concentration in 2008 is 75 µg/m^3/50 µg/m^3 standard = 1.5.
b - Ozone data are from Blythe–445 West Murphy Street monitoring station and the PM data are from the Palm Springs station.
c - All PM data are from Palm Springs monitoring station.
Source: ARB 2009c, U.S.EPA 2013b, SCAQMD 2013.

Ozone

Ozone is not directly emitted from stationary or mobile sources, but is formed as the result of chemical reactions in the atmosphere between directly emitted nitrogen oxides (NOx) and hydrocarbons (Volatile Organic Compounds [VOC]) in the presence of sunlight to form ozone. Pollutant transport from the South Coast Air Basin (Los Angeles Area) is one source of the pollution experienced in the eastern Riverside County portion of the MDAB (SCAQMD 2007, p. 1-2).

As **Air Quality Table 4** and **Air Quality Figure 1** indicate, the 1-hour and 8-hour ozone concentrations measured at the eastern border of Riverside County have been very close to the standard and very slowly decreasing over time, although there is an upward trend between 2011 and 2012. The collected air quality data (not shown) indicate that the ozone violations occurred primarily during the sunny and hot periods typical during May through September.

Nitrogen Dioxide

The entire air basin is classified as attainment or unclassifiable for the state and federal 1-hour NO_2 standard and the annual federal NO_2 standard.

Approximately 90 percent of the ambient NOx emitted from combustion sources is nitric oxide (NO), while the balance is NO_2. NO is oxidized in the atmosphere to NO_2, but some level of photochemical activity is needed for this conversion. The highest concentrations of NO_2 typically occur during the fall. The winter atmospheric conditions can trap emissions near the ground level, but lacking substantial photochemical activity (sun light), NO_2 levels are relatively low. In the summer the conversion rates of NO to NO_2 are high, but the relatively high temperatures and windy conditions disperse pollutants, preventing the accumulation of NO_2. The NO_2 concentrations in the project area are well below the state and federal ambient air quality standards.

Carbon Monoxide

The area is classified as attainment for the state and federal 1-hour and 8-hour CO standards. The highest concentrations of CO occur when low wind speeds and a stable atmosphere trap the pollution emitted at or near ground level. These conditions occur frequently in the wintertime late in the afternoon, persist during the night and may extend one or two hours after sunrise. The project area, in comparison with major urban areas, has a lack of substantial mobile source emissions and based on the Palm Springs-Fire Station monitoring site data, the local CO concentrations are expected to be well below the state and federal ambient air quality standards.

Particulate Matter (PM10) and Fine Particulate Matter (PM2.5)

PM10 can be emitted directly or it can be formed many miles downwind from emission sources when various precursor pollutants interact in the atmosphere.

The area is non-attainment for the state PM10 standards. **Air Quality Table 4** and **Air Quality Figure 1** shows recent PM10/PM2.5 concentrations from a station in the adjacent Coachella Valley portion of the Salton Sea Air Basin (SSAB), which are assumed to provide a conservative basis for the project site area. The figure shows fluctuating concentrations patterns, and shows clear exceedances of the state 24-hour

PM10 standard. It should be noted that exceedance does not necessarily mean violation or nonattainment, as exceptional events do occur and some of those events, which do not count as violations, may be included in the data.

Fine particulate matter, or PM2.5, is derived mainly from either the combustion of materials, or from precursor gases (SOx, NOx, and VOC) through complex reactions in the atmosphere. PM2.5 consists mostly of sulfates, nitrates, ammonium, elemental carbon and a small portion of organic and inorganic compounds.

Portions of the MDAB are classified as non attainment for the federal PM10 standards and the state and federal PM2.5 standards; however, the project site is located in an unclassified or attainment portion of the MDAB for these standards. This divergence in the PM10 and PM2.5 concentration levels and attainment status indicate that a substantial fraction of the ambient particulate matter levels are most likely due to localized fugitive dust sources, such as vehicle travel on unpaved roads, agricultural operations, or wind-blown dust.[4]

Sulfur Dioxide

The entire air basin is classified as attainment for the state and federal SO_2 standards.

Sulfur dioxide is typically emitted as a result of the combustion of a fuel containing sulfur. Sources of SO_2 emissions within the MDAB come from a wide variety of fuels: gaseous, liquid and solid; however, the total SO_2 emissions within the eastern MDAB are limited due to the limited number of major stationary sources and California's and U.S. EPA's substantial reduction in motor vehicle fuel sulfur content. The project area's SO_2 concentrations are well below the state and federal ambient air quality standards.

Summary

In summary, staff recommends the background ambient air concentrations in **Air Quality Table 5** for use in the modeling and impacts analysis. The recommended background concentrations are based on the maximum criteria pollutant concentrations from the past three years of available data collected at the most representative monitoring stations surrounding the project site.

[4] Fugitive dust, unlike combustion source particulate and secondary particulate, is composed of a much higher fraction of larger particles than smaller particles, so the PM2.5 fraction of fugitive dust is much smaller than the PM10 fraction. Therefore, when PM10 ambient concentrations are significantly higher than PM2.5 ambient concentrations this tends to indicate that a large proportion of the PM10 are from fugitive dust emission sources, rather than from combustion particulate or secondary particulate emission sources.

Air Quality Table 5
Staff Recommended Background Concentrations (µg/m^3)

Pollutant	Averaging Time	Recommended Background	Limiting AAQS [b]	Percent of Standard
NO_2	1 hour	92.3	339	27%
	Federal 1 hour (98th percentile)	84.6	188	46%
	Annual	17	57	30%
CO	1 hour	3,450	23,000	15%
	8 hour	744	10,000	7%
PM10	24 hour	133	50	266%
	Annual	23.2	20	116%
PM2.5	24 hour [a]	26.3	35	75%
	Annual	7.2	12	60%
SO_2	1 hour	28.7	196	15%
	3 hour	15.6	1,300	1%
	24 hour	18.4	105	18%
	Annual	2.9	80	4%

Source: ARB 2013c, U.S.EPA 2013b and Energy Commission Staff Analysis
Notes:
[a] PM2.5 24-hour data shown in **Air Quality Table 4** are 98th percentile values which is the basis of the ambient air quality standard and the basis for determination of the recommended background concentration.
[b] The limiting AAQS is the most stringent of the CAAQS or NAAQS for that pollutant and averaging period.

Where possible, staff prefers that the recommended background concentration measurements come from nearby monitoring stations with similar characteristics. For this proposed modified project, the Blythe monitoring station (ozone), at approximately 35 miles east of the project site, is the closest monitoring station. The Palm Springs monitoring station (PM10, PM2.5, NO_2, and CO) is located approximately 75 miles west of the project site. The Victorville monitoring station (SO_2) is located approximately 135 miles west northwest of the project site. In general, the Palm Springs and Victorville monitoring stations are considered to provide conservative estimates of the worst case background concentrations due to their proximity to the South Coast Air Basin (Metropolitan Los Angeles). Monitoring stations located in Imperial County were not selected or considered as representative due to the predominant air flow patterns and due to air pollution from Mexico that creates a significant local influence for the worst-case pollutant concentration readings within Imperial County.

The background concentrations for PM10 are well above the most restrictive existing ambient air quality standards, while the background concentrations for the other pollutants are all below the most restrictive existing ambient air quality standards.

The pollutant modeling analysis was limited to the pollutants listed above in **Air Quality Table 5**; therefore, recommended background concentrations were not determined for the other criteria pollutants (ozone, lead, visibility, etc.).

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

Staff provided a number of data requests regarding the construction and operations emission estimates and air dispersion modeling analysis (CEC 2013c), which the project owner responded to by providing revised emissions estimates (Palen 2013c) and substantially revised and more robust dispersion modeling analysis (Solar Millennium 2010a). Staff has reviewed the revised emission estimates and air dispersion modeling analysis[5] and finds them to be reasonable considering the level of emissions mitigation stipulated to by the project owner.

Project Description

In each plant, one Rankine-cycle steam turbine would receive steam from the SRSG to generate electricity. The solar field and power generation equipment would start each morning after sunrise and would shut down (unless augmented by the auxiliary boiler) when solar insolation drops below the level required to keep the turbine on-line. Each plant would have two natural gas-fired auxiliary boilers that could also be used to extend daily power generation.

Each plant would use an air-cooled condenser (ACC) for the main steam cycle. A wet surface air cooler (WSAC) would be used for auxiliary equipment cooling. Raw water would be drawn daily from on-site wells located in each power block and in the common area adjacent to the administration building. Groundwater would be treated in on-site treatment systems and would be used for mirror washing, WSAC makeup, and process water makeup. Each power block would be connected via underground electrical cables to the on-site switchyard in the northern area of the site. Each power block would also have a gas metering set. Permanent parking areas would be provided at each power block for operations and maintenance personnel.

PSEGS would be a concentrated solar thermal electric generating facility with two adjacent (Unit #1 and Unit #2), independent, and similar solar plants of 250 megawatt (MW) nominal capacity each for a total nominal capacity of 500 MW. The PSEGS would be located in the Southern California inland desert, approximately 10 miles east of the small community of Desert Center, in eastern Riverside County, California. PSEGS facilities would occupy approximately 3,794acres of public lands owned by the Federal government for which a right-of-way (ROW) lease is being obtained by the project owner from the Bureau of Land Management (BLM).

Units #1 and #2 would be developed in phases with construction scheduled to begin in early 2014 and continue through the second quarter of 2016. Commercial operation of Unit #1 is expected to begin in mid-2015, with commercial operation of Unit #2 following by the end of 2016.

The main operation area (solar field and power block) of Units #1 and #2 would occupy about 1,790 acres each. The two plants would share a main office building, a main warehouse / maintenance building and a parking lot, all located to the south of the solar fields. The two units would also share a storage tank for reverse osmosis (RO) concentrate (located in Unit #1) and a central internal switchyard located north of the solar fields. The main access road into the site would be located southwest of Unit #2.

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[5] This includes a review of the emission source inputs, including the type of source (point, volume, area) and the variables used to describe each source (emissions, height, location, temperature, etc. as appropriate).

The generation tie-line would be re-routed near the western end of the route and around the newly constructed Red Bluff Substation; the purpose of this re-routing is to align the PSEGS generation tie-line route so that it is immediately adjacent to the NextEra Desert Sunlight generation tie-line to minimize crossings over Interstate 10 and to ensure easy entry into the Red Bluff Substation nearest the PSEGS breaker position.

Project Emissions

Project Construction

The total duration of project construction for PSEGS is estimated to be approximately 33 months, and would include construction of the two solar fields and two power blocks. The total site related acreage is ~3,794 acres, i.e., the area inside the fence-line. Only 337.2 acres would actually be graded or have extensive earthwork. The maximum acreage disturbed on any one day during construction (earthwork phase) would be approximately 10 percent of the total, or approximately 34 acres. The maximum acreage to be disturbed during power block and heliostat installation would be 211 acres, with these disturbance activities related to vehicle movements and heliostat foundation work. The maximum acreage disturbed on any one day during power block and heliostat installation would be 26 acres. Although the site is essentially flat, the site would require minimum grading and leveling prior to construction of the power blocks, support systems, solar array field, and site buildings. Site preparation includes finish grading, excavation of footings and foundations, and backfilling operations. After site preparation is finished, the construction of the foundations and structures is expected to begin. Once the foundations and structures are finished, installation and assembly of the mechanical and electrical equipment are scheduled to commence[6].

Combustion emissions would result from the off-road construction equipment, including diesel construction equipment used for site grading, excavation, and construction of onsite structures, and water and soil binder spray trucks used to control construction dust emissions; and off-road construction equipment used at the onsite batch plant. Fuel combustion emissions also would result from exhaust from on-road construction vehicles, including heavy duty diesel trucks used to deliver materials, other diesel trucks used during construction, and worker personal vehicles and pickup trucks used to transport workers to and from and around the construction site. Fugitive dust emissions would result from site grading/excavation activities, installation of a temporary 12 kV construction power transmission and the new project power transmission lines, completion of onsite wells and water pipelines, construction of power plant facilities, roads, and substations, the use of an onsite batch plant, and vehicle travel on paved and unpaved roads.

The project owner’s mitigated maximum daily and annual construction emission estimates for the entire proposed modified project are provided below in **Air Quality Tables 6** and **7**. To determine the potential worst-case daily construction impacts, exhaust and dust emission rates have been evaluated for each source of emissions. Worst-case daily fugitive dust emissions are expected to occur during the first months of construction when site preparation occurs (Palen 2013c). The worst-case daily combustion exhaust emissions are expected to occur during the middle of the

[6] Palen 2013c Appendix 4.1E

construction schedule during the installation of the major mechanical equipment and as shown in **Air Quality Table 6**. Annual emissions are based on the average equipment mix and use rates during the construction period. Daily emissions are derived from the annual values using the estimated construction time frame and as shown in **Air Quality Table 7**.

Air Quality Table 6
PSEGS Construction - Maximum Daily Emissions (lbs/day)

	NOx	VOC	CO	PM10	PM2.5	SOx
Onsite Construction Emissions						
Main Power Block (entire project)						
Off-road Equipment Exhaust	760.8	97.1	396	37.7	37.7	1.0
On-road Support Vehicles	0.17	0.14	1.63	0.026	0.026	0.00025
Fugitive Dust from Paved Roads	--	--	--	1.04	0.2	--
Fugitive Dust from Unpaved Roads	--	--	--	6.95	0.69	--
Fugitive Dust from Constr. Activities	--	--	--	21.7	4.65	--
Fugitive Dust from Batch Plant Emissions	--	--	--	2.09	0.21	--
Subtotal - Power Block Onsite Emissions	**761.0**	**97.2**	**397.6**	**69.5**	**43.5**	**1.0**
Power Block On-road Delivery/Hauling (offsite)	19.9	1.55	7.62	0.93	0.93	0.04
Fugitive Dust from Access Road Construction (offsite)	--	--	--	0.27	0.06	--
Worker Travel (offsite)	21.9	21.0	244.9	9.32	9.32	0.45
Fugitive Dust from Paved Roads (offsite)	--	--	--	7.4	1.25	--
Fugitive Dust from Unpaved Roads and track-out (offsite)	--	--	--	0.29	0.05	--

Source: Palen 2013c, Table 4.1E-1 and 2
Note: Emissions that were not added may not be additive due to occurring at different times during the construction schedule; all emissions include fugitive dust as appropriate.

Air Quality Table 7
PSEGS Construction - Maximum Annual Emissions (tons/period)

	NOx	VOC	CO	PM10	PM2.5	SOx
Construction Emissions						
Main Power Block (entire project)						
Off-road Equipment Exhaust	263.6	33.64	137.2	13.07	13.07	0.36
On-road Support Vehicles	0.057	0.047	0.563	0.009	0.009	0.001
Fugitive Dust from Paved Roads	--	--	--	0.34	0.06	--
Fugitive Dust from Unpaved Roads	--	--	--	2.07	0.21	--
Fugitive Dust from Constr. Activities	--	--	--	5.02	1.08	--
Fugitive Dust from Batch Plant Emissions	--	--	--	0.31	0.03	--
Subtotal - Power Block Onsite Emissions	**263.7**	**33.7**	**137.8**	**20.8**	**14.5**	**0.36**
Power Block On-road Delivery/Hauling (offsite)	6.9	0.54	2.64	0.323	0.323	0.013
Fugitive Dust from Access Road Construction (offsite)	--	--	--	0.27	0.06	--
Worker Travel (offsite)	7.59	7.28	84.9	1.4	1.4	0.155
Fugitive Dust from Paved Roads (offsite)	--	--	--	7.4	1.25	--
Fugitive Dust from Unpaved Roads and track-out (offsite)	--	--	--	0.29	0.05	--

Source: Palen 2013c, Table 4.1E-1 and 2
Note: Emissions that were not added may not be additive due to occurring at different times during the construction schedule; all emissions include fugitive dust as appropriate.

Project Operation

The project owner submitted a new permit application to the South Coast Air Quality Management District (SCAQMD) on April 4, 2012[7] for the required air permits needed for the project. On May 5, 2013 the SCAQMD sent a letter stating the PSEGS project application is still deemed to be incomplete.[8] -

At this time, staff has evaluated only construction related air quality impacts from the modified project. The operational related impacts will be evaluated during the time of the Final Staff Assessment and once the SCAQMD has published a Determination of Compliance and Energy Commission Staff can then recommend adoption of Air Quality Conditions of Certification

Initial Commissioning

Initial commissioning refers to a period of time prior to beginning commercial operation when the equipment undergoes initial tests. For PSEGS initial commissioning would occur at intervals during the construction period when each of the two power units becomes operational. Because of this proposed modified project's use of a non-fuel fired generating technology, staff does not expect major changes in emissions from the facility commissioning activities compared to that of normal operation.

Dispersion Modeling Assessment

While the emissions are the actual mass of pollutants emitted from the proposed modified project, the impacts are the concentration of pollutants from the proposed modified project that reach the ground level. When emissions are expelled at a high temperature and velocity through a relatively tall stack, the pollutants would be greatly diluted by the time they reach ground level. For this proposed modified project, there are no tall emission stacks, but the construction and maintenance vehicles and emergency engine do have high temperature and velocity exhausts; and the boilers also have relatively high exhaust temperatures and velocities. The emissions from the proposed modified project, both stationary source and onsite mobile source emissions, are analyzed through the use of air dispersion models to determine the probable impacts at ground level.

Air dispersion models provide a means of predicting the location and ground level concentrations of the impacts of a new emissions source. These models consist of several complex series of mathematical equations, which are repeatedly calculated by a computer for many ambient conditions to provide theoretical maximum offsite pollutant concentrations for short-term (1-hour, 3-hour, 8-hour, and 24-hour) and annual periods. The model results are generally described as maximum concentrations, often described as a unit of mass per volume of air, such as micrograms per cubic meter ($\mu g/m^3$).

The project owner used the U.S.EPA guideline ARMS/EPA Regulatory Model (AERMOD) model (version12345) to estimate ambient impacts from project construction

[7] SCAQMD 2013a – South Coast Air Quality Management District/Mohsen Nazemi (TN 70277). Letter to Roger Johnson, dated April 5, 2013. Submitted to CEC/Dockets Unit on April 11, 2013

[8] SCAQMD 2013b – South Coast Air Quality Management District/Mohsen Nazemi (TN 70536). Completeness Letter for the Palen Solar Electric Generation Project to Charles Turlinski, dated April 26, 2013. Submitted to CEC/Docket Unit April 30, 2013

and operation. The construction emission sources for the site were grouped into two categories: combustion exhaust emissions and fugitive dust emissions. Combustion equipment exhaust emissions were modeled as 3.048 meter high point sources (exhaust parameters of 750 Kelvin, 64.681 m/s velocity, and 0.1524m diameter) placed at regular intervals. Construction fugitive dust emissions were modeled as area sources with an effective height of 0.5 meters. Short-term impacts were modeled assuming the emissions were located at the two power blocks, the common area, and for the site preparation phase, the construction and truck staging area. This resulted in seventeen (17) point sources (2 acres/source, located 50-100 meters apart) and area sources approximating the 34 and 26 acre areas discussed above for site preparation and power block and heliostat installation phases, respectively (Palen 2013c).

The inputs for the air dispersion models include two power blocks with stack information (exhaust flow rate, temperature and stack dimensions), specific engine and vehicle emission data and meteorological data, such as wind speed, atmospheric conditions, and site elevation. For this proposed modified project, the meteorological data used as inputs to the model included hourly wind speeds and directions measured at the Blythe Airport meteorological station during 2002 through 2006.

For the determination of one-hour average and annual average construction NOx concentrations, the Ozone Limiting Method (OLM) was used to determine worst-case near field NO_2 impacts. The NOx emissions from internal combustion sources, such as diesel engines, are primarily in the form of nitric oxide (NO) rather than NO_2. The NO converts into NO_2 in the atmosphere, primarily through the reaction with ambient ozone, and NOx OLM assumes full conversion of stack NO emission with the available ambient ozone. NO_2 impacts were computed using the ambient ratio method (ARM) with the USEPA default values of 0.80 and 0.75 for the 1-hour and annual NO2/NOx ratios, respectively.

The project owner has also provided a modeling analysis to show compliance during operation with the new federal 1-hour NO_2 standard[9] (TN 70786). This modeling analysis, also using the AERMOD dispersion model, includes the use of the NOx OLM modeling option and used a post-processor developed by the project owner's consultant to also add in the corresponding hourly NO_2 background data and determine the 98th percentile of daily maximums (eighth highest) for each modeled receptor location. The NOx OLM option considers that the emissions of NOx are initially primarily in the form of NO that over time oxidizes, primarily through a reaction with ozone, to NO_2**.** Operational impacts will be assessed in the FSA.

Staff reviewed the background concentrations provided by the project owner, replacing them where appropriate with the available highest ambient background concentrations from the last three years at the most representative monitoring stations as show in **Air Quality Table 5**. Staff added the modeled impacts to these background concentrations, and then compared the results with the ambient air quality standards for each respective air contaminant to determine whether the proposed modified project's

[9] Palen 2013n – Galati Blek/J. Leyva Record (TN 70786). Palen Solar Electric Air Quality Modeling Files, dated May 7, 2013. Submitted to CEC/Docket Unit on May 7, 2013

emission impacts would cause a new exceedance of an ambient air quality standard or would contribute to an existing exceedance.

The following sections discuss the proposed modified project's short-term direct construction ambient air quality impacts, as estimated by the project owner, and describes appropriate mitigation measures.

Construction Impacts and Mitigation

Construction Modeling Analysis

Using estimated peak hourly, daily and annual construction equipment exhaust emissions, the project owner modeled the proposed modified project's construction emissions to determine impacts (Palen 2013c). To determine the construction impacts on ambient standards (i.e. 1-hour through annual), construction was assumed to occur for 12 hours/day (8 AM to 8 PM), which represents an average of the workday periods which would fluctuate between 8 and 16 hours per day. The construction impacts modeling analysis used the same meteorological data and other modeling inputs as used for the project operating impact analysis. However, for the construction modeling, only the facility fence line and nearby downwash receptor grid (used for operational impacts) were used (both with 50-meter spacing), since maximum impacts would occur in the immediate vicinity of the property boundary due to the low plume heights during construction.

The predicted proposed modified project pollutant concentration levels were added to conservatively worst-case maximum background concentration levels (from **Air Quality Table 5**) to determine the cumulative effect. The results of the project owner's modeling analysis are presented in **Air Quality Table 10**. The construction emissions modeling analysis, including both the onsite fugitive dust and vehicle tailpipe emission sources (with project owner-proposed control measures) are summarized in **Air Quality Tables 6** and **7**.

Air Quality Table 10
Maximum Project Construction Impacts

Pollutants	Avg. Period	Project Impact (□g/m^3)	Background (□g/m^3)	Total Impact (□g/m^3)	Standard (□g/m^3)	Percent of Standard
NO_2	1-hr.	200.6	92.3	292.9	339	86%
	Fed.1 hr (98th percentile)	168.6	84.6	253.26	188	**135%**
	Annual	0.7	17	17.7	57	31%
CO	1-hr	131	3,450	3581	23,000	16%
	8-hr	52	744	796	10,000	8%
PM10	24	15.3	133	148.3	50	**297%**
	Annual	0.10	23.2	23.3	20	**117%**
PM2.5	24	3.4	26.3	29.7	35	85%
	Annual	0.05	7.2	7.25	12	60%
SO_2	1-hr	0.33	28.7	29.03	665	4%
	3-hr	0.21	15.6	15.81	1,300	1%
	24-hr	0.07	18.4	18.47	105	18%
	Annual	0.01	2.9	2.91	80	4%

Source: Palen 2013c
Notes: [a] – This is the background concentration that corresponds with the hour with the highest combined matched hourly project impact and hourly monitored NO_2 background concentration.
[b]98th percentile NOx 1-hour OLM = 168.6 ug/m3 (Palen 2013n)

This modeling analysis indicates, with the exception of PM10 and Federal 1-hour NO_2, that the proposed modified project would not create new exceedances or contribute to existing exceedances for any of the modeled air pollutants. The conditions that would create worst-case project modeled impacts (low wind speeds) are not the same conditions when worst-case background is expected for PM10. Additionally, the worst-case PM10 impacts occur at the fence line and drop off quickly with distance from the fence line. In light of the existing PM10 non-attainment status for the project site area, staff considers the construction PM10 emissions to be potentially CEQA significant and recommends that the off-road equipment and fugitive dust PM10 emissions be mitigated pursuant to CEQA.

The project owner's modeling results indicate that 1-hour NO_2 concentrations above the federal standard only occur within 200 meters of the north fence line at night. Staff believes that these results are conservative and over predict the impacts for project construction for the following reasons:

- The modeling analysis included the very conservative input assumptions of using area sources to model all of the construction NOx emissions, except for the concrete batch plant generator which was modeled as a point source and consequently found to have minimal NO_2 impacts (less than 3 µg/m3).
- The project itself would not cause a violation of the standard and only when added to the 98th percentile background value would the impacts be over the standard.
- Total concentrations shown in this table are the sum of the maximum predicted impact and the maximum measured background concentration. Because the maximum impact would most likely not occur at the same time as the maximum background concentration, the actual maximum combined impact would be lower.
- The modeling, which did incorporate the ozone limiting method (OLM), did not undergo further refinement to determine the actual expected maximum conversion of NO to NO_2 in the very short time period the emissions plume would take to get to and just past the fence line. OLM assumes immediate 100 percent conversion based on the available concentration of ozone.
- The entire construction period is expected to be 33 months in duration, while the federal 1-hour NO_2 standard is averaged over 36 months.
- Staff is certain that a more refined analysis would show that the maximum NO_2 concentrations from construction would not exceed the federal standard.

However, to be certain that there would be no risk to public health from construction NOx, emissions staff recommends that the off-road construction equipment be mitigated by requiring the use of equipment that meets the latest U.S. EPA and ARB engine emission standards.

Staff concludes with implementation of staff-proposed mitigation measures the construction impacts would not contribute substantially to exceedances of PM10 or ozone standards, nor cause new exceedances of the 1-hour federal NO_2 standard.

The modeling analysis shows that, after implementation of the recommended emission mitigation measures, the proposed modified project's construction is not predicted to cause new exceedances of the AAQS.

Adequacy of Current Mitigation as adopted in the original CEC Palen Decision

Staff will propose retaining Air Quality Conditions of Certification **AQ-SC1** through **AQ-SC5** with some modifications and updates that have been used in more recent solar projects.

Staff Proposed Mitigation

Staff recommends the project owner's proposed construction mitigation be formalized, with minor modifications that update the measures to meet current staff recommendations, in Air Quality Conditions of Certification **AQ-SC1** through **AQ-SC5**. Staff has determined that these Conditions of Certification would mitigate all construction air quality impacts of the proposed modified project to less than significant levels pursuant to CEQA.

Staff has considered the minority population surrounding the site (see Socioeconomics Figure 1). Since the proposed modified project's direct air quality impacts have been reduced to less than significant, there is no environmental justice issue for air quality.

Indirect Pollutant and Secondary Pollutant Impacts

The proposed modified project would have direct emissions of chemically reactive pollutants (NOx, SOx, and VOC), but would also have indirect emission reductions associated with the reduction of fossil fuel–fired power plant emissions due to the proposed modified project displacing the need for their operation, since solar renewable energy facilities would operate on a must-take basis.[10] However, the exact nature and location of such reductions is not known, so the discussion below focuses on the direct emissions from the proposed modified project within the Riverside County portion of the Mojave Desert Air Basin.

Ozone Impacts

There are air dispersion models that can be used to quantify ozone impacts, but they are used for regional planning efforts where hundreds or even thousands of sources are input into the model to determine ozone impacts. There are no regulatory agency models approved for assessing single source ozone impacts. However, because of the known relationship of NOx and VOC emissions to ozone formation, it can be said that the emissions of NOx and VOC from the PSEGS project do have the potential (if left unmitigated) to contribute to higher ozone levels in the region. These impacts would be cumulatively significant under CEQA because they would contribute to ongoing violations of the state ozone ambient air quality standards.

PM2.5 Impacts

Secondary particulate formation, which is assumed to be 100 percent PM2.5, is the process of conversion from gaseous reactants to particulate products. The process of gas-to-particulate conversion, which occurs downwind from the point of emission, is complex and depends on many factors, including local humidity and the presence of air

[10] This refers to the fact that the contract between the owner of this solar power facility and the utility will require that the utility take all generation from this facility with little or no provisions for the utility to direct turn down of generation from the facility.

pollutants. The basic process assumes that the SOx and NOx emissions are converted into sulfuric acid and nitric acid first and then react with ambient ammonia to form sulfate and nitrate. The sulfuric acid reacts with ammonia much faster than nitric acid and converts completely and irreversibly to particulate form. Nitric acid reacts with ammonia to form both a particulate and a gas phase of ammonium nitrate. The particulate phase would tend to fall out; however, the gas phase can revert back to ammonia and nitric acid. Thus, under the right conditions, ammonium nitrate and nitric acid establish a balance of concentrations in the ambient air.

The emissions of NOx and SOx from PSEGS do have the potential (if left unmitigated) to contribute to higher PM2.5 levels in the region; however, the region is attainment for PM2.5 standards and the low level of NOx and SOx emissions from the proposed modified project would not significantly impact that status.

Impact Summary

The project owner is proposing to mitigate the proposed modified project's stationary source NOx, VOC, SO_2, and PM10/PM2.5 emissions through the use of Best Available Control Technology (BACT) and reduce the proposed modified project's mobile source emissions by using lower emitting new vehicles. With Condition of Certification **AQ-SC5,** staff concludes that the proposed modified project would not cause significant secondary pollutant impacts during construction.

PROJECT-RELATED ACTIONS – AIR QUALITY

In order to transmit the power generated at the PSEGS to the electricity grid, a new substation is required. Southern California Edison Company (SCE) is constructing the substation and will operate it, which would allow PSEGS's electricity to be carried by the Devers-Palo Verde No. 1 (DPV1) 500 kV transmission line. SCE's web site states that the Red Bluff Substation Project is scheduled to become operational in December 2013[11].

CUMULATIVE IMPACTS

Cumulative impacts are defined by CEQA as "two or more individual effects which, when considered together, are considerable or...compound or increase other environmental impacts." (CEQA Guidelines, § 15355.) A cumulative impact consists of an impact that is created as a result of a combination of the project evaluated in the EIR together with other projects causing related impacts." (CEQA Guidelines, § 15130(a)(1).) Such impacts may be relatively minor and incremental, yet still be significant because of the existing environmental background, particularly when one considers other closely related past, present, and reasonably foreseeable future projects.

This analysis is concerned with criteria air pollutants. Such pollutants have impacts that are usually (though not always) cumulative by nature. Rarely would a project by itself cause a violation of a federal or state criteria pollutant standard. However, a new source of pollution may contribute to violations of criteria pollutant standards because of high existing background concentrations or foreseeable future projects. Air districts attempt

[11] (SEC 2013a - https://www.sce.com/wps/portal/home/about-us/reliability/upgrading-transmission/red-bluff)

to attain the criteria pollutant standards by adopting attainment plans, which comprise a multi-faceted programmatic approach to such attainment. Depending on the air district, these plans typically include requirements for emissions offsets and the use of Best Available Control Technology (BACT) for new sources of emissions, and restrictions of emissions from existing sources of air pollution.

Thus, much of the preceding discussion is concerned with cumulative impacts. The "Existing Ambient Air Quality" subsection describes the air quality background in the Riverside County portion of the MDAB, including a discussion of historical ambient levels for each of the significant criteria pollutants. The "Construction Impacts and Mitigation" subsection discusses the proposed modified project's contribution to the local existing background caused by project construction. The "Operation Impacts and Mitigation" subsection (once completed in the FSA) discusses the proposed modified project's contribution to the local existing background caused by project operation. The following subsection includes two additional analyses:

- a summary of projections for criteria pollutants by the air district and the air district's programmatic efforts to abate such pollution; and
- an analysis of the proposed modified project's *localized cumulative impacts*, the proposed modified project's direct operating emissions combined with other local major emission sources.

SUMMARY OF PROJECTIONS

The SCAQMD is the agency with principal responsibility for air quality attainment planning in the portion of the MDAB surrounding the project site. The project site area is considered attainment or unclassifiable for all federal air quality standards, so for the MDAB portion of SCAQMD's jurisdiction, there are no federal planning requirements. However, this area is also non-attainment for state ozone and PM10 standards, where there are state planning requirements for ozone attainment, but not PM10 attainment. SCAQMD has adopted two recent Air Quality Management Plans. These adopted air quality plans are summarized below.

- **2007 Air Quality Management Plan** (adopted 6/1/2007, not yet approved by U.S.EPA) Link: www.aqmd.gov/aqmp/07aqmp/index.html
- **Final 2003 Air Quality Management Plan** (originally adopted 12/10/1999, amended in 2003, partially approved/partially disapproved by U.S.EPA in 2009.) Link: www.aqmd.gov/aqmp/AQMD03AQMP.htm

These two plans extensively cover the attainment planning requirements for the South Coast Air Basin, and provide a separate chapter covering attainment planning for the portion of the Salton Sea Air Basin within SCAQMD jurisdiction. However, these plans do not mention any specific state ozone attainment planning requirements for the portion of the MDAB within SCAQMD jurisdiction. PM10 attainment planning documents are not required by the state.

2007 Air Quality Management Plan

The Final 2007 Air Quality Management Plan (AQMP) control measures consist of four components: 1) the District's Stationary and Mobile Source Control Measures; 2) ARB's Proposed State Strategy; 3) District Staff's Proposed Policy Options to Supplement ARB's Control Strategy; and 4) Regional Transportation Strategy and Control Measures provided by SCAG. None of the specified control measures directly impact PSEGS emission sources beyond existing regulations and permit requirements.

2003 Air Quality Management Plan

The SCAQMD amended the 1997 AQMP in 1999 to address the U.S. EPA's proposed disapproval of the 1997 Ozone SIP revision to ensure that the 1997 AQMP complied with or exceeded federal requirements. The 1999 AQMP amendments to the 1997 AQMP were subsequently approved by the U.S. EPA into the SIP in April 2000. The SCAQMD updated the PM10 portion of the 1997 AQMP for both the South Coast Air Basin and Coachella Valley in 2002 as part of the District's request to extend the PM10 attainment date from 2001 to 2006 for these areas as allowed under the federal Clean Air Act (CAA). The U.S. EPA approved the 2002 update on April 18, 2003.

The purpose of the 2003 Revision to the AQMP for the South Coast Air Basin (Basin) and those portions of the Salton Sea Air Basin under SCAQMD jurisdiction is to set forth a comprehensive program that will lead these areas into compliance with all federal and state air quality planning requirements. Specifically, the 2003 AQMP Revision is designed to satisfy the California Clean Air Act (CCAA) triennial update requirements and fulfill the District's commitment to update transportation emission budgets based on the latest approved motor vehicle emissions model and planning assumptions. The Plan will be submitted to U.S. EPA as a SIP revision once it is approved by the SCAQMD Governing Board and the California Air Resources Board (CARB).

The control measures specified in the 2003 AQMP are similar to those specified in the 2007 AQMP. Again, the specified control measures do not directly impact PSEGS emission sources beyond the existing SCAQMD regulations and permit requirements.

Summary of Conformance with Applicable Air Quality Plans

The applicable air quality plans do not outline any new control measures applicable to the proposed modified project's construction or operating emission sources. Therefore, compliance with existing District rules and regulations would ensure compliance with those air quality plans.

Localized Cumulative Impacts

Since the power plant air quality impacts can be reasonably estimated through air dispersion modeling (see the "Operation Modeling Analysis" subsection) the proposed modified project's contributions to localized cumulative impacts can be estimated. To represent *past* and, to an extent, *present projects* that contribute to ambient air quality conditions, the Energy Commission staff recommends the use of ambient air quality monitoring data (see the "Existing Ambient Air Quality" subsection), referred to as the *background*. The staff takes the following steps to estimate what are additional appropriate “present projects” that are not represented in the background and “reasonably foreseeable projects”:

- First, the Energy Commission staff (or the project owner) works with the air district to identify all projects that have submitted, within the last year of monitoring data, new applications for an authority to construct (ATC) or permit to operate (PTO) and applications to modify an existing PTO within 6 miles of the project site. Based on staff’s modeling experience, beyond 6 miles there is no statistically significant concentration overlap for non-reactive pollutant concentrations between two stationary emission sources.
- Second, the Energy Commission staff (or the project owner) works with the air district and local counties to identify any new area sources within 6 miles of the project site. As opposed to point sources, area sources include sources like agricultural fields, residential developments or other such sources that do not have a distinct point of emission. New area sources are typically identified through draft or final Environmental Impact Reports (EIRs) that are prepared for those sources. The initiation of the EIR process is a reasonable basis on which to determine what is “reasonably foreseeable” for new area sources.
- The data submitted, or generated from the applications with the air district for point sources or initiating the EIR process for area sources, provides enough information to include these new emission sources in air dispersion modeling. Thus, the next step is to review the available EIR(s) and permit application(s), determine what sources must be modeled and how they must be modeled.
- Sources that are not new, but may not be represented in ambient air quality monitoring are also identified and included in the analysis. These sources include existing sources that are co-located with or adjacent to the proposed source (such as an existing power plant). In most cases, the ambient air quality measurements are not recorded close to the proposed modified project, thus a local major source might not be well represented by background air monitoring data. When these sources are included, it is typically a result of there being an existing source on the project site and the ambient air quality monitoring station being more than 2 miles away.
- The modeling results must be carefully interpreted so that they are not skewed towards a single source in high impact areas near that source’s fence line. It is not truly a cumulative impact of PSEGS if the high impact area is the result of high fence line concentrations from another stationary source and PSEGS is not providing a substantial contribution to the determined high impact area.

Once the modeling results are interpreted, they are added to the background ambient air quality monitoring data and thus the modeling portion of the cumulative assessment is complete. Due to the use of air dispersion modeling programs in staff’s cumulative impacts analysis, the project owner must submit a modeling protocol, based on information requirements for an application, prior to beginning the investigation of the sources to be modeled in the cumulative analysis. The modeling protocol is typically reviewed, commented on, and eventually approved in the Data Adequacy phase of the licensing procedure. Staff typically assists the project owner in finding sources (as described above), characterizing those sources, and interpreting the results of the modeling. However, the actual modeling runs are usually left to the project owner to complete. There are several reasons for this: modeling analyses take time to perform and require significant expertise, the project owner has already performed a modeling analysis of the proposed modified project alone (see the “Operation Modeling Analysis” subsection), and the project owner can act on its own to reduce stipulated emission rates and/or increase emission control requirements as the results warrant. Once the cumulative project emission impacts are determined, the necessity to mitigate the proposed modified project emissions can be evaluated, and the mitigation itself can be proposed by staff and/or the project owner (see the “Operation Mitigation” subsection).

Staff has confirmed that there are no projects within a 6-mile border of PSEGS (bedsides the Red Bluff substation which will complete construction by the end of 2013) near the PSEGS site that are under construction or have received permits to be built or operate in the foreseeable future. Therefore, it has been determined that no stationary sources requiring a cumulative modeling analysis exist within a 6-mile buffer zone of the proposed modified project site.

Staff has considered the minority population surrounding the site (see **Socioeconomics Figure 1**). Since the proposed modified project’s cumulative air quality impacts have been mitigated to less than significant, there is no environmental justice issue for air quality.

COMPLIANCE WITH LORS

FEDERAL

The District is responsible for issuing the federal New Source Review (NSR) permit and has been delegated enforcement of the applicable New Source Performance Standards (Subparts Dc and IIII). However, this proposed modified project does not require a federal NSR or Title V permit and furthermore this proposed modified project would not require a Prevention of Significant Deterioration (PSD) permit from U.S.EPA prior to initiating construction.

The proposed modified project requires the approval of a federal agency (BLM), but the site is located in an area that is in attainment or unclassified with all federal ambient air quality standards. Therefore, the proposed modified project is not subject to general conformity regulations (40 CFR Part 93).

STATE

The project owner will demonstrate that the proposed modified project will comply with Section 41700 of the California State Health and Safety Code, which restricts emissions that would cause nuisance or injury, with the issuance of the District’s Final Determination of Compliance and the Energy Commission’s affirmative finding for the project.

LOCAL

The project owner has submitted a new permit application to the South Coast Air Quality Management District (SCAQMD) on April 4, 2012[12] for the required air permits needed for the project. On May 5, 2013 the SCAQMD sent a letter stating the PSEGS project is still deemed to be incomplete.[13] Staff needs the information in the Determination of Compliance to complete staff's analysis. Because this information will not be available before staff needs to publish the PSA, the Air Quality analysis will cover construction-related Air Quality impacts only. Operational impacts will be discussed in the Final Staff Assessment (FSA) once SCAQMD finalizes the Determination of Compliance for the Palen Solar Power Project.

Regulation IV – Prohibitions

Rule 401 – Visible Emissions

This rule limits visible emissions from emissions sources, including stationary source exhausts and fugitive dust emission sources. Compliance with this rule is expected. In the PDOC for PSPP (Palen Solar Power Plant, the previously-approved solar trough configuration of this project), the District determined that the facility is expected to comply with this rule. This conclusion is also expected for PSEGS.

Rule 402 – Nuisance

This rule restricts discharge of emissions that would cause injury, detriment, annoyance, or public nuisance. The facility is expected to comply with this rule (identical to California Health and Safety Code 41700).

Rule 403 – Fugitive Dust

This rule limits fugitive emissions from certain bulk storage, earthmoving, construction and demolition, and manmade conditions resulting in wind erosion. With the implementation of recommended Air Quality Conditions of Certification **AQ-SC3** and **AQ-SC4**, the facility is expected to comply with this rule.

Rule 404 – Particulate Matter Concentration

The rule limits particulate matter (PM) emissions based on the volume discharge rate. The PSEGS stationary sources would be subject to this rule (auxiliary boilers, and emergency engines) and would need to comply with the PM concentration limits of this regulation. Operational impacts will be discussed in the Final Staff Assessment (FSA) once SCAQMD finalizes the Determination of Compliance for PSEGS.

Rule 409 – Combustion Contaminants

This rule limits discharge into the atmosphere from fuel burning equipment combustion contaminants exceeding in concentration at the point of discharge, 0.1 grain per cubic

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[12] SCAQMD 2013a – South Coast Air Quality Management District/Mohsen Nazemi (TN 70277). Letter to Roger Johnson, dated April 5, 2013. Submitted to CEC/Dockets Unit on April 11, 2013

[13] SCAQMD 2013b – South Coast Air Quality Management District/Mohsen Nazemi (TN 70536). Completeness Letter for the Palen Solar Electric Generation Project to Charles Turlinski, dated April 26, 2013. Submitted to CEC/Docket Unit April 30, 2013

foot of gas calculated to 12% of carbon dioxide (CO_2) at standard conditions averaged over a minimum of 15 consecutive minutes. Operational impacts will be discussed in the Final Staff Assessment (FSA) once SCAQMD finalizes the Determination of Compliance for PSEGS.

Rule 429 – NOx Exemptions for Startup/Shutdown

Rule 429 limits NOx exemptions for boilers subject to Rule 1146 for periods of startup and shutdown. Operational impacts will be discussed in the Final Staff Assessment (FSA) once SCAQMD finalizes the Determination of Compliance for PSEGS.

Rule 431.2 – Sulfur Content of Liquid Fuels

Rule 431.1 limits discharge into the atmosphere of sulfur compounds from the burning of liquid fuels. Operational impacts will be discussed in the Final Staff Assessment (FSA) once SCAQMD finalizes the Determination of Compliance for PSEGS.

Rule 463 – Organic Liquids Storage

This rule sets standards for storage of organic liquids with a true vapor pressure of 1.5 pounds per square inch or greater. The project would store insulating mineral oil (for transformers), hydraulic oil (for steam turbine and other equipment), lubricating oil, and diesel fuel on site, all of which have combined storage vessel capacities and true vapor pressures that are below the applicability thresholds for this rule. Operational impacts will be discussed in the Final Staff Assessment (FSA) once SCAQMD finalizes the Determination of Compliance for PSEGS.

Rule 474 – Fuel Burning Equipment – Oxides of Nitrogen

This rule limits NOx emission concentrations from stationary sources, with specific concentration levels being based on heat input rates and fuel types (gas/liquid/solid). Operational impacts will be discussed in the Final Staff Assessment (FSA) once SCAQMD finalizes the Determination of Compliance for PSEGS.

Regulation IX – Standards of Performance for New Stationary Sources

Rule 900 – Standard of Performance For New Stationary Source (NSPS)

This rule incorporates the Federal NSPS (40 CFR 60) rules by reference. The proposed boilers are subject to subpart Dc. Operational impacts will be discussed in the Final Staff Assessment (FSA) once SCAQMD finalizes the Determination of Compliance for PSEGS.

Regulation XI – Source Specific Standards

Rule 1110.2 – Emissions from Gaseous- and Liquid-Fueled Engines

The purpose of this rule is to reduce NOx, VOCs, and CO emissions from engines with 50 hp or higher. Operational impacts will be discussed in the Final Staff Assessment (FSA) once SCAQMD finalizes the Determination of Compliance for PSEGS.

Rule 1121 – Emissions of Oxides of Nitrogen from Industrial, Institutional and Commercial Boilers, Steam Generators and Process Heaters

Rule 1121 limits NOx emissions from natural gas fired residential type water heaters. Operational impacts will be discussed in the Final Staff Assessment (FSA) once SCAQMD finalizes the Determination of Compliance for PSEGS.

Rule 1146 – Emissions of Oxides of Nitrogen from Industrial, Institutional and Commercial Boilers, Steam Generators and Process Heaters

Rule 1146 limits NOx emissions from boilers, steam generators, and process heaters with greater than 5 MMBtu/hr rated input capacity used in industrial, institutional, and commercial operations. Operational impacts will be discussed in the Final Staff Assessment (FSA) once SCAQMD finalizes the Determination of Compliance for PSEGS. In a letter to the project owner dated April 26, 2013, the SCAQMD indicated that the project owner's initial proposal to limit NOx emissions from their auxiliary boilers to 9 ppmv was inadequate and that no more than 5 ppmv would be allowed. This requirement became effective January 1, 2013.

Rule 1166 – Volatile Organic Compound Emissions from Decontamination of Soil

This rule specifies requirements for VOC emissions from the handling and decontamination activities of VOC-contaminated soils. Operational impacts will be discussed in the Final Staff Assessment (FSA) once SCAQMD finalizes the Determination of Compliance for PSEGS.

Regulation XIII – New Source Review

Rule 1303 – Requirements

This rule requires implementation of BACT for a new emissions unit. Each of PSEGS's construction related equipment would employ current BACT.

Construction modeling is required if emissions of NOx, CO, and PM10 exceed the emission rates specified in Appendix A, Table A-1 of this rule. The emissions for PSEGS have not been determined to exceed these thresholds; therefore, modeling requirements do not apply.

NOTEWORTHY PUBLIC BENEFITS

Renewable energy facilities, such as PSEGS, are needed to meet California's mandated renewable energy goals. While there are no local area air quality public benefits[14] resulting from the proposed modified project, it would indirectly reduce criteria pollutant emissions within the Southwestern U.S. by reducing fossil fuel–fired electricity generation.

[14] Air quality benefits should not be confused with greenhouse gas/climate change benefits, which are discussed in Appendix AIR-1.

RESPONSE TO AGENCY AND PUBLIC COMMENTS

INTERVENOR BASIN AND RANCH WATCH'S STATUS REPORT (BRW 2013A)

The Basin and Range Watch group included comments regarding background ambient pollutant concentrations. Each of these comments is responded to separately below.

Fugitive Dust during Construction in regards to Valley Fever

The Intervenor has raised concerns in their (May 8, 2013) status report regarding air quality and public health during the construction and operational phases of the proposed project to insure air quality standards don't exceed significant thresholds of PM10/PM2.5 for fugitive and windblown dust.

> Response: Ambient air quality standards are set at levels that are protective of public health and welfare. Energy Commission air quality staff are responsible for evaluating the compliance of proposed emitting sources with ambient air quality standards, which are adopted for the purpose of protecting public health, among other matters. However, Valley Fever is not specifically addressed under ambient air quality standards. For specific responses to Basin and Range Watch's concerns regarding Valley Fever relating to public health, please see the Public Health and Worker Safety sections of this PSA. The ambient air quality impact assessment submitted for the PSEGS project during construction would demonstrate project impacts will be below the most stringent state standards with the proposed mitigation measures as required in Air Quality Conditions of Certification **AQ-SC1** to **AQ-SC5**.

MITIGATION MEASURES/ PROPOSED CONDITIONS OF CERTIFICATION

Staff continues to recommend the following Air Quality Conditions of Certification for PSEGS:

- If left unmitigated, the proposed modified project's construction activities would likely contribute to significant CEQA-significant adverse PM10 and ozone impacts. Therefore, staff recommends **AQ-SC1** to **AQ-SC5** to mitigate these potential impacts.
- **AQ-SC5** was modified to match a more revised version of the condition that is similar to the more recent solar projects that have been approved by the Energy Commission or are pending projects.
- **AQ-SC6** to **AQ-SC11** are included below but have not been modified and will be evaluated in the FSA to determine if they are necessary for facility operations.

Staff has proposed modifications to the Air Quality Conditions of Certification as shown below. (Note: Deleted text is in ~~strikethrough~~, new text is **<u>bold and underlined.</u>**) At this time staff has evaluated only construction related air quality impacts from the project. The operational impacts will be evaluated during the time of the Final Staff Assessment once the South Coast AQMD has published a Determination of Compliance and Energy

Commission staff can then recommend adoption of Air Quality Conditions of Certification.

STAFF CONDITIONS OF CERTIFICATION

AQ-SC1 Air Quality Construction Mitigation Manager (AQCMM): The project owner shall designate and retain an on-site AQCMM who shall be responsible for directing and documenting compliance with Conditions of Certification **AQ-SC3**, **AQ-SC4** and **AQ-SC5** for the entire project site and linear facility construction. The on-site AQCMM may delegate responsibilities to one or more AQCMM Delegates. The AQCMM and AQCMM Delegates shall have full access to all areas of construction on the project site and linear facilities, and shall have the authority to stop any or all construction activities as warranted by applicable construction mitigation Conditions. The AQCMM and AQCMM Delegates may have other responsibilities in addition to those described in this Condition. The AQCMM shall not be terminated without written consent of the Compliance Project Manager (CPM).

Verification: At least 30 days prior to the start of ground disturbance, the project owner shall submit to the CPM for approval, the name, resume, qualifications, and contact information for the on-site AQCMM and all AQCMM Delegates.

AQ-SC2 Air Quality Construction Mitigation Plan (AQCMP): The project owner shall provide an AQCMP, for approval, which details the steps that will be taken and the reporting requirements necessary to ensure compliance with Conditions of Certification **AQ-SC3**, **AQ-SC4,** and **AQ-SC5**.

Verification: At least 30 days prior to the start of any ground disturbance, the project owner shall submit the AQCMP to the CPM for approval. The AQCMP shall include effectiveness and environmental data for the proposed soil stabilizer. The CPM will notify the project owner of any necessary modifications to the plan within 15 days from the date of receipt.

AQ-SC3 Construction Fugitive Dust Control: The AQCMM shall submit documentation to the CPM in each Monthly Compliance Report that demonstrates compliance with the Air Quality Construction Mitigation Plan (AQCMP) mitigation measures for the purposes of minimizing fugitive dust emission creation from construction activities and preventing all fugitive dust plumes that would not comply with the performance standards identified in **AQ-SC4** from leaving the project site. The following fugitive dust mitigation measures shall be included in the Air Quality Construction Mitigation Plan (AQCMP) required by **AQ-SC2**, and any deviation from the AQCMP mitigation measures shall require prior CPM notification and approval.

a. The main access roads through the facility to the power block areas will be either paved or stabilized using soil binders, or equivalent methods, to provide a stabilized surface that is similar for the purposes of dust control to paving, that may or may not include a crushed rock (gravel or similar material with fines removed) top layer, prior to initiating construction in the main power block area, and delivery areas for operations materials (chemicals, replacement parts, etc.) will be paved or treated prior to taking initial deliveries.

b. All unpaved construction roads and unpaved operation and maintenance site roads, as they are being constructed, shall be stabilized with a non-toxic soil stabilizer or soil weighting agent that can be determined to be both as efficient or more efficient for fugitive dust control as ARB approved soil stabilizers, and shall not increase any other environmental impacts, including loss of vegetation to areas beyond where the soil stabilizers are being applied for dust control. All other disturbed areas in the project and linear construction sites shall be watered as frequently as necessary during grading (consistent with **Biology** Conditions of Certification that address the minimization of standing water); and after active construction activities shall be stabilized with a non-toxic soil stabilizer or soil weighting agent, or alternative approved soil stabilizing methods, in order to comply with the dust mitigation objectives of Condition of Certification **AQ-SC4**. The frequency of watering can be reduced or eliminated during periods of precipitation.

c. No vehicle shall exceed 10 miles per hour on unpaved areas within the construction site, with the exception that vehicles may travel up to 25 miles per hour on stabilized unpaved roads as long as such speeds do not create visible dust emissions.

d. Visible speed limit signs shall be posted at the construction site entrances.

e. All construction equipment vehicle tires shall be inspected and washed as necessary to be cleaned free of dirt prior to entering paved roadways.

f. Gravel ramps of at least 20 feet in length must be provided at the tire washing/cleaning station.

g. All unpaved exits from the construction site shall be graveled or treated to prevent track-out to public roadways.

h. All construction vehicles shall enter the construction site through the treated entrance roadways, unless an alternative route has been submitted to and approved by the CPM.

i. Construction areas adjacent to any paved roadway below the grade of the surrounding construction area or otherwise directly impacted by sediment from site drainage shall be provided with sandbags or other equivalently effective measures to prevent run-off to roadways, or other similar run-off control measures as specified in the Storm Water Pollution Prevention Plan (SWPPP), only when such SWPPP measures are necessary so that this Condition does not conflict with the requirements of the SWPPP.

j. All paved roads within the construction site shall be swept daily or as needed (less during periods of precipitation) on days when construction activity occurs to prevent the accumulation of dirt and debris.

k. At least the first 500 feet of any paved public roadway exiting the construction site or exiting other unpaved roads en route from the construction site or construction staging areas shall be swept as needed (less during periods of precipitation) on days when construction activity occurs or on any other day when dirt or runoff resulting from the construction site activities is visible on the public paved roadways.

l. All soil storage piles and disturbed areas that remain inactive for longer than 10 days shall be covered, or shall be treated with appropriate dust suppressant compounds.

m. All vehicles that are used to transport solid bulk material on public roadways and that have potential to cause visible emissions shall be provided with a cover, or the materials shall be sufficiently wetted and loaded onto the trucks in a manner to provide at least one foot of freeboard.

n. Wind erosion control techniques (such as windbreaks, water, chemical dust suppressants, and/or vegetation) shall be used on all construction areas that may be disturbed. Any windbreaks installed to comply with this Condition shall remain in place until the soil is stabilized or permanently covered with vegetation.

Verification: The AQCMM shall provide the CPM a Monthly Compliance Report to include the following to demonstrate control of fugitive dust emissions:

A. a summary of all actions taken to maintain compliance with this Condition;

B. copies of any complaints filed with the District in relation to project construction; and

C. any other documentation deemed necessary by the CPM or AQCMM to verify compliance with this Condition. Such information may be provided via electronic format or disk at the project owner's discretion.

AQ-SC4 Dust Plume Response Requirement: The AQCMM or an AQCMM Delegate shall monitor all construction activities for visible dust plumes. Observations of visible dust plumes that have the potential to be transported (A) off the project site and within 400 feet upwind of any regularly occupied structures not owned by the project owner or (B) 200 feet beyond the centerline of the construction of linear facilities indicate that existing mitigation measures are not resulting in effective mitigation. The AQCMP shall include a section detailing how the additional mitigation measures will be accomplished within the time limits specified. The AQCMM or Delegate shall implement the following procedures for additional mitigation measures in the event that such visible dust plumes are observed:

Step 1: The AQCMM or Delegate shall direct more intensive application of the existing mitigation methods within 15 minutes of making such a determination.

Step 2: The AQCMM or Delegate shall direct implementation of additional methods of dust suppression if Step 1, specified above, fails to result in adequate mitigation within 30 minutes of the original determination.

Step 3: The AQCMM or Delegate shall direct a temporary shutdown of the activity causing the emissions if Step 2, specified above, fails to result in effective mitigation within one hour of the original determination. The activity shall not restart until the AQCMM or Delegate is satisfied that appropriate additional mitigation or other site conditions have changed so that visual dust plumes will not result upon restarting the shutdown source. The owner/operator may appeal to the CPM any directive from the AQCMM or Delegate to shut down an activity, if the shutdown shall go into effect within one hour of the original determination, unless overruled by the CPM before that time.

Verification: The AQCMM shall provide the CPM a Monthly Compliance Report **(MCR)** to include:

A. a summary of all actions taken to maintain compliance with this Condition;

B. copies of any complaints filed with the District in relation to project construction; and

C. any other documentation deemed necessary by the CPM or AQCMM to verify compliance with this Condition. Such information may be provided via electronic format or disk at the project owner's discretion.

AQ-SC5 Diesel-Fueled Engine Control: The AQCMM shall submit to the CPM, in the ~~Monthly Compliance Report~~ **MCR**, a ~~construction mitigation report~~ **table** that demonstrates compliance with the AQCMP mitigation measures for purposes of controlling diesel construction-related **combustion** emissions. ~~The following off road diesel construction equipment mitigation measures shall be included in the Air Quality Construction Mitigation Plan (AQCMP) required by AQ-SC2, and~~ any deviation from the AQCMP mitigation measures ~~shall require~~ **requires** prior CPM notification and approval.

All ~~diesel fueled engines~~ **off-road diesel construction equipment with a rating of 50 hp or greater** used in the construction of ~~the~~ this facility shall ~~have clearly visible tags issued~~ **be powered** by the ~~onsite AQCMM showing that the engine meets the Conditions set forth herein.~~ **cleanest engines available that also comply with the** California ~~Emissions Standards~~ **Air Resources Board's (ARB's) Regulation** for **In-Use** Off-Road ~~Compression Ignition Engines, as specified in~~ **Diesel Fleets** (California Code of **Federal** Regulations Title 13, ~~section 2423(b)(1), unless a good faith effort to~~ **Article 4.8, Chapter 9, Section 2449 et. Seq.) and shall be included in** the ~~satisfaction of~~ **Air Quality Construction Mitigation Plan (AQCMP) required by AQ-SC2. The AQCMP measures shall include** the ~~CPM that is certified by~~ following, with the ~~onsite AQCMM demonstrated that such~~ **lowest-emitting** engine ~~is not~~ **chosen in each case, as** available:

a. All off-road vehicles with compression ignition engines shall comply with the California Air Resources Board's (ARB's) Regulation for ~~a particular item of equipment.~~ In ~~the event that a Tier 3 engine is not~~ **In-Use Off-Road Diesel Fleets**.

b. To meet the highest level of emissions reduction available for ~~and off-road~~ **the engine family of the equipment** ~~larger than 100 hp, that,~~ **each piece of diesel-powered equipment shall be powered by a Tier 4 engine (without add-on controls) or Tier 4i engine (without add-on controls), or a Tier 3 engine with a post-combustion retrofit device verified for use on the particular engine powering the device by the ARB or the US EPA. For PM, the retrofit device shall be a particulate filter if verified, or a flow-through filter, or at least an oxidation catalyst. For NOx, the device shall meet the latest Mark level verified to be available (as of January 2012, none meet this NOx requirement).**

c. For diesel powered equipment where the requirements of Part “b” cannot be met, the equipment shall be equipped with a Tier **3 engine without retrofit control devices or with a Tier** 2 **or lower Tier** engine ~~or an engine that is equipped with~~ **using** retrofit controls **verified by ARB or US EPA as the best available control device** to reduce exhaust emissions of **PM and** nitrogen oxides (NOx)~~and diesel particulate matter (DPM) to no more than Tier 2 levels~~ unless certified by engine manufacturers or the on-site AQCMM that the use of such devices is not practical for specific engine types. For purposes of this condition, the use of such devices ~~is~~ **can be considered** “not practical” for the following, as well as other, reasons:

   1. There is no available retrofit control device that has been verified by either the California Air Resources Board or U.S. Environmental Protection Agency to control the engine in question ~~to Tier 2 equivalent emission levels~~ and the highest level of available control using retrofit or Tier 1 engines is being used for the engine in question; or

   2. **The use of the retrofit device would unduly restrict the vision of the operator such that the vehicle would be unsafe to operate because the device would impair the operator’s vision to the front, sides, or rear of the vehicle, or**

   3. The construction equipment is intended to be on site for 10 **work** days or less.

d. The CPM may grant relief from ~~this~~ **a** requirement **in Part “b” or “c”** if the AQCMM can demonstrate a good faith effort to comply with ~~this~~ **the** requirement and that compliance is not practical.

e. The use of a retrofit control device may be terminated immediately provided that**: (1)** the CPM is informed within 10 working days ~~of the~~ **following such** termination ~~and that~~**; (2)** a replacement for the **construction** equipment ~~item~~ in question ~~meeting~~**, which meets** the ~~controls~~ **level of control** required ~~in item “b”~~, occurs within 10 **work** days ~~of~~ **following such** termination of the use (if the equipment would be needed to continue working at this site for more than 15 **work** days after the use of the retrofit control device is terminated)**; and (3)** one of the following **conditions** exists:

1. The use of the retrofit control device is excessively reducing the normal availability of the construction equipment due to increased down time for maintenance, and/or reduced power output due to an excessive increase in **exhaust** back pressure.

2. The retrofit control device is causing or is reasonably expected to cause engine damage.

3. The retrofit control device is causing or is reasonably expected to cause a substantial risk to workers or the public.

4. Any other seriously detrimental cause which has the approval of the CPM prior to implementation of the termination.

f. ~~d.~~ All ~~heavy earth moving~~ equipment ~~and heavy duty construction related trucks~~ with engines meeting the requirements ~~of (b)~~ above shall be properly maintained and the engines tuned to the engine manufacturer's specifications. **Each engine shall be in its original configuration and the equipment or engine must be replaced if it exceeds the manufacturer's approved oil consumption rate.**

g. ~~e. All diesel heavy construction equipment shall not idle for more than five minutes. Vehicles that need to idle as part of their normal operation (such as concrete trucks) are exempted from this requirement.~~ Construction equipment will employ electric motors when feasible.

h. **If the requirements detailed above cannot be met, the AQCMM shall certify that a good faith effort was made to meet these requirements and this determination must be approved by the CPM.**

i. **All off-road diesel-fueled engines used in the construction of the facility shall have clearly visible tags issued by the on-site AQCMM showing that the engine meets the conditions set forth herein**.

Verification: The AQCMM shall include in the ~~Monthly Compliance Report~~ **MCR** the following to demonstrate control of diesel construction-related emissions:

A. A summary of all actions taken to control diesel construction related emissions;

B. **A table listing** list of all heavy equipment used on site during that month, ~~including~~ **showing the tier level of each engine and the basis for alternative compliance with this condition for each engine not meeting Part "b" requirements. The MCR shall identify** the owner of ~~that~~ **the** equipment and **contain** a letter from each owner indicating that **the** equipment has been properly maintained; and

C. Any other documentation deemed necessary by the CPM and ~~the~~ AQCMM to verify compliance with this ~~Condition. Such information may be provided via electronic format or disk at the project owner's discretion~~ **condition**.

AQ-SC6 The project owner, when obtaining dedicated on-road or off-road vehicles for mirror washing activities and other facility maintenance activities, shall only obtain vehicles that meet California on-road vehicle emission standards or appropriate U.S.EPA/California off-road engine emission standards for the latest model year available when obtained.

Verification: At least 30 days prior to the start commercial operation, the project owner shall submit to the CPM a copy of the plan that identifies the size and type of the on-site vehicle and equipment fleet and the vehicle and equipment purchase orders and contracts and/or purchase schedule. The plan shall be updated every other year and submitted in the Annual Compliance Report.

AQ-SC7 The project owner shall provide a site Operations Dust Control Plan, including all applicable fugitive dust control measures identified in the verification of **AQ-SC3** that would be applicable to minimizing fugitive dust emission creation from operation and maintenance activities and preventing all fugitive dust plumes that would not comply with the performance standards identified in **AQ-SC4** from leaving the project site; that:

a. describes the active operations and wind erosion control techniques such as windbreaks and chemical dust suppressants, including their ongoing maintenance procedures, that shall be used on areas that could be disturbed by vehicles or wind anywhere within the project boundaries; and

b. identifies the location of signs throughout the facility that will limit traveling on unpaved portion of roadways to solar equipment maintenance vehicles only. In addition, vehicle speed shall be limited to no more than 10 miles per hour on these unpaved roadways, with the exception that vehicles may travel up to 25 miles per hour on stabilized unpaved roads as long as such speeds do not create visible dust emissions.

The site operations fugitive dust control plan shall include the use of durable non-toxic soil stabilizers on all regularly used unpaved roads and disturbed off-road areas, or alternative methods for stabilizing disturbed off-road areas, within the project boundaries, and shall include the inspection and maintenance procedures that will be undertaken to ensure that the unpaved roads remain stabilized. The soil stabilizer used shall be a non-toxic soil stabilizer or soil weighting agent that can be determined to be as efficient as or more efficient for fugitive dust control than ARB approved soil stabilizers, and that shall not increase any other environmental impacts including loss of vegetation to areas beyond where the soil stabilizers are being applied for dust control.

The performance and application of the fugitive dust controls shall also be measured against and meet the performance requirements of Condition **AQ-SC4**. The measures and performance requirements of **AQ-SC4** shall also be included in the operations dust control plan.

Verification: At least 30 days prior to start of commercial operation, the project owner shall submit to the CPM for review and approval a copy of the site Operations Dust Control Plan that identifies the dust and erosion control procedures, including effectiveness and environmental data for the proposed soil stabilizer, that will be used during operation of the project and that identifies all locations of the speed limit signs. Within 60 days after commercial operation, the project owner shall provide to the CPM a report identifying the locations of all speed limit signs, and a copy of the project employee and contractor training manual that clearly identifies that project employees and contractors are required to comply with the dust and erosion control procedures and on-site speed limits.

AQ-SC8 The project owner shall provide the CPM copies of all District issued Authority-to-Construct (ATC) and Permit-to-Operate (PTO) documents for the facility.

The project owner shall submit to the CPM for review and approval any modification proposed by the project owner to any project federal air permit. The project owner shall submit to the CPM any modification to any federal air permit proposed by the District or U.S. Environmental Protection Agency (U.S. EPA), and any revised federal air permit issued by the District or U.S. EPA, for the project.

Verification: The project owner shall submit any ATC, PTO, and proposed federal air permit modifications to the CPM within 5 working days of its submittal either by 1) the project owner to an agency, or 2) receipt of proposed modifications from an agency. The project owner shall submit all modified ATC/PTO documents and all federal air permits to the CPM within 15 days of receipt.

AQ-SC9 The project owner shall provide a list of the proposed VOC emission reduction credit (ERC) sources that total at least 68 pounds per day, shall submit requests to modify this list, and shall submit documentation confirming that the ERCs have been surrendered as required by South Coast Air Quality Management District rules.

Verification: The project owner shall provide to the CPM the following:

A. The list of proposed emission reduction credit sources, with the amount of reduction, the location of reduction, the method of reduction and date of reduction prior to initiating construction.

B. Documentation prior to the start of operation that demonstrates the emission reduction credits have been surrendered in a manner and timeframe that complies with district rules.

C. Any requests to modify the list of emission reduction credits shall be provided no later than at least 30 days prior to their surrender.

AQ-SC10 The project owner shall operate the cooling towers with high efficiency mist eliminators and shall determine and report water quality and annual emissions.

Verification: The project owner shall provide the following at least 30 days prior to installation of the cooling tower to the CPM for review and approval:

A. The manufacturer specifications for the cooling tower, that provides the number of cells and design recirculating water flow rate for the two cooling towers.

B. The manufacturer specifications for the mist eliminators that provide a manufacturer guarantee that the mist eliminators will reduce drift to no more than 0.0005 percent of recirculating water flow.

The project owner shall provide the following in the Annual Compliance Reports:

C. The sampling data for the recirculating water TDS concentration, performed at least quarterly, that demonstrates that the annual average TDS concentration was no more than 2,000 milligrams per liter (ppmw).

D. The estimated annual particulate emissions from the cooling tower using the following equation: (annual gallons of water recirculated) x (0.000005 fraction mist) x (average annual TDS concentration in mg/l) / (1,000,000) x (8.34 lbs/gallon).

STAFF CONDITION FOR PROJECT ALTERNATIVES

AQ-SC11 The project owner shall use one of the following four options to assure that the operation of the emergency engines will not cause an exceedance of the state or federal 1-hour NO_2 ambient air quality standards:

1) The project owner shall provide an air dispersion modeling analysis that demonstrates to Staff's satisfaction that the currently proposed or officially revised worst-case operating emissions would not have the potential to cause exceedances of the state or federal 1-hour NO_2 ambient air quality standards, or

2) The project owner shall procure emergency generator engines that meet ARB Tier 4 standards for NOx emissions (0.5 grams per break horsepower), or

3) In the event that Tier 4 engines are not available at the time of engine purchase, the project owner shall; a) provide documentation from engine manufacturers that Tier 4 engines are not available; and b) procure emergency engines that have a NOx emissions guarantee of no more than 2.6 grams per break horsepower, or

4) The project owner shall agree to limit the emergency generator engine testing duration to no more than 30 minutes per event and a testing frequency limited to the minimum required by engine manufacturer.

In no event shall the project owner propose the use of an emergency engine that does not meet the most strict applicable federal or state engine emission limit regulation without a signed waiver from U.S. EPA or ARB as appropriate. The project owner shall justify the date of engine purchase.

<u>Verification</u>: The project owner shall provide to the CPM the air dispersion modeling analysis, if performed, that demonstrates compliance with part 1) of this condition at least 30 days prior to purchasing the emergency engine generators for this project, or shall provide documentation to the CPM at least five days prior to purchasing the engine generators that demonstrates how they would comply with part 2), or part 3), or part 4) of this condition.

District Conditions

At this time staff has evaluated only construction related air quality impacts from the modified project. The operational related impacts will be evaluated during the time of the final Staff Assessment and once the South Coast AQMD has published a Determination of Compliance and Energy Commission Staff can then recommend adoption or modification of Air Quality Conditions of Certification **AQ-1** to **AQ-51**. These conditions of certification may either be modified or deleted once the Energy Commission has reviewed the local air districts' Determination of Compliance.

On April 26, 2013, SCAQMD sent a letter to the project owner describing deficiencies that must be corrected before the district would begin their evaluation, requesting this information to be submitted within 30 days. As of June 2013, Energy Commission staff has not been informed of any such data submittal.

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ACRONYMS

AAQS	Ambient Air Quality Standard
ACC	Air Cooled Condenser
AERMOD	ARMS/EPA Regulatory Model
AFC	Application for Certification
APCO	Air Pollution Control Officer
AQCMM	Air Quality Construction Mitigation Manager
AQCMP	Air Quality Construction Mitigation Plan
AQMD	Air Quality Management District
AQMP	Air Quality Management Plan
ARB	California Air Resources Board
ASOS	Automated Surface Observing Systems
ATC	Authority to Construct
ATCM	Airborne Toxic Control Measure
BACT	Best Available Control Technology
bhp	brake horsepower
BLM	Bureau of Land Management
Btu	British Thermal Unit
CCR	California Code of Regulations
CEC	California Energy Commission (or Energy Commission)
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CPM	(CEC) Compliance Project Manager
DPM	Diesel Particulate Matter
Degrees F	Degrees Fahrenheit
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
FDOC	Final Determination Of Compliance
FSA	Final Staff Assessment
GHG	Greenhouse Gas
H_2S	Hydrogen Sulfide
HTF	Heat Transfer Fluid
hp	horsepower
HSC	Health and Safety Code

kV	Kilovolt
lbs	Pounds
LORS	Laws, Ordinances, Regulations and Standards
LLC	Limited Liability Company
LPG	Liquefied Petroleum Gas
MCR	Monthly Compliance Report
MDAB	Mojave Desert Air Basin
MDAQMD	Mojave Desert Air Quality Management District
μg/m3	microgram per cubic meter
mg/m3	milligrams per cubic meter
MMBtu/hr	Million British Thermal Units per Hour
MW	Megawatts (1,000,000 Watts)
MWh	Megawatt-hour
NAAQS	National Ambient Air Quality Standard
NEPA	National Environmental Protection Act
NMHC	Non-Methane Hydrocarbon
NO	Nitric Oxide
NO_2	Nitrogen Dioxide
NOx	Oxides of Nitrogen or Nitrogen Oxides
NSPS	New Source Performance Standard
NSR	New Source Review
O_2	Oxygen
O_3	Ozone
OLM	Ozone Limiting Method
PDOC	Preliminary Determination Of Compliance
PM	Particulate Matter
PM10	Particulate Matter less than 10 microns in diameter
PM2.5	Particulate Matter less than 2.5 microns in diameter
ppm	Parts Per Million
ppmv	Parts Per Million by Volume
ppmvd	Parts Per Million by Volume, Dry
PSA	Preliminary Staff Assessment (this document)
PSEGS	Palen Solar Electric Generating System
PSD	Prevention of Significant Deterioration
PSH	Palen Solar Holding (project owner)
PTC	Permit to Construct
PTO	Permit to Operate

RO	Reverse Osmosis
ROW	Right of Way
SA/DEIS	Staff Assessment/Draft Environmental Impact Statement
SB	Senate Bill
SCAQMD	South Coast Air Quality Management District
SCE	Southern California Edison
scf	standard cubic feet
SIP	State Implementation Plan
SO_2	Sulfur Dioxide
SO_4	Sulfate
SOx	Oxides of Sulfur
SoCAB	South Coast Air Basin
SSAB	Salton Sea Air Basin
SWPPP	Storm Water Pollution Prevention Plan
TDS	Total Dissolved Solids
tpy	tons per year
U.S.EPA	United States Environmental Protection Agency
VMT	Vehicle Miles Traveled
VOC	Volatile Organic Compounds
WC	Weather Channel

APPENDIX AIR-1 – GREENHOUSE GAS EMISSIONS

Jacquelyn Leyva Record and David Vidaver

SUMMARY OF CONCLUSIONS

The Palen Solar Electric Generating System (PSEGS) project owner is proposing to replace the parabolic trough solar collection system and associated heat transfer fluid (HTF) system previously approved by the California Energy Commission (Energy Commission) for the Palen Solar Power Plant (PSPP) with solar tower technology. Text using the term PSEGS refers to the currently proposed modified project design while the term PSPP refers to the previously approved design.

The PSEGS solar tower technology would make steam to run a steam turbine generator by using a field of heliostats—elevated mirrors, each approximately 12 feet tall, mounted on pylons and guided by a sun-tracking system—to focus the sun's rays on a solar receiver steam generator on top of a 750-foot solar tower located near the center of each solar field. The proposed modified PSEGS project is comprised of two solar plants, each of which would have 250-MW of capacity, totaling 500 MW for the facility. As a solar project, its greenhouse gas (GHG) emissions would be considerably less than the existing statewide average GHG emissions per unit of generation and considerably less than the GHG emissions from existing fossil fuel–fired power plants providing generation to California, and thus would contribute to continued reduction of GHG emissions in the interconnected California and the western United States electricity systems.

The operating emissions of the modified PSEGS were provided by the project owner in the amendment application. The values used in this section are from the amendment application but may change as a result of the air district's evaluation of the project and GHG emissions will be updated as needed in the Final Staff Assessment (FSA). Operating emissions for the previously approved PSPP were estimated at 14,818 metric tons of carbon dioxide equivalent per year. The applicant's estimated emissions for PSEGS are 82,325 metric tons of carbon dioxide equivalent emissions per year. This is due to increased fuel use in the PSEGS auxiliary and nighttime preservation boilers compared to the approved PSPP which did not have these additional boilers.

While PSEGS would emit some GHG emissions, the contribution of PSEGS to the system build-out of renewable resources to meet the goals of the Renewable Portfolio Standard (RPS) in California would result in a net cumulative reduction of fossil-fueled energy generation and GHG emissions from new and existing fossil fueled electricity resources. Electricity is produced by operation of inter-connected generation resources. Operation of one power plant, like PSEGS, affects all other power plants in the interconnected system. PSEGS would be a "must-take" facility and its operation would affect the overall electricity system operation and GHG emissions in several ways:

- PSEGS would displace higher GHG-emitting electricity generation. Because the project's GHG emissions per megawatt-hour (MWh) would be largely based upon renewable solar generation, GHG emissions would be much lower than power plants that the project would displace even with use of natural gas in the auxiliary boilers. Therefore, the addition of the PSEGS would contribute to a reduction of California and overall Western Electricity Coordinating Council system GHG[15] emissions and GHG emission rate average and would be part of California's programmatic approach to meeting GHG emissions reduction goals.

- PSEGS would facilitate to some degree the replacement of out-of-state high-GHG-emitting (e.g., coal) electricity generation that must be phased out in conformance with the State's Emissions Performance Standard.
- PSEGS could facilitate to some extent the replacement of generation provided by aging power plants and those that use once-through cooling (OTC).

These system interactions would result in a net reduction in GHG emissions across the electricity system, while providing energy and capacity to California. Thus, staff concludes that the proposed modified project would result in a cumulative overall reduction in GHG emissions from power plants, does not worsen current conditions, and would not result in impacts that are cumulatively California Environmental Quality Act (CEQA) significant.

Staff concludes that the short-term minor emission of GHGs during construction that are necessary to create this new, low-GHG-emitting power generating facility would be sufficiently reduced by "best practices" and would be more than offset by GHG emission reductions during operation. Thus, construction GHG emissions would not be CEQA significant.

The PSEGS project, as a solar project with a nightly shutdown, would operate significantly less than a 60 percent capacity factor and therefore would not be subject to the requirements of Senate Bill (SB) 1368 (Greenhouse Gases Emission Performance Standard; Title 20, California Code of Regulations, section 2900 et. seq.). However, PSEGS would easily comply with the requirements of SB 1368 and the Greenhouse Gas Emission Performance Standard.

INTRODUCTION

The generation of electricity using fossil fuels, even in an auxiliary boiler or back-up generator at a thermal solar plant, produces GHG emissions in addition to the criteria air pollutants that have been traditionally regulated under the federal and state Clean Air Acts (CAA). The **AIR QUALITY** section evaluates PSEGS for these criteria pollutants and this appendix evaluates PSEGS for GHG emissions.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS (LORS)

The following federal, state, and local laws and policies in **Greenhouse Gas Table 1** pertain to the control and mitigation of GHG emissions. Staff's analysis examines the proposed modified project's compliance with these requirements.

[15] Fuel-use closely correlates to the efficiency of and carbon dioxide (CO_2) emissions even from renewable power plants.

AIR QUALITY GHG ANALYSIS

California is actively pursuing policies to reduce GHG emissions that include adding low-GHG emitting renewable electricity generation resources to the system. The GHGs evaluated in this analysis include carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4), sulfur hexafluoride (SF_6), hydrofluorocarbons (HFC), and perflurocarbons (PFC). CO_2 emissions are far and away the most common of these emissions; as a result, even though the other GHGs may have a greater impact on climate change on a per-unit basis due to their greater global warming potential as described more fully below, GHG emissions are often “normalized” in terms of metric tons of CO_2-equivalent (MTCO2E) for simplicity. Global warming potential (GWP) is a relative measure, compared to carbon dioxide, of a compound’s ability to warm the planet, taking into account each compound’s expected residence time in the atmosphere. By convention, carbon dioxide is assigned a global warming potential of one. In comparison, for example methane has a GWP of 21, which means that it has a global warming effect 21 times greater than carbon dioxide on an equal-mass basis. The carbon dioxide equivalent (CO2E) for a source is obtained by multiplying each GHG by its GWP and then adding the results together to obtain a single, combined emission rate representing all GHGs in terms of CO2E.

GHG emissions are not included in the class of pollutants traditionally called “criteria pollutants.” Since the impact of the GHG emissions from a power plant’s operation has global rather than local effects, those impacts should be assessed not only by analysis of the plant’s emissions, but also in the context of the operation of the entire electricity system of which the plant is an integrated part. Furthermore, the impact of the GHG emissions from a power plant’s operation should be analyzed in the context of applicable GHG laws and policies, especially Assembly Bill (AB) 32, California’s Global Warming Solutions Act of 2006.

GLOBAL CLIMATE CHANGE AND CALIFORNIA

Worldwide, with the exception of 1998, over the past 132-year record the nine warmest years all have occurred since 2000, with the two hottest years on record being 2010 and 2005 (NASA 2013). According to “The Future Is Now: An Update on Climate Change Science Impacts and Response Options for California,” an Energy Commission document, the American West is heating up faster than other regions of the United States (CEC 2009e). The California Climate Change Center (CCCC) reports that, by the end of this century, average global surface temperatures could rise by 4.7°F to 10.5°F due to increased GHG emissions.

The accumulation of GHGs in the atmosphere regulates the earth’s temperature. Without these natural GHGs, the earth’s surface would be approximately 61°F (34°C) cooler (CalEPA 2006); however, emissions from fossil fuel combustion for activities such as electricity production and vehicular transportation have elevated the concentration of GHGs in the atmosphere above natural levels. California Air Resources Board (ARB) estimated that the mobile source sector accounted for approximately 38 percent of the GHG emissions generated in California in 2009, while the electricity generating sector accounted for approximately 23 percent of the 2009 California GHG emissions inventory with just more than half of that from in-state generation sources (ARB 2011).

The Fourth U.S. Climate Action Report concluded, in assessing current trends, that CO_2 emissions increased by 20 percent from 1990 to 2004, while methane and nitrous oxide emissions decreased by 10 percent and 2 percent, respectively. The Intergovernmental Panel on Climate Change (IPCC) constructed several emission trajectories of GHGs needed to stabilize global temperatures and climate change impacts. It concluded that stabilization of GHGs at 450 ppm carbon dioxide equivalent concentration is required to keep the global mean warming increase below 3.8°F (2.1°C) from year 2000 base line levels (IPCC 2007a).

GHGs differ from criteria pollutants in that GHG emissions from a specific project do not cause direct adverse localized human health effects. Rather, the direct environmental effect of GHG emissions is the cumulative effect of an overall increase in global temperatures, which in turn has numerous indirect effects on the environment and humans. The impacts of climate change include potential physical, economic and social effects. These effects could include inundation of settled areas near the coast from rises in sea level associated with melting of land-based glacial ice sheets, exposure to more frequent and powerful climate events, and changes in suitability of certain areas for agriculture, reduction in Arctic sea ice, thawing permafrost, later freezing and earlier break-up of ice on rivers and lakes, a lengthened growing season, shifts in plant and animal ranges, earlier flowering of trees, and a substantial reduction in winter snowpack (IPCC 2007b). For example, current estimates include a 70 to 90 percent reduction in snow pack in the Sierra Nevada mountain range. Current data suggest that in the next 25 years, in every season of the year, California could experience unprecedented heat, longer and more extreme heat waves, greater intensity and frequency of heat waves, and longer dry periods. More specifically, the CCCC predicted that California could witness the following events (CCCC 2006):

- Temperature rises between 3 and 10.5 ºF
- 6 to 20 inches or greater rise in sea level
- 2 to 4 times as many heat-wave days in major urban centers
- 2 to 6 times as many heat-related deaths in major urban centers
- 1 to 1.5 times more critically dry years
- Losses to mountaintop snowpack and water supply (e.g., according to the CCCC, Sierra Nevada snowpack could be reduced by as much as 70 to 90 percent by 2100 [CEC 2009e])
- 25 to 85 percent increase in days conducive to ozone formation
- 3 to 20 percent increase in electricity demand
- 10 to 55 percent increase in the risk of wildfires

There is general scientific consensus that climate change is occurring and that human activity contributes in some measure (perhaps substantially) to that change. Man-made emissions of GHGs, if not sufficiently curtailed, are likely to contribute further to continued increases in global temperatures. Indeed, the California Legislature finds that "[g]lobal warming poses a serious threat to the economic well-being, public health, natural resources, and the environment of California" (Cal. Health & Safety Code, sec. 38500, division 25.5, part 1).

The state has demonstrated a clear willingness to address global climate change (GCC) through research, adaptation[16], and GHG emission reductions. In that context, staff evaluates the GHG emissions from the proposed project, presents information on GHG emissions related to electricity generation (see **Electricity System GHG Impacts** below), and describes the applicable GHG policies and programs.

In April 2007, the U.S. Supreme Court held that GHG emissions are pollutants within the meaning of the CAA. In reaching its decision, the Court also acknowledged that climate change results, in part, from anthropogenic causes (Massachusetts et al. v. Environmental Protection Agency 549 U.S. 497, 2007). The Supreme Court's ruling paved the way for the regulation of GHG emissions by U.S. Environmental Protection Agency (U.S. EPA) under the CAA.

In response to this Supreme Court decision, on December 7, 2009 the U.S. EPA Administrator signed two distinct findings regarding GHGs under Section 202(a) of the CAA:

- Endangerment Finding: That the current and projected concentrations of the GHGs in the atmosphere threaten the public health and welfare of current and future generations; and
- Cause or Contribute Finding: That the combined emissions of GHGs from new motor vehicles and new motor vehicle engines contribute to the GHG pollution which threatens public health and welfare.

As a result, regulating GHGs at the federal level is now required by U.S. EPA's Prevention of Significant Deterioration Program (PSD) for sources that exceed 100,000 tons per year of carbon dioxide-equivalent emissions and federal rules require federal reporting of GHGs. As federal rulemaking evolves, staff at this time focuses on analyzing the ability of the project to comply with existing federal- and state-level policies and programs for GHGs.

In 1998, the Energy Commission identified a range of strategies to prepare for an uncertain climate future, including a need to account for the environmental impacts associated with energy production, planning, and procurement (CEC 1998, p. 5). In 2003, the Energy Commission recommended that the state require reporting of GHGs or global climate change[17] emissions as a condition of state licensing of new electric generating facilities (CEC 2003, IEPR p. 42). In 2006, California enacted the California Global Warming Solutions Act of 2006 (AB 32). It requires the ARB to adopt standards to reduce statewide GHG emissions to GHG emissions levels that existed in 1990, with such reductions to be achieved by 2020. To achieve this, ARB has a mandate to define the 1990 emissions level and achieve the maximum technologically feasible and cost-effective GHG emission reductions to meet this requirement. Executive Order S-3-05 signed by then-Governor Arnold Schwarzenegger in June 2005, also requires ARB to

[16] While working to understand and reverse global climate change, it is prudent to also adapt to potential changes in the state's climate (for example, changing rainfall patterns).

[17] Global climate change is the result of greenhouse gases, or air emissions with global warming potentials, affecting the global energy balance and thereby the global climate of the planet. The terms greenhouse gases (GHGs) and global climate change (GCC) gases are used interchangeably.

plan for further GHG emissions reductions to achieve an 80 percent reduction from 1990 GHG emissions by the year 2050.

The ARB adopted early action GHG reduction measures in October 2007, adopted mandatory reporting requirements and the 2020 statewide target in December 2007, and adopted a statewide scoping plan in December 2008, to identify how emission reductions will be achieved from significant sources of GHG via regulations, market mechanisms, and other actions. ARB adopted regulations implementing cap-and-trade regulations on December 22, 2011, and ARB staff continues to develop and implement regulations to refine key elements of the GHG reduction measures to improve their linkage with other GHG reduction programs. Federal and state mandatory reporting and state cap-and-trade requirements all apply to this project.

Greenhouse Gas Table 1
Laws, Ordinances, Regulations, and Standards (LORS)

Applicable LORS	Description
Federal	
40 Code of Federal Regulations (CFR) Parts 51, 52, 70 and 71	This rule "tailors" GHG emissions to PSD and Title V permitting applicability criteria.
40 Code of Federal Regulations (CFR) Parts 51 and 52	A new stationary source that emits more than 100,000 TPY of GHGs is considered to be a major stationary source subject to Prevention of Significant Determination (PSD) requirements. This project would not trigger this 100,000 TPY PSD threshold.
40 Code of Federal Regulations (CFR) Part 98	This rule requires mandatory reporting of GHG emissions for facilities that emit more than 25,000 metric tons of CO_2 equivalent emissions per year. This requirement is triggered by this project.
State	
California Global Warming Solutions Act of 2006, AB 32 (Stats. 2006; Chapter 488; Health and Safety Code sections 38500 et seq.)	This act requires the California Air Resource Board (ARB) to enact standards to reduce GHG emission to 1990 levels by 2020. Electricity production facilities will be regulated by the ARB. A cap-and-trade program became active in January 2012, with enforcement beginning in January 2013. Cap-and-trade is expected to achieve approximately 20 percent of the GHG reductions expected under AB 32 by 2020.
California Code of Regulations, tit. 17, Subchapter 10, Article 2, sections 95100 et. seq.	These ARB regulations implement mandatory GHG emissions reporting as part of the California Global Warming Solutions Act of 2006 (Stats. 2006; Chapter 488; Health and Safety Code sections 38500 et seq.)
Title 20, California Code of Regulations, section 2900 et seq.; CPUC Decision D0701039 in proceeding R0604009 (also known as SB 1368)	The regulations prohibit utilities from entering into long-term contracts with any base load facility that does not meet a greenhouse gas emission standard of 0.5 metric tonnes carbon dioxide per megawatt-hour (0.5 $MTCO_2$/MWh) or 1,100 pounds carbon dioxide per megawatt-hour (1,100 lbs CO_2/MWh).

The California Climate Action Team produced a report to the Governor (CalEPA 2006) which included many examples of strategies that the state could pursue to reduce GHG emissions in California, in addition to several strategies that had been recommended by the Energy Commission and the California Public Utilities Commission (CPUC). Their third biennial report published in December 2010 and required by Executive Order S-3-05, is the most recent report addressing actions that California could take to reduce GHG emissions (CalEPA 2010). The scoping plan approved by ARB in December 2008 builds upon the overall climate change policies of the Climate Action Team reports and includes recommended strategies to achieve the goals for 2020 and beyond. Some strategies focus on reducing consumption of petroleum across all areas of the California economy. Improvements in transportation energy efficiency (fuel economy) and land use planning and alternatives to petroleum-based fuels are slated to provide substantial reductions by 2020 (CalEPA 2006). The scoping plan includes a 33 percent RPS, aggressive energy efficiency targets, and a cap-and-trade program that includes the electricity sector (ARB 2008). Mandatory compliance period[18] with cap-and-trade requirements commenced on January 1, 2012, although enforcement was delayed until January 2013. SB 2 (Simitian, Chapter 1, Statutes of 2011-12) expresses the intent of the California Legislature to have 33 percent of California's electricity supplied by renewable sources by 2020 and the PSEGS Project would contribute to this goal.

It is likely that GHG reductions mandated by ARB will be non-uniform or disproportional across emitting sectors, in that most reductions will be based on cost-effectiveness (i.e., the greatest GHG reduction for the least cost). For example, ARB proposes a 40 percent reduction in statewide GHG emissions from the electricity sector even though that sector currently only produces about 25 percent of the state's GHG emissions.

SB 1368,[19] enacted in 2006, and regulations adopted by the Energy Commission and the CPUC, pursuant to that bill, prohibits California utilities from entering into long-term commitments with any base load facilities that exceed the Emission Performance Standard (EPS) of 0.5 metric tonnes CO_2 per megawatt-hour[20] (1,100 pounds CO_2/MWh). Specifically, the SB 1368 EPS applies to base load power from new power plants, new investments in existing power plants, and new or renewed contracts with terms of five years or more, including contracts with power plants located outside of California.[21] If a project, instate or out of state, plans to sell base load electricity to California utilities, those utilities will have to demonstrate that the project meets the EPS. *Base load* units are defined as units that are expected to operate at a capacity factor higher than 60 percent. Compliance with the EPS is determined by dividing the annual average carbon dioxide emissions by the annual average net electricity production in MWh. This determination is based on capacity factors, heat rates, and corresponding emissions rates that reflect the *expected* operations of the power plant and not on full load heat rates [Chapter 11, Article 1 §2903(a)]. At the January 12, 2012,

[18] A compliance period is the time frame during which the compliance obligation is calculated. The years 2013 and 2014 are known as the first compliance period and the years 2015 2017 are known as the second compliance period. The third compliance period is from 2018 2020. At the end of each compliance period each facility will be required to turn in compliance instruments, including allowances and a limited number of ARB offset credits equivalent to their total GHG emissions throughout the compliance period. (http://www.arb.ca.gov/cc/capandtrade/guidance/chapter1.pdf)

[19] Public Utilities Code § 8340 et seq.

[20] The Emission Performance Standard only applies to carbon dioxide and does not include emissions of other greenhouse gases converted to carbon dioxide equivalent.

[21] See Rule at http://www.cpuc.ca.gov/PUBLISHED/FINAL_DECISION/64072.htm

Business Meeting, the Energy Commission opened an Order Instituting Rulemaking (12-OIR-1) to consider revisions to the EPS.

In addition to these programs, California is involved in the Western Climate Initiative (WCI), a multi-state and international effort to establish a cap-and-trade market to reduce GHG emissions in the Western United States and the Western Electricity Coordinating Council (WECC). WCI created a special entity, WCI, Inc. to assist jurisdictions that are moving ahead with cap-and-trade programs. The initial participants are California and the Canadian province of Quebec. Two other Canadian provinces may join in the near future.

Each participating entity is developing their own cap-and-trade program to reduce GHG pollution, using their own authorities, laws and regulations. These programs will be linked in a larger market if each participating organization finds that such joining of programs creates synergy and can be done without adversely impacting their own system.

WCI timelines are similar to those of AB 32, with full roll-out beginning in 2012. And, as with AB 32, the electricity sector has been a major focus of attention of this group. ARB continues to refine AB 32 regulations to mesh California requirements with those of the WCI to minimize leakage of GHG emissions from one geographic area to another. For example, they held a staff workshop on April 9, 2012, to discuss draft amendments to California's cap-and-trade program to better link these two efforts. None of the proposed amendments would change GHG requirements for PSEGS.

SB 1018 (Unfinished Business, Senate Budget and Fiscal Review Committee, for purposes of implementing the Budget Act of 2012) establishes new legislative oversight and controls over the ARB including: the creation of a separate expenditure fund for proceeds from the auction or sale of allowances pursuant to the market-based compliance mechanism (their cap-and-trade program); the establishment of a separate Cost of Implementation Fee account for oversight and tracking of funds; oversight of actions taken on behalf of the State of California related to market-based compliance and auctions, specific to the Western Climate Initiative and Western Climate Initiative, Incorporated; and provides for return of certain funds to ratepayers of Investor Owned Utilities from funds related to the auction or sale of allowances.

If built, PSEGS would be required to participate in California's GHG cap-and-trade program. This cap-and-trade program is part of a broad effort by the State of California to reduce GHG emissions as required by AB 32, which is being implemented by ARB. As currently proposed, market participants such as PSEGS would be required to report their GHG emissions and to obtain GHG emissions allowances (and offsets) for those reported emissions by purchasing allowances from the capped market and offsets from outside the AB 32 program. As new participants enter the market and as the market cap is ratcheted down over time, GHG emission allowance and offset prices will increase encouraging innovation by market participants to reduce their GHG emissions. Thus, PSEGS, as a GHG cap-and-trade participant, would be consistent with California's landmark AB 32 Program, which is a statewide program coordinated with a region wide WCI program to reduce California's GHG emissions to 1990 levels by 2020.

ELECTRICITY PROJECT GREENHOUSE GAS EMISSIONS

Electricity use can be as simple as turning on a switch to operate a light or fan. The system to deliver the adequate and reliable electricity supply is complex and variable. But it operates as an integrated whole to reliably and effectively, meet demand, such that the dispatch of a new source of generation unavoidably curtails or displaces one or more less efficient or less competitive existing sources. Within the system, generation resources provide electricity, or energy, generating capacity, and ancillary services to stabilize the system and facilitate electricity delivery, or movement, over the grid. *Capacity* is the instantaneous output of a resource, in megawatts. *Energy* is the capacity output over a unit of time, for example an hour or year, generally reported as megawatt-hours or gigawatt-hours (GWh). Ancillary services[22] include regulation, spinning reserve, non-spinning reserve, voltage support, and black start capability. Individual generation resources can be built and operated to provide only one specific service. Alternatively, a resource may be able to provide one or all of these services, depending on its design and constantly changing system needs and operations.

PSEGS GHG EMISSIONS

Project Construction

Construction of industrial facilities such as power plants requires coordination of numerous equipment and personnel. The concentrated on-site activities result in short-term, unavoidable increases in vehicle and equipment emissions that include GHGs. The construction would last approximately 33 months. The GHG emissions estimate, for the entire construction period, provided by the project owner is below in **Greenhouse Gas Table 2**. Construction period GHG emissions average 16,485 MTCO2E per year (45,335 MTCO2E/33 months) X (12 months in a year).

Greenhouse Gas Table 2
Estimated PSEGS Potential Construction Greenhouse Gas Emissions

Construction Element	CO_2-Equivalent (MTCO2E)[1,2,3]
On-Site Construction Equipment (includes delivery and hauling vehicles)	31,560
On-Site Motor Vehicles (LTDs)	83
Off-Site Motor Vehicles	13,692
Construction Total (33 months)	45,335

Notes:
1 - One metric tonne (MT) equals 1.1 short tons or 2,204.6 pounds or 1,000 kilograms
2 - The vast majority of the CO2E emissions, over 99%, is CO_2 from these combustion sources.
3 – Values shown per period for construction. Days per period: 21 days per month at 33 months = 693 days total
Source: Palen 2013c, Appendix 4.1E

[22] See CEC 2009b, page 95.

Project Operations

The final operational PSEGS impacts will be evaluated in the FSA. Shown below in **Greenhouse Gas Table 3** is the evaluation performed by the applicant for operating PSEGS emissions. These values are preliminary at this time and may need to be updated in the FSA, depending on the outcome of the Determination of Compliance after it has been issued.

Greenhouse Gas Table 3
Estimated PSEGS Operating Period Greenhouse Gas Emissions

Operating Activity	MTCO2e/year
Auxiliary Boilers	35,100
Nightime Preservation Boilers	5,710
Emergency Generators	827
Fire Pumps	228
Mirror Washing	36,151
Support Vehicles	1,554
Total GHG Emissions	**82,325**
Facility MWh per year (from Table 2.2-1 of amendment)	1,412,300
Facility GHG Emissions Rate (MTCO2e/MWh)	**0.06**

Solar Project Energy Payback Time

The beneficial energy and GHG impacts of renewable energy projects can also be measured by the *energy payback time.*[23] **Greenhouse Gas Tables 2** and **3** (to be provided in the FSA) provide an estimate of the onsite construction and operation emissions, employee transportation emissions, and the final segment of offsite materials and consumables transportation. However, there are additional direct transportation and indirect manufacturing GHG emissions associated with the construction and operation of the proposed modified project, which are all considered in the determination of the energy payback time. A document sponsored by Greenpeace estimates that the energy payback time for concentrating solar power plants, such as PSEGS, to be on the order of 5 months (Greenpeace 2005, Page 9); and the project life for PSEGS is on the order of 30 years. Therefore, the proposed modified project's GHG emissions reduction potential from energy displacement would be substantial.[24]

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[23] The energy payback time is the time required to produce an amount of energy as great as what was consumed during production, which in the context of a solar power plant includes all of the energy required during construction and operation.

[24] The GHG displacement for the project would be similar to, but not exactly the same as, the amount of energy produced after energy payback is achieved multiplied by the average GHG emissions per unit of energy displaced. The average GHG emissions for the displaced energy over the project life is not known but currently fossil fuel fired power plants have GHG emissions that range from 0.35 MT/MWh CO2E for the most efficient combined cycle gas turbine power plants to over 1.0 MT/MWh for coal fired power plants.

Closure and Decommissioning

Closure and decommissioning, as a one-time limited duration event, would have emissions that are similar in type and magnitude, but likely lower than, the construction emissions discussed above.

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

Staff assesses four kinds of impacts: construction, operation, closure and decommissioning, and cumulative effects. As the name implies, construction impacts result from the emissions occurring during the construction of the proposed modified project. The operation impacts result from the emissions of the proposed modified project during operation. Cumulative impacts analysis assesses the impacts that result from the proposed modified project's incremental effect viewed over time. The impact of GHG emissions caused by this solar facility is characterized by considering how the power plant would affect the overall electricity system. The integrated electricity system depends on non-fossil and fossil-fueled generation resources to provide energy and satisfy local capacity needs. As directed by the Energy Commission's adopted order initiating an informational (OII) proceeding (08-GHG OII-1) (CEC 2009a), staff is refining and implementing the concept of a "blueprint" that describes the long-term roles (i.e., retirements and displacement) of fossil-fueled power plants in California's electricity system as we move to a high-renewable, low-GHG electricity system, which will include projects like PSEGS.

Construction Impacts

Staff concludes that the GHG emission increases from construction activities would not be CEQA significant for several reasons. First, the period of construction would be short-term and the emissions intermittent during that period, not ongoing during the life of the proposed modified project. Second, best practices control measures that staff recommends, such as limiting idling times and requiring, as appropriate, equipment that meets the latest emissions standards, would further minimize GHG emissions since the use of newer equipment would increase efficiency and reduce GHG emissions and be compatible with low-carbon fuel (e.g., bio-diesel and ethanol) mandates that will likely be part of the ARB regulations to reduce GHG from construction vehicles and equipment. And lastly, these temporary GHG emissions are necessary to create this renewable energy source that would provide electricity with a very low GHG emissions profile, and the construction emissions would be more than offset by the reduction in fossil fuel–fired generation that would be enabled by this proposed modified project. If the project construction emissions were distributed over the estimated 30-year life of the proposed modified project they would only increase the project life time facility GHG emissions rate by 0.002 MT CO2E per MWh.

Electricity System GHG Operational Impacts – David Vidaver

Direct/Indirect Operation Impacts and Mitigation

The proposed PSEGS promotes the state's efforts to move towards a high-renewable, low-GHG electricity system, and therefore reduces both the amount of natural gas used by electricity generation and GHG emissions. It does this in several ways:

- California's Energy Action Plan Loading Order specifies that electrical energy demand be met first by energy efficiency and demand response, followed by employing renewable energy such as would be provided by PSEGS.
- The energy produced by the PSEGS would displace energy from higher GHG-emitting coal- and natural gas-fired generation resources, lowering the GHG emissions from the western United States, the relevant geographic area for the discussion of GHG emissions from electricity generation.
- The dependable capacity provided by the PSEGS would facilitate the retirement/divestiture of resources that cannot meet the Emissions Performance Standard (EPS) or are adversely affected by the SWRCB's policy on OTC.

CALIFORNIA'S ENERGY ACTION PLAN LOADING ORDER

In 2003, the three key energy agencies in California – the California Energy Commission, the California Power Authority (CPA), and the CPUC– came together in a spirit of unprecedented cooperation to adopt an "Energy Action Plan" (EAP) that listed joint goals for California's energy future and set forth a commitment to achieve these goals through specific actions. The EAP is a living document meant to change with time, experience, and need. In 2005 the CPUC and the Energy Commission jointly prepared an Energy Action Plan II to identify further actions necessary to meet California's future energy needs (CEC 2005).

The EAP's overarching goal is for California's energy to be adequate, affordable, technologically advanced, and environmentally-sound. Energy must be reliable – provided when and where needed and with minimal environmental risks and impacts. Energy must be affordable to households, businesses and industry, and motorists – and in particular to disadvantaged customers who rely on California government to ensure that they can afford this fundamental commodity. EAP actions must be taken with clear recognition of cost considerations and trade-offs to ensure reasonably priced energy for all Californians.

The EAP accomplishes these goals in the electricity sector by calling for a "loading order" specifying the priority order for how to balance electricity supply and demand. The loading order identifies energy efficiency and demand response as the State's preferred means of meeting growing electrical energy needs. After cost-effective efficiency and demand response, it relies on renewable sources of power and distributed generation, such as combined heat and power applications. To the extent efficiency, demand response, renewable resources, and distributed generation are unable to satisfy increasing energy and capacity needs, the loading order supports clean and efficient fossil-fired generation.

The Role of the PSEGS in Energy Displacement

California's RPS calls for 33 percent of California's electrical energy to be provided by qualifying renewable energy facilities by the year 2020. The RPS was established by SB 1078 (Sher, Chapter 516, Statutes of 2002), effective January 1, 2003, with revisions to the law as a result of SB 1250 (Perata, Chapter 512, Statutes of 2006), SB 107 (Simitian, Chapter 464, Statutes of 2006), and SB X1 2 (Simitian, Chapter 1, Statutes of 2011, First Extraordinary Session). The RPS originally required California's electric utilities to obtain at least 20 percent of its power supplies from renewable sources by 2010. It now has been expanded to require retail sellers of electricity and local publicly owned electric utilities (POUs) to increase the amount of renewable energy they procure until 33 percent of their retail sales are served with renewable energy by December 31, 2020. Under the law, the Energy Commission is required to certify eligible renewable energy resources that may be used by retail sellers of electricity and POUs to satisfy their RPS procurement requirements, develop an accounting system to verify retail sellers' and POUs' compliance with the RPS, and adopt regulations specifying procedures for enforcement of the RPS for the POUs.

As California moves towards an increased reliance on renewable electrical energy by implementing the RPS, non-renewable electric energy resources will be displaced. A 33 percent RPS is forecasted to require California load-serving entities to procure more than 82,800 GWh of renewable electrical energy in 2024, an increase of roughly 28,300 GWh over current levels.[25]

Given an RPS, renewable electrical energy displaces electricity that would otherwise be produced from coal- and natural gas-fired generation. The construction and operation of the PSEGS would not displace other renewable resources as load-serving entities must meet the renewable energy purchase requirements embodied in the RPS. Even in the absence of an RPS, PSEGS would not replace other renewables. The fuel and other variable costs associated with most forms of renewable generation are much lower than for other resources and even where this may not be the case (e.g., selected biofuels) the renewable resource will frequently have a "must-take" contract with a load-serving entity requiring that all of electrical energy produced by the project be purchased by the buyer. Hydroelectric generation is not displaced as it has very low variable costs of production; the variable cost of nuclear generation is much lower than for fossil resources as well.

While the PSEGS would combust some natural gas and thus emit GHGs as part of its operations, it would produce far less GHG emissions (emitting approximately 132[26] lbs CO2/MWh) than the coal- and natural gas-fired resources it would displace. Coal-fired generation requires the combustion of 9,000 – 10,000 Btu/MWh, resulting in more than 1,800 lbs CO2/MWh. Natural gas-fired generation in California requires an average of 8,566 Btu/MWh, yielding approximately 1,000 lbs CO2/MWh (CEC 2011b).[27]

The Role of the PSEGS in Capacity Displacement

The PSEGS would provide up to 500 MW of electrical capacity and associated electrical energy to the grid during early afternoon hours in the summer. Electricity demand in California reaches its peak during mid- to late-afternoon on the hottest weekdays of the summer. Dependable capacity – the amount of capacity that can be counted upon to be available during the peak - is needed to reliably serve loads; the generation fleet, in

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[25] Retail sales requiring renewable procurement are forecasted to be almost 283,300 GWh in 2024 (CEC 2013a); as of January 2013 California is estimated to have procured 54,400 GWh (CEC 2013a)

[26] Derived from Greenhouse Gas Table 3 Estimated PSEGS Operating Period Greenhouse Gas Emissions

[27] The PSEGS would displace resources with a higher than average heat rate during most hours, as the most expensive (least efficient) resources would be displaced.

conjunction with demand response programs, must provide a sufficient amount of dependable capacity to meet demand on the highest load day of the year.[28] Load-serving entities in the California Independent System Operator (Cal ISO) control area, for example, are required by the Cal ISO to procure dependable capacity in amounts determined by their peak load forecast.

While the PSEGS's dependable capacity value would depend upon its exact performance, its ability to sustain output even when solar irradiance is reduced due to cloud cover, and thus provide energy during extreme peak hours would mean a higher value than would otherwise be the case. Although the dependable capacity can be augmented by the natural gas-fired auxiliary boiler, if operating period fuel use exceeds a "de minimus" level defined in the RPS regulations, the facility would no longer qualify as a renewable facility for purposes of the RPS.

The dependable capacity provided by the PSEGS would assist in replacing that lost due to the EPS and the State Water Resources Control Board's (SWRCB) OTC policy, both discussed more fully below.

Replacement of High GHG-Emitting Generation

High GHG-emitting resources, such as coal, are effectively prohibited from entering into new long-term contracts for California electricity deliveries as a result of the Emissions Performance Standard adopted in 2007 pursuant to SB 1368. Between now and 2020, 1,549 MW of coal-fired generation capacity under contract will have to reduce GHG emissions or be replaced; these contracts are presented in **Greenhouse Gas Table 4**.

Greenhouse Gas Table 4
Expiring Long-term Contracts with Coal-fired Generation 2009 – 2020

Utility	Facility	Contract Expiration	MW
Department of Water Resources	Reid Gardner	2013 [1]	213
SDG&E	Boardman	2013	84
SCE [2]	Four Corners	2016	720
Turlock Irrigation District	Boardman	2018	55
LADWP	Navajo	2019	477
		TOTAL	**1,549**

Source: Energy Commission staff based on Quarterly Fuel and Energy Report (QFER) filings.
Notes:
1. Contract not subject to Emission Performance Standard, but the Department of Water Resources has stated its intention not to renew or extend.
2. The sale of SCE's share of Four Corners to Arizona Public Service has been approved by the CPUC and is awaiting FERC approval.

Retirement of Generation Using Once-Through Cooling

The State Water Resource Control Board's (SWRCB) policy on cooling water intake at coastal power plants has led to the retirement and replacement of several plants that used OTC. Numerous others are likely to retire on or prior to assigned compliance

[28] This is usually the hottest weekday in the summer, when residential and commercial cooling loads are at their highest.

dates,[29] some of which will require replacement.[30] The units with compliance dates on or before the end of 2020 are presented in **Greenhouse Gas Table 5**.

Greenhouse Gas Table 5
OTC Units with SWRCB Compliance Dates on or before December 31, 2020[31]

Plant Name & Unit	Local Reliability Area	Capacity (MW)
Alamitos 1 – 6	LA Basin	2,010
El Segundo 3 & 4	LA Basin	670
Encina 1 – 5	San Diego	950
Huntington Beach 1 & 2	LA Basin	430
Mandalay 1 & 2	Ventura	436
Morro Bay 3 & 4	None	650
Moss Landing 6 & 7	None	1,510
Moss Landing 1 & 2	None	1,020
Ormond Beach 1 & 2	Ventura	1,516
Pittsburg 5 & 7 [2]	SF Bay	1,311
Redondo Beach 5 – 8	LA Basin	1,356
Total		**11,859**

Notes:
Pittsburg Unit 7 (682 MW) does not use once-through cooling but would be required to shut down if Units 5 and 6 retire.

CLOSURE AND DECOMMISSIONING – JACQUELYN LEYVA RECORD

Eventually PSEGS would close, either at the end of its useful life or due to some unexpected situation such as a natural disaster or catastrophic facility breakdown. When the facility closes, all sources of air emissions would cease and thus impacts associated with GHG emissions would no longer occur. The only other expected, albeit temporary, GHG emissions would be equipment exhaust (off-road and on-road) from dismantling activities. These activities would be of much a shorter duration than construction of the proposed modified project, equipment used to dismantle the facility are assumed to have lower comparative GHG emissions due to technology advancement during the intervening years, and this equipment would be required to be controlled in a manner at least equivalent to that required during construction. It is assumed that the beneficial GHG impacts of this facility, displacement of fossil fuel–fired generation, would be replaced by the construction of newer more efficiency renewable energy or other low GHG generating technology facilities. Also, the recycling of the facility components (steel, concrete, etc.) could indirectly reduce GHG emissions from decommissioning activities. Therefore, while there would be temporary adverse GHG CEQA impacts during decommissioning, they are determined to be less than significant.

[29] Most of the OTC units are aging facilities, for which extensive retrofits will be uneconomical. While compliance using operational and structural controls is allowed, the ability of units to comply in this manner and still operate in a fashion that yields a sufficient revenue stream is questionable.

[30] The California ISO, CPUC and the Energy Commission are studying amount of OTC capacity that will require replacement.

[31] Greenhouse Gas Table 5 does not include OTC units that retired prior to January 1, 2012, resources with compliance dates through 2020 that have already been slated for replacement (e.g., LADWP units at Haynes and Scattergood), or units with post-2020 compliance dates (the remaining units at Haynes and Scattergood, LADWP's Harbor combined cycle, and the nuclear facilities at San Onofre [which Southern California Edison announced on June 7, 2013 that they would close it rather than repair it] and Diablo Canyon)

CUMULATIVE IMPACTS

Cumulative impacts are defined as "two or more individual effects which, when considered together, are considerable or...compound or increase other environmental impacts" (CEQA Guidelines § 15355). "A cumulative impact consists of an impact that is created as a result of a combination of the project evaluated in the EIR together with other projects causing related impacts" (CEQA Guidelines § 15130[a][1]). Such impacts may be relatively minor and incremental, yet still be significant because of the existing environmental background, particularly when one considers other closely related past, present, and reasonably foreseeable future projects.

This entire assessment is a cumulative impact assessment. The proposed modified project alone would not be sufficient to change global climate, but would emit GHGs and therefore has been analyzed as a potential cumulative impact in the context of existing GHG regulatory requirements and GHG energy policies.

COMPLIANCE WITH LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

The PSEGS, as a solar energy generation project, is exempt from the mandatory GHG emission reporting requirements for electricity generating facilities as currently required by the ARB for compliance with the California Global Warming Solutions Act of 2006 (AB 32 Núñez, Statutes of 2006, Chapter 488, Health and Safety Code sections 38500 et seq.) (ARB 2008a).

The PSEGS, as a renewable energy generation facility, is determined by rule to comply with the Greenhouse Gas Emission Performance Standard requirements of SB 1368 (Chapter 11, Greenhouse Gases Emission Performance Standard, Article 1, Section 2903 [b][1]).

NOTEWORTHY PUBLIC BENEFITS

GHG related noteworthy public benefits include the construction of renewable and low-GHG emitting generation technologies and the potential for successful integration into the California and greater WECC electricity systems. Additionally, the PSEGS project would contribute to meeting the state's AB 32 goals.

RESPONSE TO AGENCY AND PUBLIC COMMENTS

Staff has not received GHG comments.

PROPOSED CONDITIONS OF CERTIFICATION

No conditions of certification related to greenhouse gas emissions are proposed. The project owner would comply with mandatory ARB GHG emissions reporting regulations (California Code of Regulations, tit. 17, Subchapter 10, Article 2, Sections 95100 et. seq.) and/or future GHG regulations formulated by the U. S. EPA or the ARB, such as GHG emissions cap-and-trade requirements.

CONCLUSIONS

The PSEGS would emit considerably less GHGs than existing power plants and most other generation technologies, and thus would contribute to continued improvement of the overall western United States, and specifically California, electricity system GHG emission rate average. The proposed project would lead to a net reduction in GHG emissions across the electricity system that provides energy and capacity to California. Thus, even though PSEGS would emit more GHGs than the approved PSPP, staff concludes that the proposed project's operation would result in a cumulative overall reduction in GHG emissions from the state's power plants and that any short-term impacts would be less than significant.

Staff concludes that GHG emissions typical from construction and decommissioning activities would not create significant impacts under CEQA for several reasons. First, the periods of construction and decommissioning would be short-term and not ongoing during the life of the proposed project. Second, the best practices control measures that staff recommends, such as limiting idling times and requiring, as appropriate, equipment that meets the latest emissions standards, would further minimize GHG emissions since the use of newer equipment would increase efficiency and reduce GHG emissions and be compatible with low-carbon fuel (e.g., bio-diesel and ethanol) mandates that will likely be part of the ARB regulations to reduce GHG from construction vehicles and equipment. Finally, the construction and decommissioning emissions are miniscule when compared to the reduction in fossil-fuel power plant GHG emissions during project operation. For all these reasons, staff concludes that the short-term emission of greenhouse gases during construction would be sufficiently reduced and would be offset during proposed project's operating period and would, therefore, not create a significant impact under CEQA.

The PSEGS, as a renewable energy generation facility, is determined by rule to comply with the Greenhouse Gas Emission Performance Standard requirements of SB 1368 (Title 20, Greenhouse Gases Emission Performance Standard, Section 2900 et. seq.). The project is not subject to the requirements of SB 1368 (Greenhouse Gasses Emission Performance Standard; Cal. Code Reg., tit. 20, § 2900 et. Seq.) and the Emission Performance Standard; however, it would nevertheless meet the Emission Performance Standard.

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ACRONYMS

AB	Assembly Bill
ARB	California Air Resources Board
CAA	Clean Air Act
CalEPA	California Environmental Protection Agency
Cal ISO	California Independent System Operator
CCCC	California Climate Change Center
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CH_4	Methane
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CO2E	Carbon Dioxide Equivalent
CPUC	California Public Utilities Commission
EIR	Environmental Impact Report
EPS	Emission Performance Standard
FSA	Final Staff Assessment
GCC	Global Climate Change
GHG	Green House Gas
GWh	Gigawatt-hour
GWP	Global Warming Potential
HFC	Hydrofluorocarbons
IEPR	Integrated Energy Policy Report
IGCC	Integrated Gasification Combined Cycle
IPCC	Intergovernmental Panel on Climate Change
LADWP	Los Angeles Department of Water and Power
LRAs	Local Reliability Areas
MT	Metric tonnes
MW	Megawatts
MWh	Megawatt-hour
N_2O	Nitrous Oxide
NO	Nitric Oxide
NO_2	Nitrogen Dioxide
NO_3	Nitrates
NOx	Oxides of Nitrogen or Nitrogen Oxides
OII	Order Initiating an Informational
OTC	Once-Through Cooling
PFC	Perfluorocarbons
POU	Publicly Owner Utility
PSD	Prevention of Significant Deterioration
PSEGS	Palen Solar Electric Generating System
PSPP	Palen Solar Power Plant
QFER	Quarterly Fuel and Energy Report
RPS	Renewables Portfolio Standard
SB	Senate Bill
SF_6	Sulfur hexafluoride
SWRCB	State Water Resource Control Board
U.S. EPA	United States Environmental Protection Agency
WCI	Western Climate Initiative
WECC	Western Electricity Coordinating Council

BIOLOGICAL RESOURCES

Revised Staff Assessment for Approved Project: Carolyn Chainey-Davis, Andrew Collison, Amy Golden, Sara Keeler, Mark Massar and Susan Sanders; Preliminary Staff Assessment For Palen Solar Electric Generating System: Ann Crisp, Carol Watson, William B. Haas, Chris Huntley, and Nick Lancaster

SUMMARY OF CONCLUSIONS

The Summary of Conclusions for the PSEGS has been revised and the following replaces the Summary of Conclusions for the approved project (PSPP).

OVERVIEW OF IMPACTS TO BIOLOGICAL RESOURCES:

The Palen Solar Electric Generating System (PSEGS or project) would have significant impacts to biological resources, impacting all of the Sonoran creosote bush scrub, sand dunes, desert washes and other native plant and wildlife communities within the approximately 3,794-acre site as well as along the natural gas line corridor and proposed and approved generation tie-line corridor. The PSEGS project proposes leaving the majority of the vegetation within heliostat fields intact, while adding roads and other improvements only where necessary for project development and operation. The PSEGS will also eliminate development of the engineered channels and most of the natural drainage features will be maintained and any grading required will be designed to promote sheet flow where possible. However, staff is assuming a total loss of the function and value of the vegetation and habitats within the project site because perimeter fencing will exclude most terrestrial animals, and ongoing disturbance, noise, and other anthropogenic activities at the site may continue to degrade habitat functions within the project footprint. Wildlife and plants that are tolerant to disturbance may continue to occupy the site, however, staff does not consider leaving the vegetation on site a benefit to these species due to ongoing risk of injury or mortality by construction equipment or other project construction or operational work efforts.

Desert Tortoise Impacts:

- The PSEGS project site encompasses an area that was already surveyed and permitted for desert tortoise, with the exception of alterations to the generation tie-line and gas lines alignments. Most of the Project site provides low to moderate quality habitat for desert tortoise. The PSEGS project would functionally remove access to 3,947 acres of desert tortoise habitat, including 229 acres within the Chuckwalla Critical Habitat Unit.
- Desert tortoise sign (i.e., burrows, pallets, and shell remains) were detected on the PSEGS project site; however no living animals were observed. Surveys conducted in 2010 identified seven tortoises (adult and juvenile) in the Project area including four along the generation tie line and three tortoises south of I-10, the latter being outside of the Project Disturbance Area. Based on estimates provided by the USFWS 2012 BO for the Approved Project, the site is expected to support from two to 12 adult/subadult tortoises, three to six juvenile tortoises, and 35 eggs. Because these values are based on regional densities and animals detected in buffer areas, the projected number of desert tortoise likely to occur on the site is expected to be lower than the estimates provided in this PSA.

- Construction and operation of the PSEGS project will result in direct and indirect, impacts to desert tortoise (federally and State listed as threatened). Implementation of the project would also result in the permanent loss of desert tortoise habitat.
- Construction and operation of the PSEGS project will constrain wildlife movement to some degree and fragment and degrade adjacent native plant and wildlife communities. The PSEGS project may promote the spread of invasive non-native plants and desert tortoise predators such as ravens.
- Conditions of Certification **BIO-9** through **BIO-11** would require the protection of desert tortoise and other biological resources that occur in and near the project area and would minimize potential take of desert tortoise during Project construction and operation. To offset the loss of 3,947 acres of desert tortoise habitat, staff's proposed Condition of Certification **BIO-12** recommends habitat compensation at a 1:1 ratio for areas outside of critical habitat and a 5:1 ratio for disturbance to habitat in the Chuckwalla Critical Habitat Unit. The PSEGS project would require 4,863 acres of compensatory mitigation for desert tortoise.
- Condition of Certification **BIO-13** requires implementation of a Raven Management and Monitoring Plan to address Project-related increases in ravens, a desert tortoise predator, as well as contributions to help fund a USFWS regional raven management program.
- In June, 2011, USFWS issued a biological opinion (BO) for the licensed PSPP project (USFWS 2011b). Because the PSEGS project would still impact the federally-listed desert tortoise and its habitat and the area affected by the proposed project has changed, the BLM intends to reinitiate consultation to amend the original BO. To reinitiate formal consultation, the BLM would submit a request along with a Revised Biological Assessment (BA) to the USFWS. The BA would reflect changes in the project description; quantify impacts to desert tortoise and provide a revised, analysis of impacts from the PSEGS project; determination of effects to listed species; and recommend avoidance and minimization measures that would be implemented as part of the proposed action. Following review of the Revised BA, the USFWS is expected to issue an amended BO, which will specify terms and conditions that must be implemented to minimize take of the species. The BLM will not issue a Record of Decision prior to receiving the approved BO. At the time of publication of this PSA, the BLM has not entered formal consultation with the USFWS.

Ephemeral Streams:

- Conversion of the project from parabolic trough to concentrating solar power would result in direct impacts to 359.07 acres of state jurisdictional waters, a slight increase from PSPP's impacts to 312 acres. Approximately 32 acres of ephemeral streams located downstream of the project will be indirectly impacted but to a limited degree. The project owner will minimize obstructions of the natural surface drainage patterns where possible, but staff concluded the biological functions and values of the streams will be lost due to perimeter exclusion fencing, partial grading, road construction and maintenance, vegetation maintenance, herbicide spraying, and human disturbance. Staff considers the direct, indirect, and cumulative impacts to ephemeral streams to be significant because they would result in a loss of the beneficial functions and values that these state waters provide to wildlife.

- Condition of Certification **BIO-21** would minimize and offset direct and indirect impacts to state waters to less-than-significant levels and would assure compliance with California Department of Fish and Wildlife (CDFW) codes that regulate impacts to these waters. **BIO-21** specifies acquisition of state waters within the Chuckwalla Valley basin, in the Palen watershed or adjacent watersheds, at a 1:1 ratio for unvegetated ephemeral dry wash and at a 3:1 ratio for desert dry wash woodland.

Impacts to Groundwater-Dependent Ecosystems:

- The modified project would use less groundwater during both construction and operation than the PSPP project. Construction groundwater use is stated to be 1,130 acre-feet per year (AFY), a reduction from the original permitted project groundwater consumption of 1,917 AFY. Operational groundwater use is stated as 201 AFY, a reduction of nearly 100 AFY.
- Two conditions, **BIO-23** and **BIO-24** were required for the original project. Condition of Certification **BIO-23** requires monitoring of groundwater levels and of groundwater-dependent vegetation within the area affected by groundwater pumping, and Condition of Certification **BIO-24** requires implementation of remedial action and compensatory mitigation if the monitoring reveals adverse effects. No new or additional impacts were identified in conjunction with the modified project, and therefore no new conditions, or edits to the existing conditions **BIO-23** or **BIO-24** are necessary. With implementation of these mitigation measures the Project impacts to groundwater-dependent plant communities would be reduced to less-than-significant levels.

Special-Status Plants:

- Impacts to special-status plant species are similar to impacts identified for the PSPP project. No federal- or state-listed plant species were detected within the PSPP Project Disturbance Area, but three other species of special-status plants were detected within the disturbance area during the spring 2010 surveys for the PSPP: Harwood's milk-vetch, California ditaxis, and ribbed cryptantha. These species are located in the PSEGS Project Disturbance Area and would be similarly impacted by the PSEGS Project. Fall 2010 botanical surveys were conducted in the PSPP project area; however no additional special-status plant species were detected. No additional special-status plants were detected during spring 2013 surveys for new areas of impact for the PSEGS project including the proposed generation tie-line and natural gas line corridor. However, staff has not yet received the final survey report from the project owner. Staff requires the final results of all additional spring surveys in time to be included in the Final Staff Assessment (FSA).

  Condition of Certification **BIO-19** describes measures for avoiding and minimizing effects to avoided occurrences of Harwood's milk-vetch, California ditaxis and other special-status plants occurring within 100 feet of the project boundary, and guidelines for minimizing direct effects along Project linears. **BIO-19** also contains guidelines for conducting fall 2013 botanical surveys, triggers for mitigation, and detailed specifications and performance standards to ensure that any additional special-status plants that would have been missed during the previous spring surveys would be mitigated to a less-than-significant level. Fall 2010 surveys were completed for the PSPP however fall 2013 botanical surveys would be required for the new areas of impact for the PSEGS project including the proposed generation tie-line and natural gas line corridor.

Avian Impacts

Desert dry wash woodland, Sonoran creosote bush scrub and other habitat within the Project Area provides foraging, cover, and/or breeding habitat for a number of resident and migratory birds, including a number of special-status bird species potentially occurring at the site. Construction and operation of the proposed project or its alternatives could result in death or injury of these birds.

The solar tower technology creates a new impact, solar flux. Flux is concentrated over the heliostat field, and increasing in intensity nearing the tower. Exposure to elevated flux may cause injury or death. From an aerial perspective, heliostats may reflect water or sky, creating a mirage effect. It is possible for birds to be attracted to the project site, and collide with mirrors. Mirror collision was also a project impact of the PSPP project. Staff believes the evaporation ponds and adjacent date-palm and jojoba agricultural operations may attract insects, bats, and birds; increasing their risk from collision or exposure to elevated levels of solar flux.

Staff has requested further information on resident birds that may be present at the project site, including the suite of birds that may migrate in the project vicinity, including foraging behavior and flight patterns of each species. This information will help staff identify which species are most likely to be impacted by elevated levels of solar flux and collision risk

Nesting Birds

- The large-scale conversion of the site from relatively intact native habitat to an operating solar field has the potential to impact nesting birds. Staff’s recommended Conditions of Certification **BIO-1** through **BIO-8** would require a project Biologist, and prescribe a variety of minimization measures and best management practices to protect nesting birds, control fugitive dust, reduce the potential for wildfires, require worker training to minimize disturbances, require biological monitoring and reporting of project disturbances, and compensate for habitat loss through the acquisition and management of offsite lands. Condition of Certification **BIO-14**, Weed Management, requires preparation and implementation of a Weed Management Plan to prevent the loss or ongoing degradation of habitat values, and measures to protect wildlife from weed management activities. In addition, staff’s recommended Condition of Certification **BIO-15** would require surveys and avoidance measures to prevent destruction of active bird nests during construction and operations. Conditions of certification **BIO-16a and BIO-16b** provide for ongoing project monitoring, powerline retrofits, and implementation of a suite of habitat restoration and enhancement measures that would benefit nesting birds. Taken together, staff concludes that these conditions of certification would avoid or minimize potential take of these species during project construction and would reduce impacts to their habitat to a level less than significant according to CEQA.

Bald and Golden Eagle

- The bald eagle is protected by the federal Bald and Golden Eagle Protection Act (BGEPA) and Migratory Bird Treaty Act (MBTA) and fully protected under the California Fish and Game Code. The golden eagle is a BLM sensitive species, also protected under the federal Bald and Golden Eagle Protection Act and Migratory Bird Treaty Act, and is designated as fully protected under the California Fish and Game Code. There is no suitable bald or golden eagle nesting habitat on the proposed project site. The entire project is suitable golden eagle foraging habitat year-around, and bald eagles may fly over the area or (rarely) forage on the site during winter or migration seasons. Recommended Conditions of Certification **BIO-1** through **BIO-8** would serve to mitigate many of the project's impacts to native vegetation and wildlife habitat, including eagle foraging habitat. Staff believes that all compensation land meeting recommended selection criteria as desert tortoise habitat (**BIO-12**) and desert dry wash habitat (**BIO-21**) also would serve as suitable eagle foraging habitat. Staff concludes that the project's impacts to eagle foraging habitat would be less than significant with incorporation of these recommended conditions of certification.
- The project would present long-term operational hazards to bald and golden eagles. Staff's recommended Conditions of Certification **BIO-1** through **BIO-8** would minimize adverse impacts to eagles. Operation of the project may result in eagle collisions with the heliostat mirrors and mortality or injury from exposure to concentrated solar energy (flux) surrounding the central towers. No mechanism is currently available to allow staff to quantify the expected mortality for bald or golden eagles, or any other avian species at this time, however staff believes that the modified project has the potential to take one or more bald or golden eagles over the life of the project, due either to collision with project facilities or to injury or mortality caused by flying through concentrated solar energy over the heliostat field. Staff recommends conditions of certification **BIO-16a** and **BIO-16b** to address impacts to bald and golden eagles. Conditions of certification **BIO-16a and BIO-16b** provide for ongoing project monitoring and implementation of a suite of habitat restoration and enhancement measures that would benefit bald and golden eagles, including powerline retrofits, to mitigate and avoid potential electrocutions both on and offsite. Staff concludes that the take of a bald or golden eagle, should it occur, would be significant according to CEQA.

Other Special Status Birds

- Several special status species of birds are expected to be found in the region seasonally, especially during winter, or as year-around residents, and have the potential to be adversely affected by the project during operation. This includes the state-threatened Swainson's hawk, which do not nest or over-winter in the region, but migrate through en route to breeding and wintering ranges. Other special status species that might be adversely affected by the project include the Yuma clapper rail, gilded flicker, elf owl, osprey, ferruginous hawk, burrowing owl, Cooper's hawk, bald eagle, sharp-shinned hawk, northern harrier, prairie falcon, peregrine falcon, Harris hawk, and short-eared owl. Staff is awaiting further onsite data collection to inform the final list of avian species expected to occur at the project site, including migrant species, which may only occasionally migrate over the project site or general project area. Mortality or other take, such as sub-lethal injury caused by burning or blinding through exposure to elevated flux, would be significant under CEQA and may violate CESA.

- Staff concludes that for migratory species, the project would not affect nest sites, and the project's adverse impacts to foraging habitat for wintering and migratory species would be less than significant. Staff's recommended Conditions of Certification **BIO-1** through **BIO-8** and **BIO-12** would minimize or compensate for project impacts to special status birds.
- All of these species may be vulnerable to operational impacts including collision with heliostats or other project facilities and injury or mortality from exposure to solar flux. This impact is unavoidable, and may be significant even after implementation of mitigation. Staff does not have sufficient information to make this determination at this time, but will be receiving necessary information from the project applicant and will be prepared to make this determination in the Falstaff's recommended conditions of certification **BIO-16a and BIO-16b** provide for ongoing project monitoring, powerline retrofits, and implementation of a suite of habitat restoration and enhancement measures that would benefit nesting birds. These conditions of certification are not fully-developed and details will continue to be worked out as information is received from the project applicant and through staff coordination with the resource agencies and at public workshops

Special Status Bats

- Documented roosting areas for several special-status bats, including caves and mines, are known to occur in in mountains surrounding the project site. Bats have also been found roosting under bridges along Interstate 10. Bats may roost in large palm trees in adjacent commercial agriculture operations. Important foraging habitat is found over agricultural lands and desert wash woodland on-site and on lands to the east. No special-status bats are expected to roost on-site, but several species could forage or fly over the site en route between roosting areas in the Mule Mountains and agricultural lands located to the east. Staff's recommended Conditions of Certification **BIO-1** through **BIO-8** would minimize or compensate for habitat loss, including offset for dry desert washes at a 3:1 ratio. Staff concludes that these measures would effectively mitigate habitat impacts for special-status bats. Conditions of Certification **BIO-16a and BIO-16b** provide for ongoing project monitoring and implementation of a suite of habitat restoration and enhancement measures that would benefit bats, and recommends adaptive management strategies based on results of project monitoring. Staff has directed the project owner to install acoustic bat detection systems (Anabat^{TM} or Sonobat^{TM}) on the project site to collect further data on bat species that may be present (CEC 2013i). The results of this ongoing data collection will be available in the FSA.

Impacts to Burrowing Mammals

- Desert dry wash woodland, Sonoran creosote bush scrub and other habitat in the Project Area provides foraging, cover, and/or breeding habitat for American badgers and desert kit fox. Construction and operation of the Project could result in death or injury of these species.

- American badgers and desert kit fox occur throughout the Project area, and construction activities could crush or entomb kit fox and American badger. Staff's proposed Condition of Certification **BIO-17,** requires development of an American Badger and Desert Kit Fox Mitigation and Monitoring Plan that includes, but is not limited to, procedures and impact avoidance measures for conducting pre-construction surveys and avoidance measures to protect badgers and kit fox during construction and operation, would avoid or minimize this potential impact.

Impacts to Burrowing Owl

- Burrowing owls have been detected on the PSEGS site as recently as 2013. Construction and operation of the PSEGS would result in disturbance or habitat loss for this species. Potential impacts to burrowing owls would likely be mitigated by implementation of staff's proposed Condition of Certification **BIO-18.** This condition involves passive relocation of burrowing owls, as well as acquisition of 78 acres of off-site compensatory mitigation lands suitable for two pairs of burrowing owls for development of the PSEGS project site. This offset may be nested within Condition of Certification **BIO-12**, Desert Tortoise Compensatory Mitigation; given that selection criteria are met. Additional, off-site compensatory mitigation land may be required pending completion of additional surveys of the new natural gas pipeline corridor and the modified generation tie-line corridor. Staff requires the results of all additional surveys to be conducted following the CDFW recommended protocol in time to be included in the FSA. Conditions of certification **BIO-16a and BIO-16b** provide for ongoing project monitoring and implementation of a suite of habitat restoration and enhancement measures that would benefit burrowing owls, and implement adaptive management strategies based on results of project monitoring.

Impacts to Sand Dunes/Mojave Fringe-toed Lizards

- The 2010 Final Decision approved two reconfigured alternatives (Reconfigured Alternative 2 and Reconfigured Alternative 3) that shifted the original proposed PSPP project out of the sand transport corridor, thus avoiding substantial interference with the sand transport corridor and reducing impacts to sand dune dependent species such as Mojave fringe-toed lizards and several special-status plants. The PSEGS project is located within the footprint of the approved PSPP footprint (Reconfigured Alternative 2 and Reconfigured Alternative 3)
- The PSEGS project would directly affect 1,480 acres of Mojave fringe-toed lizard habitat. The PSEGS project would have significant but mitigatable impacts to Mojave fringe-toed lizards, and would generally avoid interference with the sand transport corridor. Staff has requested additional information from the project owner regarding the extent of indirect impacts on sand transport resulting from the changes to the PSEGS footprint and the modified site configuration and components. The project owner assumed 39.7 acres of indirect impacts for the private parcel adjacent to project site that would be surrounded on three sides by project fencing. The project owner assumed with removal of the 30 foot tall wind fence required for the PSPP that all sand would flow through site unrestricted. However, indirect impacts are currently being independently assessed by staff using the sand transport model developed by staff for the PSPP project as applicable. The analysis of indirect impacts will include an assessment of the results of additional sand transport

modeling for the PSEGS project components and site configuration and a full analysis of indirect impacts will be included in the Final Staff Assessment.

- The PSEGS project proposes leaving some vegetation onsite, while adding roads and other improvements only where necessary for project development and operation. In addition, the PSEGS will have asphaltic roads within the project site fence that were not present for the PSPP project. Additional asphaltic pavement onsite may lead to increased road kill of Mojave fringe-toed lizard and other reptiles or amphibians that may use the asphalt roads as thermoregulation sites. Implementation of vegetation management activities could also result death or injury of Mojave fringe-toed lizard. Staff has requested a draft vegetation management plan be submitted by the project owner prior to publication of the Final Staff Assessment. Any modification to existing conditions of certification or additional proposed conditions of certification will be included in the Final Staff Assessment as appropriate.
- Condition of Certification **BIO-20** requires acquisition, protection and enhancement of core populations of Mojave fringe-toed lizard habitat elsewhere in the Chuckwalla or Palen valleys. This compensatory mitigation would offset the impacts of the PSEGS project to less-than-significant levels. Any modifications to **BIO-20** or additional proposed conditions of certification will be included in the Final Staff Assessment. In addition, staff has modified **BIO-6** and **BIO-8** to address the potential for vehicle strikes of Mojave fringe-toed lizard when lizards are using asphalt road within the PSEGS site to thermoregulate.

Temporarily Disturbed Areas

During a September 27, 2010 Workshop, staff and Solar Millennium agreed to delete **BIO-27**. Staff concurred that the applicant should not be required to conduct habitat restoration for temporarily disturbed lands (linears) that have already been mitigated for through habitat acquisition (in **BIO-12, BIO-20 and BIO-21)**, under the condition that: 1) avoidance and minimization measures described in **BIO-27** are incorporated into **BIO-8** (Impact Avoidance and Minimization Measures), and 2) weed management measures described in **BIO-27** are incorporated into **BIO-14** (Weed Management Plan). Restoration and revegetation of the solar facility and other permanently disturbed areas upon decommissioning is addressed separately in **BIO-22**.

Staff was also concerned about potential use of non-native or non-local plant species for erosion control seeding that may be implemented under soil stabilization or erosion control requirements in conditions of certification for Soil & Water or Air Quality, or **BIO-8** (#16). Staff included some guidelines for seed selection in the proposed revisions to **BIO-8** and **BIO-14**. With all of the revisions in the revised **BIO-8** and **BIO-14**, below, staff agreed to delete **BIO-27**.

Cumulative Effects

- Construction and operation of the PSEGS, as proposed, would have cumulatively considerable impacts to many biological resources within the Chuckwalla Valley and the Northern and Eastern Colorado Desert Coordinated Management Plan (NECO) area. These include: desert washes; Mojave fringe-toed lizard; desert tortoise; movement and connectivity; special status birds such as bald and golden eagle, Swainson's hawk, Leconte's thrasher and burrowing owl; American badger and desert kit fox; the Chuckwalla Valley dune system, desert wash woodland, groundwater-dependent ecosystems and other natural communities, and special-status plants.

- The Project's contribution to cumulative impacts to important sand dune habitat and Mojave fringe-toed lizards; would be minimized to a level less than cumulatively considerable with implementation of condition of certification **BIO-20**.
- Staff's proposed conditions of certification address impacts that might be individually minor but cumulatively considerable, and includes measures to minimize: the spread of invasive non-native plants, habitat fragmentation, an increase in raven predation, increased roadkills, bird collisions and exposure to elevated solar flux, increased disturbance from noise and lighting, fugitive dust, chemical drift, unauthorized ORV use of temporary access roads, altered surface drainage patterns, and accidental impacts during construction and operation.
- The projects' contribution to cumulative impacts to birds, insects and bats from exposure to elevated levels of solar flux or collision with facility structures such as heliostats has yet to be determined, and staff will wait to review the results of onsite data collection prior to finalizing this analysis and the evaluation of the effectiveness of staffs proposed conditions of certification. Fields of concentrated solar energy may result in mortality or morbidity to migratory birds. Staff is currently developing a risk assessment model that describes potential impacts to a broader suite of species (e.g. primarily migratory birds that may pass through the solar flux field), than what was originally analyzed for the PSPP. The finalized cumulative impact assessment, as well as any revisions to staff's recommended conditions of certification **BIO-16a** and **BIO-16b**, will be available in the FSA.

Additional Information Staff Required from the Project Owner in Order to Complete the FSA

Staff has received a series of reports and data from the project owner during the development of the PSA. However, some of the submittals consist of concise summaries and do not include background data, species compendiums, data sheets and other information staff considers when evaluating the content and value of the data. In addition, there remain several outstanding data requests required by staff in order to fully assess project related impacts to biological resources. These include:

1. Results of bird and bat surveys conducted during 2013, per staff's Data Request Set 3 (CEC 2013i).

2. Results of spring 2013 avian point count surveys, spring 2013 raptor surveys.

3. Results of rare plant surveys conducted in spring 2013, a summary was sent on May 21 but this did not include all information requested in Data Request Set 1 (CEC 2013b) and staff needs the remaining information to complete the analysis. This includes a complete survey report consistent with CDFW and BLM guidelines and including a complete floral inventory from the surveys. The results of cacti, yucca and trees protected by the California Desert Native Plan Act surveys should also be included, including species list and maps.

4. Results of vegetation and special habitat mapping, as well as weed mapping, as requested in Data Request 1 including calculations of acreages of permanent and temporary disturbance by vegetation type. The project owner has submitted preliminary information and per Data Response 1-5 vegetation was to be re-mapped during Spring 2013 surveys to verify changes since the original mapping (Palen 2013g).

5. A complete report of all spring wildlife survey efforts on the linears, including desert tortoise surveys, burrowing owl, other special status wildlife, include a full wildlife inventory as is noted in summary (Palen 2013s).

6. Amended Lake and Streambed Alteration Agreement (LSAA) Notification to be submitted to CDFW as discussed during the April 17 workshop and requested via email to Alice Karl on April 18 and April 24.

7. Amended 2081 Permit Application (Incidental Take Permit) as the project owner documented would be provided in early 2013 in the Petition to Amend.

8. Bat survey methods write-up covering the work efforts performed during the week of May 6th, and discussed at Staff's May 6, 2013 workshop.

9. Staff also expects a complete sand transport study as requested in Data Request #2 and acknowledges that a summary of report was docketed within Data Response Set 2 (CEC 2013f); staff is awaiting receipt of the final and full report.

10. Results of supplemental burrowing owl surveys conducted to support the linear facilities.

11. Results of all NECO plan required surveys, including Couch's spadefoot toad surveys per the protocol included in Data Response 1-5 (Palen 2013g).

INTRODUCTION

This section of the Preliminary Staff Assessment (PSA) provides the California Energy Commission (Energy Commission) staff analysis of potential impacts to biological resources from the construction and operation of the Palen Solar Electric Generating System (PSEGS or Project). This analysis describes the biological resources at the PSEGS project site (including ancillary facilities) and addresses potential impacts to special-status species, sensitive natural communities, and other significant biological resources. This section discusses the need for mitigation, evaluates the adequacy of mitigation proposed by the project owner, and specifies additional mitigation measures designed to reduce impacts. It also describes compliance with applicable laws, ordinances, regulations, and standards (LORS) and recommends staff's proposed conditions of certification. Only those aspects of the PSEGS project that have changed because of impacts caused by the proposed amendment are included. Changes from the PSPP (Reconfigured Alternative 2 and Alternative 3) to the PSEGS will be evaluated to determine if the PSEGS would remain in compliance with LORS. Refer to **Biological Resources Figure 1**. Information contained in this document includes a detailed description of the existing biotic environment for the all areas of the PSPP which are also part of the proposed PSEGS and any new areas that are part of the PSEGS which were not discussed in staff's testimony for Biological Resources as contained in the Revised Staff Assessment for the approved project. The Revised Staff Assessment for the approved project provides the basis for this document and this PSA provides an analysis of potential new or revised impacts from the modified project to biological resources and, where necessary, specifies new or modified mitigation measures (conditions of certification) to reduce potential impacts to less than significant levels.

The analysis for the Revised Staff Assessment for the approved PSPP project was based, in part, upon information from the following sources: the Application for Certification (AFC) (Solar Millennium 2009a), Supplement to the AFC (Solar Millennium 2009b), and additional information from the Applicant (Galati & Blek 2010i; Galati & Blek 2010j; AECOM 2010f; Solar Millennium 2010k; Solar Millennium 2010l); responses to staff data requests (AECOM 2010a, Palen Solar 1 2010; Kenney 2010; Solar Millennium 2010m; AECOM 2010u); staff workshops held on December 9 and 18, 2009, January 7,10,14, and 25, 2010, and April 28 and 29, 2010; site visits by staff on October 7, 2009, November 3, 2009, April 8, 2010, and January 25, 2010; communications with representatives from the California Department of Fish and Wildlife (CDFW), the Bureau of Land Management (BLM), and the U.S. Fish and Wildlife Service (USFWS); and information contained within the Northern and Eastern Colorado Desert Coordinated Management Plan (NECO)(BLM CCD 2002). Additional analysis for the PSEGS (modified project) is based, in part on information provided in the Palen Solar Holdings LLC's Petition for Amendment (Palen 2012a), two supplements to the Petition to Amend (Palen 2013a and Palen 2013c), responses to data requests, independent research and reconnaissance level surveys conducted by staff on April 9, 10, and 30, 2013. Information was also obtained through ongoing coordination with representatives of the USFWS, CDFW, and BLM. Workshops addressing biological resources for the project were conducted in April and May 2013.

CHANGES FROM PSPP REVISED STAFF ASSESSMENT

Information included in this PSA is based in part on the previously published PSPP Revised Staff Assessment (RSA) (CEC 2010c). The PSA has been revised where new data is available; to reflect changes in the project design or footprint; or where new analysis is required to disclose impacts from the PSEGS project.

Changes from the PSPP RSA to this PSEGS PSA are summarized below:

- **New Project Features and Modifications**: These changes are described below and staff has provided an analysis of new Project features that could affect biological resources in this analysis:
- **Phasing of Construction:** The project owner has proposed a phased plan for construction where Phase 1 will include construction of the generation tie-line, access road, common facilities area, common facilities, temporary construction laydown area, both power blocks including laydown area, and a portion of solar field 2. Phase 2 will include construction of the remainder of the facility (Palen 2013a). Mitigation measures would be similarly phased, with clearance surveys and translocation of desert tortoise and deposits of security for compensatory mitigation

completed before each phase of construction as described in staff's proposed Condition of Certification **BIO-29.**

- **Red Bluff Substation:** When the RSA for the PSPP was published the location of the substation had not yet been determined. Since then the site for the Southern California Edison's (SCE) Red Bluff Substation has been determined the substation is currently under construction. The Red Bluff Substation is expected to be completed and operational in December 2013. Staff has removed the discussion of the impacts of substation construction from the Project-Related Future Actions subsection of this PSA.
- **Fall 2010 Survey Results:** This PSA incorporates fall 2010 survey results (Solar Millennium (Solar Millenium 2010k) of special-status plant species conducted in the PSPP Study Area. The 2010 fall surveys were conducted after the RSA for the PSPP was published, however the results of these surveys were available during evidentiary hearings for the PSPP, and results were included in the Presiding Member's Proposed Decision. The fall 2010 surveys were conducted when summer/fall annual plant species were in bloom and/or fruit within and in the vicinity of the PSPP Project, confirming that late season surveys were being conducted at the appropriate time, however no additional rare plants were detected.
- **Spring 2013 Survey Results:** Staff has requested additional information for all new areas of the project including the natural gas line corridor and the unsurveyed segment of the generation tie-line route (CEC 2013b and CEC 2013l). Biological resource surveys had not previously been conducted in this area. Surveys are currently being conducted, and staff is awaiting final impact calculations from the project owner.
- **New and Revised Conditions of Certification:** Staff has made revisions to several conditions of certification based on new information and analysis, as well as requests by the project owner (Supplement No.1 to Support PSH's Petition for Amendment, Palen 2013a). See **Biological Resources Table 11** for a summary of changes to conditions of certification.

METHODOLOGY AND THRESHOLDS FOR DETERMINING ENVIRONMENTAL CONSEQUENCES

The analysis of PSEGS project effects must comply with California Environmental Quality Act (CEQA). However, given the land jurisdictions of the U.S. Bureau of Land Management (BLM) the project will also be required to satisfy National Environmental Policy Act (NEPA) requirements through a separate process with the BLM. The BLM is the federal lead agency and is preparing a Supplemental Environmental Impact Statement (EIS), which will analyze the PSEGS project. Energy Commission and BLM staff will share information however two separate documents will be prepared and each agency will make a decision on the PSEGS project independently.

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).

Thresholds for determining CEQA 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. The determination of whether a project has a significant effect on biological resources is based on the best scientific and factual data that staff could review for the project. In this analysis the following impacts to biological resources are considered significant if the project would result in:

- a substantial adverse effects to plant species considered by the California Native Plant Society (CNPS), CDFW, or USFWS to be rare, threatened, or endangered in California or with strict habitat requirements and narrow distributions; a substantial impact to a sensitive natural community (i.e., a community that is especially diverse; regionally uncommon; or of special concern to local, state, and federal agencies);
- a substantial adverse effect to wildlife species that are federally-listed or state-listed or proposed to be listed; a substantial adverse effect to wildlife species of special concern to CDFW, candidates for state listing, or animals fully protected in California;
- substantial adverse effects on habitats that serve as breeding, foraging, nesting, or migrating grounds and are limited in availability or that serve as core habitats for regional plant and wildlife populations;
- substantially interferes with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites;
- a substantial adverse effect on important riparian habitats or wetlands and any other “Waters of the U.S.” or state jurisdictional waters; and
- conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

The Project developer would need to comply with the following LORS during Project construction and operation, as listed in **Biological Resources Table 1.** There are no new LORS that would affect the PSEGS project.

Biological Resources Table 1
Laws, Ordinances, Regulations, and Standards (LORS)

Applicable LORS	Description
Federal	
Federal Endangered Species Act (Title 16, United States Code, section 1531 et seq., and Title 50, Code of Federal Regulations, part 17.1 et seq.)	Designates and protects federally threatened and endangered plants and animals and their critical habitats.
Clean Water Act (Title 33, United States Code, sections 1251 through 1376, and Code of Federal Regulations, part 30, section 330.5(a)(26))	Requires the permitting and monitoring of all discharges to surface water bodies. Section 404 requires a permit from the U.S. Army Corps of Engineers (USACE) for a discharge of dredged or fill materials into waters of the U.S., including wetlands. Section 401 requires a permit from a regional water quality control board (RWQCB) for the discharge of pollutants. By federal law, every applicant for a federal permit or license for an activity that may result in a discharge into a California water body, including wetlands, must request state certification that the proposed activity will not violate state and federal water quality standards.
Eagle Act (Title 50, Code of Federal Regulations, section 22.26)	Would authorize limited take of bald eagles (*Haliaeetus leucocephalus*) and golden eagles (*Aquila chrysaetos*) under the Eagle Act, where the taking is associated with, but not the purpose of activity, and cannot practicably be avoided.
Eagle Act (Title 50, Code of Federal Regulations, section 22.27)	Would provide for the intentional take of eagle nests where necessary to alleviate a safety hazard to people or eagles; necessary to ensure public health and safety; the nest prevents the use of a human-engineered structure; or the activity, or mitigation for the activity, will provide a net benefit to eagles. Only inactive nests would be allowed to be taken except in the case of safety emergencies.
Bald and Golden Eagle Protection Act (Title 16, United States Code section 668)	This law provides for the protection of the bald eagle and the golden eagle by prohibiting, except under certain specified conditions, the take, possession, and commerce of such birds. The 1972 amendments increased penalties for violating provisions of the Act or regulations issued pursuant thereto and strengthened other enforcement measures. Rewards are provided for information leading to arrest and conviction for violation of the Act.
Executive Order 13186: Responsibilities of Federal Agencies to Protect Migratory Birds	This order directs federal agencies to enter into a Memorandum of Understanding with the USFWS to protect migratory birds, and include provisions for migratory birds within planning documents or other applicable guidance.
California Desert Conservation Area (CDCA) Plan	The California Desert Conservation Area (CDCA) Plan was established by Congress at the time of the passage of the Federal Land and Policy Management Act (FLPMA). The FLPMA outlines how the BLM will manage public lands. Congress specifically provided guidance for the management of the CDCA and directed the development of the 1980 CDCA Plan.
Northern and Eastern Colorado Desert Coordinated Management Plan (NECO)	A regional amendment to the CDCA Plan approved in 2002, NECO protects and conserves natural resources while simultaneously balancing human uses in the northern and eastern portion of the Colorado Desert.
Migratory Bird Treaty Act (Title 16, United States Code, sections 703 through 711)	Makes it unlawful to take or possess any migratory nongame bird (or any part of such migratory nongame bird) as designated in the Migratory Bird Treaty Act.

Applicable LORS	Description
Executive Order 11312	Prevent and control invasive species.
Wild Free-Roaming Horse and Burro Act (Public Law 92-195)	Wild horses and burros are protected from capture, branding, harassment, and death, and managed with the intent to achieve and preserve the natural ecological balance on public lands.
Desert Tortoise (Mojave Population) Recovery Plan (USFWS 2011)	Describes a strategy for recovery and delisting of the desert tortoise.
State	
California Endangered Species Act of 1984 (Fish and Game Code, sections 2050 through 2098)	Protects California's rare, threatened, and endangered species.
Protected furbearing mammals (California Code of Regulations, Title 14, section 460)	Fisher, marten, river otter, desert kit fox, and red fox may not be taken at any time.
California Code of Regulations (Title 14, sections 670.2 and 670.5)	Lists the plants and animals of California that are declared rare, threatened, or endangered.
Fully Protected Species (Fish and Game Code, sections 3511, 4700, 5050, and 5515)	Designates certain species as fully protected and prohibits the take of such species or their habitat unless for scientific purposes (see also California Code of Regulations Title 14, section 670.7).
Nest or Eggs (Fish and Game Code section 3503)	Protects California's birds by making it unlawful to take, possess, or needlessly destroy the nest or eggs of any bird, except as otherwise provided by code or regulation.
Birds of Prey (Fish and Game Code section 3503.5	Unlawful to take, possess, or destroy any birds in the orders Falconiformes and Strigiformes or to take, possess, or destroy the nest or eggs of any such bird except as otherwise provided by code or regulation.
Migratory Birds (Fish and Game Code section 3513)	Protects California's migratory birds by making it unlawful to take or possess any migratory nongame bird as designated in the Migratory Bird Treaty Act or any part of such migratory nongame birds except as otherwise provided by code or regulation.
Nongame mammals (Fish and Game Code section 4150)	Makes it unlawful to take or possess any non-game mammal or parts thereof except as provided in the Fish and Game Code or in accordance with regulations adopted by the commission.
Significant Natural Areas (Fish and Game Code section 1930 and following)	Designates certain areas such as refuges, natural sloughs, riparian areas, and vernal pools as significant wildlife habitat.
California Environmental Quality Act (CEQA), CEQA Guidelines section 15380	CEQA defines rare species more broadly than the definitions for species listed under the state and federal endangered species acts. Under section 15830, species not protected through state or federal listing but nonetheless demonstrable as "endangered" or "rare" under CEQA should also receive consideration in environmental analyses. Included in this category are many plants considered rare by the California Native Plant Society (CNPS) and some animals on the CDFW's Special Animals List.

Applicable LORS	Description
Streambed Alteration Agreement (Fish and Game Code sections 1600 and following)	Regulates activities that may divert, obstruct, or change the natural flow or the bed, channel, or bank of any river, stream, or lake in California designated by CDFW in which there is at any time an existing fish or wildlife resource or from which these resources derive benefit. Impacts to vegetation and wildlife resulting from disturbances to waterways are also reviewed and regulated during the permitting process.
California Native Plant Protection Act of 1977 (Fish and Game Code section 1900 and following)	Designates state rare, threatened, and endangered plants.
California Desert Native Plants Act of 1981 (Food and Agricultural Code section 80001 and following and California Fish and Game Code sections 1925-1926)	Protects non-listed California desert native plants from unlawful harvesting on both public and private lands in Imperial, Inyo, Kern, Los Angeles, Mono, Riverside, San Bernardino, and San Diego Counties. Unless issued a valid permit, wood receipt, tag, and seal by the commissioner or sheriff, harvesting, transporting, selling, or possessing specific desert plants is prohibited.
Porter-Cologne Water Quality Control Act	Regulates discharges of waste and fill material to waters of the state, including “isolated” waters and wetlands.
Local	
Riverside County General Plan	Protection and preservation of wildlife for the maintenance of the balance of nature.

Desert Renewable Energy Conservation Plan – Interim Planning

In addition to the federal, state, and local LORS summarized above, federal and state agencies are currently collaborating to establish joint policies and plans to expedite development of California’s utility scale renewable energy projects. On October 12, 2009, the State of California and the U.S. Department of Interior entered into a Memorandum of Understanding (MOU) on renewable energy, building on existing efforts by California and its federal partners to facilitate renewable energy development in the state. The MOU stems from California and Department of Interior energy policy directives, and California’s legislative mandate to reduce greenhouse gases to 1990 levels by 2020, and meet the goal of 33 percent of California’s electricity production from renewable energy sources by 2020.

The California-Department of Interior MOU expands on several MOUs issued in 2008 to establish the activities of the California Renewable Energy Action Team (REAT). The REAT was established with California Executive Order S-14-08 (issued November 18, 2008), to “*establish a more cohesive and integrated statewide strategy, including greater coordination and streamlining of the siting, permitting, and procurement processes for renewable generation*…”

The Energy Commission and CDFW are the primary state collaborators of the REAT agencies, operating under a November 18, 2008 MOU between the two agencies to create a “one-stop process” for permitting renewable energy projects under their joint permitting authority. The REAT agencies also include the BLM and the USFWS under a separate MOU signed in November 2008, which outlines the state and federal cooperation of the group. In October 2011, two MOUs were issued that outlined the participation and engagement of the REAT agencies and the Desert Renewable Energy Conservation Plan (DRECP) for participating agencies, one MOU was between CDFW, Energy Commission, BLM, USFWS and the California State Land Commission and one was between CDFW, Energy Commission, BLM, USFWS and the US Department of Defense.

The October 12, 2009 MOU between California and the Department of Interior reiterates several tasks of the REAT agencies provided for in S-14-08 and the Energy Commission–Fish and Game MOU (2009). The MOU between California and the Department of Interior MOU was amended and reissued on January 13, 2012. The primary change to the MOU included the inclusion of additional participating agencies including the California Public Utilities Commission (CPUC), the California State Lands Commission (CSLC), and the California Independent System Operator (CAISO). The updated MOU was based on SBX2 (2011). Modifications to the objectives of this MOU included an extension of the timeline to complete the draft DRECP from June 2012 to the second quarter 2013 but which is now targeted for the third quarter of 2013.

The REAT agencies' primary mission is to streamline and expedite the permitting processes for renewable energy projects in the Mojave and Colorado Desert ecoregions within the State of California, while conserving endangered species and natural communities at the ecosystem scale. To accomplish this goal the REAT agencies are developing a Desert Renewable Energy Conservation Plan (DRECP), a science-based process for reviewing, approving, and permitting renewable energy applications in California. Once the DRECP is complete, which was anticipated in late 2012 and now is anticipated in 2013, the plan will be state Natural Communities Conservation Plan (NCCP) and a federal Habitat Conservation Plan (HCP) that will provide tools to expedite coordination of federal and state endangered species act permitting. Last year the Legislature gave the CDFW the authorization to allow take of the fully-protected golden eagle as a covered species in a NCCP. When the DRECP is completed, and if the DRECP includes the Palen site as expected, the take of golden eagles would be covered. The DRECP would also offer a unified framework for state and federal agencies to oversee mitigation actions, including land acquisitions, for listed species. Since 2010 when the approved project was licensed, major DRECP milestones reached include the release of the Description and Comparative Evaluation of Draft DRECP Alternatives for public review and comment in December 2012. The Draft DRECP is anticipated to be released for formal public review in October 2013.

The REAT agencies recognize that some renewable energy projects are scheduled to be approved prior to completion of the DRECP. Section 8.9 of the October 2009 Draft Planning Agreement for the DRECP <www.energy.ca.gov/2009publications/...2009.../REAT-1000-2009-034.PDF> provides explicit guidance for such interim projects, and directs the REAT agencies to ensure that permitting for these projects:

- be consistent with the preliminary conservation objectives for the DRECP;
- not compromise successful completion and implementation of the DRECP;

- facilitate Federal Endangered Species Act, California Endangered Species Act, National Environmental Policy Act, and California Environmental Quality Act compliance; and
- not be unduly delayed during preparation of the DRECP.

REAT Account and SBX8 34

The REAT agencies signed a Memorandum of Agreement (MOA) in May 2010 to establish a REAT Account that may be used by project developers to deposit funding for specified mitigation for approved renewable energy projects in the Mojave and Colorado Desert region of southern California (the MOA is available at <www.energy.ca.gov/33by2020>). For each project using the REAT Account, an individual subaccount would be established for project specific tracking, compliance and accounting purposes. The subaccount would include a list of the specific mitigation actions, the cost, a timeframe for carrying out the actions, and identify which of the REAT agencies would be responsible for requiring and coordinating the mitigation actions. The National Fish and Wildlife Foundation (NFWF) would manage the subaccount on behalf of the REAT agencies, and at their direction would disburse mitigation funding to satisfy mitigation requirements for impacts to biological resources. NFWF is a charitable non-profit corporation established in 1984 by the federal government to accept and administer funds to further the conservation and management of fish, wildlife, plants and other natural resources <hwww.nfwf.org>. Use of the REAT Account would not change any of the requirements a project proponent must fulfill in order to comply with applicable State and Federal environmental laws governing the permitting of the projects. The REAT Account will also aid project proponents in carrying out contracting and construction activities in a timely manner per requirements for American Recovery and Reinvestment Act of 2009 (ARRA) funding.

The SBX8 34 legislation that was signed into law by the Governor created a $10 million loan that provides for advanced mitigation habitat purchases. This advanced mitigation can be used by a qualifying solar renewable energy project to receive credit for implemented mitigation after a project proponent pays into the Renewable Energy Development Fee Trust Fund that was created by the SBX8 34 legislation (SBX8 34 Trust Fund). Funds in the MOA REAT Account and the SBX8 34 Trust Fund are similar in that renewable energy project proponents pay into accounts set up to receive project-specific mitigation funds, and a third party entity implements the mitigation actions. Staff's proposed Condition of Certification **BIO-28** provides an opportunity for the project owner to fulfill their mitigation obligations by depositing funds into the SBX8 34 Trust Fund.

The REAT agencies have developed a total cost accounting method for calculating acquisition or conservation easement costs for mitigation lands, including costs associated with the purchase transaction, appraisal, escrow, and title insurance including mineral, oil, and gas rights (REAT 2010). The estimate also addresses costs of initial enhancement (e.g., signs, fencing, and boundary/property line surveys; or restoration actions such as removal of exotic species, roads), management for ongoing activities such as public access and enforcement; and monitoring the implementation, effectiveness, and compliance of conservation measures with the goals and objectives. For those projects using the REAT- National Fish and Wildlife Foundation (NFWF)

Mitigation Account for implementing mitigation actions the budget includes administration of contracts and reporting. These cost estimates are used for purposes of establishing an appropriate security amount in conditions of certification, but renewable energy developers are not required to use the NFWF-REAT Mitigation Account to fulfill their obligations for securing compensation lands and are free to undertake mitigation on their own.

PROPOSED MODIFIED PROJECT

Palen Solar Holdings, LLC (PSH) (referred to as the project owner in this document) propose to construct, own, and operate the Palen Solar Electric Generating System (PSEGS or project). The PSPP project was a concentrated solar thermal parabolic trough electric power generating facility with two adjacent, independent, and identical solar plants of 250-megawatt (MW) nominal capacity each, for a total nominal capacity of 500 MW. For the PSEGS, two adjacent solar fields producing 250 MW each are proposed for a combined nominal output of approximately 500 MW using BrightSource's solar tower technology. The PSEGS project site is located approximately ½- mile north of Interstate 10 (I-10), approximately 10 miles east of the small community of Desert Center, and less than 2 miles from the southern edge of Palen Dry Lake in an unincorporated area of eastern Riverside County, California.

The PSEGS site occurs at elevations ranging from 130 feet above mean sea level (MSL) along the eastern edge to 200 feet above MSL near the southwestern portion of the Study area. The Study area for the PSPP was approximately 13,715 acres, encompassing the 4,024-acre Project Disturbance Area (including the transmission Disturbance Area) for the PSPP. The Study area for the PSPP included all areas that would have been required to be surveyed for the PSEGS per the Siting Regulations (proposed project site plus 1 mile buffer and project linear features plus a 1,000 foot buffer) except for the slight re-routing of the generation tie-line near the western end of the route and around the Red Bluff Substation, currently under construction, which encompasses 18.9 acres (120-foot Proposed Corridor). The Natural Gas Line corridor has been relocated since the submittal of the Petition to Amend and would instead be located within the Study Area for the PSPP (Palen 2013d). Refer to **Biological Resources Figure 2**. The PSEGS footprint is smaller by 572 acres than the footprint of the PSPP. The total Project Disturbance Area for PSEGS is approximately 3,901acres. The total Project Disturbance Area for the PSEGS includes the Transmission Line Disturbance Area (81.9 acres for the 120-foot Permitted Corridor and 18.9 acres for the 120-foot Proposed Corridor), the Natural Gasline Disturbance Area (3.5 acres), the Access Road Corridor Disturbance Area (3.5 acres), and the Project Site Disturbance Area (3,794 acres). New biological resource surveys of the PSEGS site were not required for areas of the project that were included in the license for the PSPP as the project owner holds a license to construct a power plant within the PSEGS footprint. Only new areas of the PSEGS project required additional biological resource surveys.

The project owner (PSH) has applied for a revised right-of-way (ROW) grant for approximately 4,759 acres of open lands owned by the federal government and managed by the U.S. Bureau of Land Management (BLM). The portion within the ROW that would support all Project facilities and would be disturbed by the Project is 3,896 acres, referred to as the Project Disturbance Area. The PSEGS project would also include two, evaporative basins approximately two acres in size. If one pond requires maintenance or solids removal, the plant can still operate with the other pond (Palen 2012a).

A detailed description of the Project is provided in the **PROJECT DESCRIPTION**. The following discusses key PSEGS Project design elements as they relate to the potential effects on biological resources.

Proposed Modified Project Features

In the Petition to Amend changes to the PSEGS were identified. This section will describe the project description changes, the potential for impacts to biological resources, and applicable biological conditions of certification that would reduce the adverse environmental effects to less-than-significant levels. The project changes to the PSEGS discussed in this section include the following:

- Two 250-MW power-generating units, each consisting of a dedicated field of approximately 85,000 heliostats, a 750-foot solar tower and receiver, and a power block;
- An approximately 15-acre common facilities area located in the southwestern corner of the site, with an administrative/warehouse building and two 2-acre evaporation ponds (reduced from four 2-acre evaporation ponds for the PSPP);
- An approximately 203-acre temporary construction laydown area located in the southwestern portion of the site immediately north of the common facilities area.
- Re-routing of the generation tie-line near the western end of the route and around the newly constructed Red Bluff Substation, currently under construction; the purpose of this re-routing is to align the PSEGS generation tie-line route immediately adjacent to the NextEra Desert Sunlight generation tie-line to minimize crossings over Interstate 10 and to ensure easy entry into the Red Bluff Substation nearest the PSEGS breaker position;
- Natural gas delivery from a new extension of the existing Southern California Gas (SoCal Gas) distribution system to the project boundary;
- No need for relocation of the existing Southern California Edison 161-kv power line, and

Solar Power Tower Technology

For the PSEGS, two adjacent solar fields producing 250 MW each are proposed for a combined nominal output of approximately 500 MW using BrightSource's solar tower technology. The two adjacent solar fields would each consist of a power block and approximately 85,000 heliostats for heating a receiver on top of a 750 foot tall solar power tower. During construction, portions of the PSEGS site would be graded, including portions along the ephemeral washes. Grading is not intended to level the site, but rather to prepare the site for installation of the heliostats and ease future maintenance activities. As such, the drainages would remain, to the extent feasible, and natural drainage waters are expected to continue to flow in and through these ephemeral washes. Any grading required would be designed to maintain existing drainage pathways, where possible (Palen 2013e). Approximately 27 percent of the site will be completely developed and the rest of the site will be left largely intact. Disturbance-tolerant wildlife and birds will continue to inhabitat and utilize the site throughout construction and operation, and ongoing vegetation management and operational activities such as mowing, vegetation removal, and mirror washing could continue to degrade remnant native habitat. Grading and mowing during construction, and continued vegetation control during operations, could affect ephemeral drainages both on and offsite, over the life of the project.

Modification of the Project's Generation-tie Line

The previous project owner provided a 230-kV transmission line connection to either of two proposed Southern California Edison (SCE) Red Bluff substation sites. The 230/500-kV RBSS would be constructed, owned, operated, and maintained by SCE (Galati & Blek 2010i). The Red Bluff substation was described in further detail in the 'Reasonably Foreseeable Project' subsection of the Revised Staff Assessment (RSA) however since the Red Bluff substation is currently under construction this section was removed. SCE considered the construction of two substations sites (eastern and western) and, two separate transmission lines (eastern and western) have been required for each of the two sites. The final location of the SCE Red Bluff substation, which is currently under construction, would require the project owner to construct the eastern generation tie line (gen-tie) alignment. The discussion of the western gen-tie alignment has been removed from this PSA.

Addition of Natural Gas Line

The PSPP did not include a natural gas supply pipeline, but rather was approved to use LPG for its auxiliary fuel. The PSEGS would use natural gas to fire its auxiliary and nighttime preservation boilers. The natural gas supply for PSEGS would be provided by SoCal Gas via a new pipeline that would extend southward from the site and interconnect with an existing SoCal Gas transmission pipeline located just south of I-10. The new gas pipeline, approximately eight inches in diameter and 2,956 feet long.

Relocation of the Blythe Eagle Mountain 161kv Line

The existing 161-kV Eagle Mountain-Blythe power line which runs in a northwesterly direction across the southwest portion of the PSEGS site, would no longer require relocation for the modified project as it would have for the approved project.

Emergency Access Gates

Due to site constraints increasing the difficulty of providing a secondary access road, **Worker Safety and Fire Protection** staff is instead requiring at least two emergency access gates, one each on the north fence line and south fence line. In the event of an emergency, if the main access road was blocked, all-terrain fire engines would be able to access the site through these gates. **Worker Safety and Fire Protection** staff is requiring that PSEGS "buy into" the Riverside County Fire Department's all-terrain fire engines purchased by the Genesis Solar Energy Project by paying the Genesis project owners the PSEGS' fair share of the cost of the purchase and maintenance of the fire engines. See the **WORKER SAFETY AND FIRE PROTECTION** section of this PSA for more details. Traffic and Transportation staff finds these alternative emergency vehicle accesses adequate from a traffic and transportation perspective.

SETTING AND EXISTING CONDITIONS

REGIONAL SETTING

The PSEGS project would be located within the Northern and Eastern Colorado Desert Coordinated Management Plan (NECO) area; a region that includes most of the California portion of the Sonoran Desert ecosystem. Specifically, it is located at the southwestern side of Palen Dry Lake, between the Chuckwalla and Palen mountains in eastern Riverside County (DTPC 2006). The Project site would be located within the central portion of Chuckwalla Valley, an area east of Palm Springs in the remote Colorado Desert, a subsection of the Sonoran Desert. The range of the Chuckwalla Valley is from 400 feet above mean sea level (MSL) at Ford Dry Lake to approximately 1,800 feet above MSL along some of the bajadas that occur west of Desert Center, California with the surrounding mountains rising to over 3,000 above MSL (Solar Millennium 2009a). Hydrologically, the Study area occurs in the Colorado River Basin within the Chuckwalla Valley Drainage Basin. This is an internally drained basin and all surface water flows to Palen Dry Lake in the western portion of Chuckwalla Valley and Ford Dry Lake in the eastern section of Chuckwalla Valley.

The Sonoran Desert region of southeastern California has a uniquely ‘tropical’ warm desert climate influenced by the addition of monsoonal summer rains; a contrast to the dry summer Mediterranean climate that characterizes much of California. The unique position of the region contributes to the presence of a number of rare and endemic plants and vegetation communities specially adapted to this bi-modal rainfall pattern, and not found elsewhere in California. These include microphyll woodlands, palm oases, and a number of summer annuals that only germinate after a significant warm summer rain.

The Chuckwalla Valley is a region of active aeolian (wind-blown) sand migration and deposition but at a magnitude substantially less that it had experienced during dune aggradational events since the late Pleistocene. Nevertheless, aeolian processes play a major role in the creation and establishment of sand dune habitat in the Chuckwalla Valley and those within the Project area. These habitats are essential to the existence of the Mojave fringe-toed lizard among many other dune habitat specialists. In general, major local sand migration corridors utilized in the past are currently utilized but the corridors have decreased in width since the late Pleistocene within the Project area indicating that the aerial extent of aeolian activity in recent times is less that it once was during regional dune aggradational events (Solar Millennium 2010b, Geomorphic Aeolian and Ancient Lake Shoreline Report).

The dominant sand migration direction within the corridors is toward the east and south. Regional aeolian system studies indicate that the prevailing wind responsible for aeolian sand transport was from the northwest toward the southeast and locally controlled by topography (mountain ranges). Three aeolian sand migration corridors have been identified within the Chuckwalla Valley region including the following: The Dale Lake-Palen Dry Lake-Ford Dry Lake sand migration corridor; the Palen Valley-Palen Dry Lake sand migration corridor; and the Palen Pass-Palen-McCoy Valley sand migration corridor (Solar Millennium 2010b).

The PSEGS project and portions of the generation tie-in are located within designated wildlife habitat management areas (WHMA) or Desert Wildlife Habitat Management Area (DWMA). These include the Palen-Ford WHMA and DWMA Connectivity WHMA, and the Chuckwalla DWMA. Management emphasis for the Palen-Ford WHMA is on the management of the dunes and playas within the Palen-Ford dune system. Management emphasis for the DWMA Connectivity WHMA is on the geographic connectivity for desert tortoise for the conservation areas east of Desert Center (i.e., connectivity between the Chuckwalla DWMA and the wilderness area north of I-10). The Palen-McCoy Wilderness is approximately three miles to the northeast of the project and the Palen Dry Lake Area of Critical Environmental Concern (ACEC) borders the project site to the east.

Vegetation and Wildlife

Natural Communities

Seven natural communities occur within the Study area for the PSEGS, a 13,715-acre area that encompassed the 4,024-acre Project Disturbance Area (including the Transmission Disturbance Area) for the PSPP, and a surrounding buffer area. These communities include: Sonoran creosote bush scrub, desert dry wash woodland (also known as “microphyll woodland”), unvegetated ephemeral streams, stabilized and partially stabilized desert dunes, active desert dunes, alkali desert sink scrub, and dry lake bed (Palen Dry Lake). Two other cover types occur in the Study area: agriculture and developed. Refer to **Biological Resources Figure 3**. The Project Disturbance Area (including Transmission Line and Natural Gas Line Disturbance Area) for the modified project has been reduced by 572 acres and will include 3,901 acres of disturbance to cover types. The Project Disturbance Area includes Sonoran creosote bush scrub, desert dry wash woodland, stabilized and partially stabilized desert dunes, and unvegetated ephemeral streams as well as minimal amounts of agriculture and developed (Palen 2013f). Staff has provided an analysis of impacts of the PSEGS on natural communities based in part on information provided as part of the analysis for the PSPP approved project. Staff has requested additional information for all new areas of the project including the natural gas line corridor and the unsurveyed segment of the generation tie-line. The project owner has submitted preliminary information regarding vegetation community mapping and vegetation will be re-mapped during Spring 2013 surveys to verify changes since the original mapping (Palen 2013f). However, results of vegetation community mapping including impact analysis and maps have not yet been submitted by the project owner. Staff will work with the project owner to resolve this outstanding information need prior to publication of the Final Staff Assessment (FSA).

Three large desert washes of varying hydrologic capacity transverse the Project site from the Chuckwalla Mountains, south of I-10, trending northeast under I-10 via bridges. Large collector ditches south of I-10 divert flows from the smaller streams into these three primary features. The upper portions of these three washes support more deeply incised channels with woody, riparian vegetation while dry, flashy washes located in the center of the Project site support less vegetated, ephemeral washes. Areas of stabilized and partially stabilized desert dunes occur in the northeastern portion of the Project Disturbance Area in association with an active dune system with portions of desert sink scrub and lake bed farther north and east in the Study area. Agriculture and disturbed areas occur in minimal amounts in the Project Disturbance Area and also occur within the 1-mile survey buffer area in the northwestern portion of the Study area.

Five of the seven natural communities—desert dry wash woodland, active desert dunes, desert sink scrub, dry lake bed (playa) and stabilized and partially stabilized desert dunes—are considered rare natural communities by CDFW (2010) and are also NECO-designated sensitive communities. Desert washes, including unvegetated ephemeral streams, are not a NECO or CNDDB community-type but are considered state jurisdictional waters (AECOM 2010a). These communities are discussed in more detail below. Vegetation communities in the Study area were classified by Holland (Holland 1986) and then cross-referenced with *A Manual of California Vegetation* (Sawyer and Keeler-Wolf 1995), where appropriate. **Biological Resources Table 2** summarizes the acreage of natural communities that occurs within the Study area (AECOM 2010a).

Biological Resources Table 2
Natural Communities and Cover Types

Natural Communities and Cover Type within the Biological Resources Study Area	PSEGS Project Disturbance Area[1]	PSPP Biological Resources Study Area[2]
Riparian		
Desert dry wash woodland	203	846
Unvegetated ephemeral dry wash	162	225
Subtotal Riparian	*365*	*1,071*
Upland		
Active desert dunes	0	684
Desert sink scrub	0	9
Dry lake bed	0	270
Sonoran creosote bush scrub	3,343	10,845
Stabilized and partially stabilized desert dunes	187	910
Subtotal Upland	*3,530*	*12,718*
Other Cover Types		
Agricultural Land	3	833
Developed	1	149
Subtotal Other Cover Types	*4*	*982*
Total Acres	**3,899**	**14,771**

Source: Palen 2013a (acreages are rounded up)
1 – The Project Disturbance Area encompasses the disturbance resulting from the proposed construction of the PSEGS project including solar fields, transmission facilities, office and maintenance buildings, lay down area, bioremediation area, drainage channels, leach fields, and other components. It includes the impact acreage of the permitted gen-tie line for the Red Bluff Substation. These acreages include preliminary data for the 18.9 acre proposed gen-tie line route. Final acreages will be provided in the FSA
2 – The BRSA encompasses the Project Disturbance Area (area inside and outside the facility fence that will be disturbed by the project), the solar facility footprint area inside the facility fence including solar fields and other support structures and facilities, the transmission line route and buffer areas (1 mile for solar footprint, 1,000 feet for the transmission line) for the PSPP project. All features for the PSEGS except the proposed generation tie-line route are included in the PSPP Project Disturbance Area.

Sonoran Creosote Bush Scrub

Sonoran creosote bush scrub habitat characterizes the majority of the Study area and intergrades with desert dry wash woodland along desert washes. This natural community is not designated as a sensitive community by BLM. CNDDB recognizes many rare associations of creosote bush scrub but none of these were found in the Project Disturbance Area. Areas of desert pavement occur in areas with a lower density of vegetation and cobbles ranging in size from one to three inches (Solar Millennium 2009a). Sonoran creosote bush scrub occurs on well-drained, secondary soils of slopes, fans, and valleys and is the basic creosote scrub habitat of the Colorado Desert (Holland 1986). Within the Study area, this community is characterized by sandy soils with a shallow clay pan. Past disturbance of the Study area by military training and agricultural practices has resulted in a high percentage of non-native invasive plant species, also referred to as noxious weeds, especially in the southern portion of the Study area and consisting primarily of Sahara mustard (*Brassica tournefortii*), Mediterranean grass (*Schismus* sp.), and Russian thistle (*Salsola tragus*). Noxious weeds are discussed in the following section. The diversion of all the smaller washes by collector ditches south of I-10 may also contribute to the overall sparse cover and low diversity of the creosote bush scrub in the Project Disturbance Area.

Agriculture

There is no Holland or Sawyer and Keeler-Wolf natural community designation for this land cover type. CDFW characterizes farmed areas as cropland or more general categories of agriculture and urban/agriculture. Active and fallow agricultural fields occur within the buffer of the Study area but not within the Project Disturbance Area. The majority of the lands mapped as agriculture within the Study area are palm tree plantations. In fallow agricultural areas, ruderal vegetation is recolonizing previously farmed areas including exotic plant species interspersed with some native vegetation (Solar Millennium 2009a). Fallow and active agriculture fields provide habitat value to local and migratory wildlife in the form of food, cover, and shelter habitat, especially if fields are actively irrigated (Mayer and Laudenslayer 1988). Adjacent to the project site lies approximately 850 acres of palm and jojoba production, an extensive irrigation network, as well as two small man-made pools.

Developed

Developed areas consist of roadways (I-10 and Corn Springs Road) and cleared or highly disturbed land in the southern portion of the Study area. A small structure, possibly a residential home, is located adjacent to the northwest corner of the Project Disturbance Area.

Dry Lake Bed

“Dry Lake Bed” corresponds with the CNDDB natural community “Playa” and incorporates the unvegetated lake bed sediments at the southern tip of Palen Dry Lake. This dry lake bed has a soft surface when wet and displays desiccation cracks once the surface dries. Dry lake beds are prone to periodic flooding with a high coefficient for swelling and contracting once dried. Palen Dry Lake is characterized as a “wet playa” since it supports significant groundwater discharge at the ground surface by evaporation

(Solar Millennium 2009a). Palen Dry Lake bed is a closed, depressional basin with no natural or artificial outlet.

Noxious Weeds

Noxious weeds are species of non-native plants included on the weed lists of the California Department of Food and Agriculture (CDFA) (CDFA 2007), the California Invasive Plant Council (Cal-IPC), or those weeds of special concern identified by the Bureau of Land Management (BLM). They are of particular concern in wild lands because of their potential to degrade habitat and disrupt the ecological functions of an area (Cal-IPC 2006). Specifically, noxious weeds can alter habitat structure, increase fire frequency and intensity, decrease forage (including for special-status species, such as desert tortoise), exclude native plants, and decrease water availability for both plants and wildlife. Soil disturbance and gathering and channeling water create conditions favorable to the introduction of new noxious weeds or the spread of existing populations. Construction equipment, fill, aeloian processes and use of purchased mulch can act as vectors introducing noxious weeds into an area.

During the original project proceeding, preliminary weed data was gathered. Non-native species were recorded as a part of Project surveys in 2009, and the project linear features were surveyed for the modified project in spring 2013, and a summary report has been provided (Palen 2013s). Additionally, the project owner docketed an updated weed management plan on May 28, 2013 (Palen 2013u). Staff is in the process of reviewing these documents with the BLM at the time of publication of this PSA. Information presented below is from the original project proceeding. A full presentation of data collected during spring and summer of 2013 will be available in the FSA.

Four[1] noxious weed species were observed within the study area: Sahara mustard, Russian thistle, salt cedar, and Mediterranean grass. Each of these species is identified on a list of the region's worst weeds compiled by the Low Desert Weed Management Area (NRCS 2005). Noxious weeds found in the study area are discussed further below.

Sahara mustard (*Brassica tournefortii*) was found in disturbed areas throughout Sonoran creosote bush scrub habitat (Solar Millennium 2009a, Appendix F). This species is of high concern; it is a BLM weed of special concern and Cal-IPC has declared this plant highly invasive (Cal-IPC 2006) and recommends that it should be eradicated whenever encountered. This species is associated with impacts to habitat for native wildlife as well as for native plants. It promotes the spread of fire by increasing fuel load and competes with native plants for moisture and nutrients. In addition, it increases cover and works to stabilize sand, thereby affecting wildlife species dependent on open sandy habitat (Brossard et al. 2000; Barrows and Allen 2007).

Russian thistle or tumbleweed (*Salsola* sp.) was found in several habitat types in the Project Disturbance Area, including dune, desert scrub, desert dry wash woodland, and Sonoran creosote bush scrub woodland (Solar Millennium 2009a, Appendix F). Although all invasive plants share the trait of being adapted to disturbed habitat, Russian thistle particularly tends to be restricted to roadway shoulders and other sites

[1] *Fescue* sp. was also recorded, however *Festuca arundinacea*, the Cal-IPC "moderate" listed invasive species, is not expected in this area.

where the soil has been recently disturbed. However, once an area is disturbed this species competes readily and can affect native plant ecosystems and increase fire hazard (Orloff et al. 2008; Lovich 1999). Dune habitat is particularly vulnerable to non-native species, which can stabilize sand or block sand movement, and Russian thistle is considered an invasive species of primary concern in this habitat (CDFG 2007). There is a high potential that Russian thistle could become established in the construction area and this species should be eradicated if observed. Cal-IPC has determined that this plant has a limited invasiveness rating in California (Cal-IPC 2006) and the CDFA has given it a “C” rating.

Tamarisk or **salt cedar** (*Tamarix ramosissima*) is a riparian plant and is therefore restricted to habitats where there is perennial saturation such as springs and seeps, or runoff from poorly maintained water pipelines or well pumps. It was observed interspersed throughout desert dry wash woodland within the study area. Cal-IPC has declared this plant highly invasive (Cal-IPC 2006) and it is a CDFA “B” rated species. Salt cedar is associated with many ecological impacts including impacts to channel geomorphology, groundwater availability, plant species diversity, and fire frequency (Lovich 1999). Salt cedar can also affect sand dunes by blocking sand movement, a vital part of the natural function of these habitats (CDFG 2007).

Mediterranean grass (*Schismus arabicus, S. barbatus*) is prevalent throughout Sonoran creosote bush scrub within the study area. Mediterranean grass is an annual that reproduces by seed, and is widespread in arid and semi-arid California landscapes. This species competes effectively with native plants for nutrients and water and can provide cover that prevents native annuals from sprouting (VanDevender et al. 1997; Brossard et al. 2000) and contributes to dune stabilization (CDFG 2007). Fire, historically, was rare in the Colorado Desert. The presence of Mediterranean grass and other annual non-native grasses has provided a continuous and increased fuel load, influencing the extent, frequency, and intensity of fire in these ecosystems (Brooks and Pyke 2001; Brooks et al. 2004). BLM and other agencies recognize that because of the widespread distribution of Mediterranean grass, this species is not considered feasible to eradicate.

Sensitive Natural Communities and Waters of the State

Sensitive natural communities support unique or biologically important plant or wildlife species, or perform important ecological functions (e.g., bank stabilization or water filtration). These communities are usually locally and regionally scarce and therefore vulnerable to elimination. Sensitive natural communities in the desert region includes many wash-dependent communities, dune and playa habitats, and groundwater-dependent plant communities, such as mesquite groves, waters of the state, wetland and riparian habitats, and others that are of particular concern to BLM, CDFW, and other local, state, and federal agencies. The most current version of the Department’s *List of California Terrestrial Natural Communities* indicates which natural communities are of special status given the current state of the California classification (CDFW 2010).

The following sensitive natural communities occur in or immediately adjacent to the Project, and thus may be directly or indirectly affected:

- Desert dry wash woodland (waters of the state)
- Unvegetated ephemeral wash (waters of the state)
- Desert sink scrub (off-site)
- Active dunes (off-site)
- Playa/lake bed (off-site)
- Stabilized and partially stabilized dunes
- Mesquite Bosque (small stands)

Waters of the State

On November 25, 2009 a formal jurisdictional delineation report was submitted as part of the Lake and Streambed Alteration Agreement Notification application to CDFW for the approved PSPP project to determine the extent of potential jurisdictional waters of the U.S. and waters of the State that occur within the project footprint (Galati & Blek 2009a).The delineation specially addressed waters (and/or wetlands) regulated under the federal Clean Water Act and/or streams and associated habitat regulated under the California Fish and Game Code. The report identified a total of 312 acres of State waters within the Project Disturbance Area for the PPSP. This included 148 acres of desert dry wash woodland and 164 acres of ephemeral desert washes (Solar Millennium 2010m). Refer to **Biological Resources Figure 4**. A total of 32 acres of jurisdictional state waters were delineated downstream of the Project Disturbance Area to account for project design features that reduce or eliminate flow to these features post construction. Waters regulated by the U.S. Army Corps of Engineers (USACE) and U.S. Environmental Protection Agency (USEPA) do not occur on the project site. Correspondence from the USACE South Coast Branch determined that waters regulated by the Corps are not present on the project site (letter from USACE). The project is located in a closed basin with no identifiable outlet and there is no direct hydrologic connection to any navigable waters.

The solar field for the PSEGS project would occur within the Disturbance Area of the approved PSPP project and would rely on the November 25, 2009 delineation. This report delineated all aquatic features, including desert washes which lack a continuous component of desert wash woodland but provide other wildlife habitat function and values. The delineation also included waters and wash-dependent vegetation downstream of the project footprint that would have been indirectly affected by the diversion of waters at the upstream side of the project into a perimeter stormwater conveyance channel. However, the PSEGS project requires less area and the project Disturbance Area would be reduced from 4,366 acres to 3,794 acres. In addition, the PSEGS project would not require the construction of manufactured channels within the solar field to control storm flows. The PSEGS project would include two linear facilities that were not analyzed for the approved PSPP project. This includes a natural gas pipeline and a relocation of the proposed generation tie-in to the Red Bluff substation, which is currently under construction.

The generation tie-in and the natural gas pipeline are located in the alluvial plain and span a number of ephemeral drainages. The project owner is currently conducting a jurisdictional delineation for the PSEGS project linears and this information will be provided in the FSA. Preliminary data provided by the project owner indicate the PSEGS project supports approximately 359 acres of State jurisdictional waters.

Hydrology

The affected waters occur within the Chuckwalla-Palen hydrologic unit, or “watershed” of the Colorado River Hydrologic Basin Planning Area (Solar Millennium 2009a). The rainfall pattern is bimodal with a rainy season in summer and winter (December through March and July through September [commonly the wetter of the two]). Average annual rainfall for the Project area is approximately 3.7 inches (NOAA 2009).

In arid fluvial systems, it is flash flood events (particularly the larger summer thunderstorms), combined with highly erosive soils of alluvial fans that most contribute to the conversion from single thread channels to a compound or anastomosing (braided) morphology. Because the ephemeral washes occurring within the disturbance area are subject to very wide fluctuations in discharges over a short period of time their channels can frequently change configuration to accommodate large variations in surface flow during storm events. As a result, arid fluvial systems usually exhibit long periods of little morphologic change interspersed with short-term dramatic changes in channel configuration. Therefore, arid stream geometry is more likely to be influenced strongly by a large event of low recurrence frequency (Lichvar et al. 2006).

Surface hydrology in the Project area is influenced largely by stormwater runoff from the northeastern flank of the Chuckwalla Mountains, approximately 4 miles south, and south of I-10 (Galati & Blek 2010a). The main hydrologic feature in the watershed, and in the Project area, is Corn Springs Wash, which is supported largely by precipitation but also in part by Corn Springs. The stream drains approximately 31 square miles of the Chuckwalla Mountains at higher elevations (Solar Millennium 2009a). Corn Springs Wash and all other desert washes in the watershed are ephemeral (flowing only in response to storm events). At the foot of the Chuckwalla Mountains, as Corn Springs Wash and other features empty onto the alluvial fan of more erosive, less consolidated soils, the stream system changes from single thread channel to compound, anastomosing channels with highly variable flow pathways. Compound channels are considered the most common channel types in arid regions and are characterized by low-flow meandering channels inset into a wider braided channel network (Lichvar et al. 2006). These channels are highly susceptible to widening and avulsions (i.e., rapid changes in channel position and/or channel relocation) during moderate to high discharges, reestablishing a low-flow channel during subsequent low flows (Lichvar and McColley 2008). This channel avulsion creates diverse physical features and habitats, supports a complex ecosystem, and sustains healthy stream function despite frequent and rapid changes in channel position (USACE 2007). With any compound/ anastomosing ephemeral stream system in arid regions, the riparian corridor may consist of streambanks lined with adapted riparian vegetation, unvegetated areas such as recently created swales and terraces (interfluves), or a mosaic of these types (Bendix and Hupp 2000).

Historic Hydrologic Alterations

When I-10 was constructed across the alluvial fan outlet of Corn Springs Wash over 40 years ago, it deprived the downstream reaches of all surface flows, interrupted natural channel formation and meandering nature of the alluvial fan flow path(s) that historically drained unimpeded from the Chuckwalla Mountains toward Palen Dry Lake, a playa lake (depressional desert sink) (Galati & Blek 2009a). A series of wing dikes were constructed just upstream (south) of the freeway, diverting the flows of numerous smaller channels into the three largest branches of Corn Springs Wash, which I-10 crosses with three short bridges. These dikes and bridges along I-10 concentrate the flows of dozens of small washes into three discrete discharge points. The westerly bridge near Corn Springs Road Interchange conveys flows from the main branch of Corn Springs Wash to the northwest corner of the site. The two other bridges convey flows to the center and east side of the project site respectively. The flat topography at the outlet of the culverts creates an initially incised watercourse that rapidly diminishes and eventually spreads out into numerous small, newly formed channels that abate fairly quickly. In general, alluvial fan channels become increasingly less defined as they flow down the fan (Vyverberg 2010), confinement is lost and the channels dissipate.

The elevated freeway permanently deprived flows of many of the channels that once crossed the Project; many dead and declining ironwood trees are still evident and there is a marked decrease in the cover, vigor, diversity, and overall habitat function and value in the impaired reaches on the Project. This observation is also supported by comparisons of current and historical aerial photography of the Project site (before and after the diversions) (Galati & Blek 2010a).

Habitat Function and Value of State Waters

Desert dry washes play an integral role in the ecology of the watershed. The importance of ephemeral streams to wildlife in the desert is undisputed and well-documented in the literature, the sum of which represents decades of observations and surveys (Levick et al. 2008; Baxter 1988; Kirkpatrick et al. 2007; Kubick & Remsen 1977; Tomoff 1977; Daniels & Boyd 1979, and others). Ephemeral washes (both vegetated and unvegetated) provide unique habitat that is distinct from the surrounding uplands providing more continuous vegetation cover and microtopographic diversity than the surrounding uplands. Ephemeral and intermittent streams in the arid west provide important habitat for wildlife and are responsible for much of the biotic diversity (Levick et al. 2008). They have higher moisture content, and the topographic relief provides shade and cooler temperatures within the channel. In cases where the habitat is distinct in species composition, structure, or density, wash communities provide habitat values not available in the adjacent uplands. They provide movement corridors and seasonal access to water or moisture.

Both the wash-dependent and upland vegetation along desert washes drive food webs, provide seeds for regeneration, habitat for wildlife, access to water, and create cooler, more hospitable microclimatic conditions essential for a number of plant and animal species. Baxter (1988) noted that washes, because of their higher diversity plant communities, are probably important foraging locations for desert tortoise; in smaller washes, there is greater cover and diversity of spring annuals, providing important food sources. Researchers have noted the high diversity of herpetofauna in desert washes and many snakes and lizards preferentially use xeroriparian habitat because of its denser cover (*ibid.*). Kirkpatrick et al. (2007) noted that even dry, ephemeral washes have greater avian abundance and species richness than adjacent uplands. In a study of 66 plots on BLM lands in California, dry washes supported 1.5 times more breeding species and twice as many wintering species as the more common desert scrub (Kubick & Remsen 1977; Tomoff 1977; Daniels & Boyd 1979, and others).

The vegetation—whether dominated by woodland trees or shrubs and perennial herbs—contributes channel roughness that reduces the velocity of floodwaters, and provides organic matter for soil development and nutrient cycling. Functional services of these communities include moderating soil and air temperatures, stabilizing channel banks and interfluves, seed banking and trapping of silt and fine sediment favorable to the establishment of diverse floral and faunal species, and dissipating stream energy which aids in flood control (USEPA 2008).

During seasonal dry periods, plant species diversity levels along ephemeral stream channels are typically low. Following seasonal wet periods, however, diversity levels along some ephemeral stream channels can equal that along perennial stream channels (Lichvar and McColley 2008) with ephemeral desert annuals.

Because ephemeral and intermittent stream channels have a higher moisture content and more abundant vegetation than the surrounding areas, they are very important to wildlife. Frequently, these streams may retain the only available water in the area, with permanent pools interposed wherever hydrogeological conditions allow (USEPA 2008). The short duration and episodic flood pulses of surface and overbank flow is important as it allows some species to complete important life-history developmental stages. The habitat provided by desert streams contracts and expands dramatically in size due to the extreme variations in flow, which can range from high-discharge floods to periods when surface flow is absent. This spatial variation in habitat or ecosystem size is a fundamental, defining feature of these streams (Smith et al. 1995; USEPA 2008).

Within the survey area there was ample evidence of the presence of wildlife use of the ephemeral washes (e.g., tracks and scat) as a movement corridor (Solar Millennium 2010a). In addition to Sonoran creosote bush scrub, the desert dry wash woodland and unvegetated ephemeral dry wash communities within the survey area are considered suitable burrowing owl foraging and nesting habitat. Desert tortoises are often present in higher densities associated with drainages, swales, mountainous areas, and alluvial fans. Annual and perennial plant production is higher in these areas and is longer lasting. Ephemeral streams also contain rich assemblages of both invertebrates and macro-invertebrates (USEPA 2008).

Desert Dry Wash Woodland

Desert dry wash woodland is a sensitive natural community recognized by the CNDDB, BLM, and is also designated as state waters by CDFW (CDFG 2003, BLM CDD 2002). This community is described by Holland as an open to densely covered, drought-deciduous, microphyll (small-leaved) riparian scrub woodland. These habitats are often supported by braided wash channels that change patterns and flow directions following every surface flow event (Holland 1986).This natural community occupies the major washes that traverse the Project Disturbance Area and is dominated by an open tree layer of ironwood (*Olneya tesota*), blue palo verde (*Parkinsonia florida*), honey mesquite (*Prosopis glandulosa*), and smoke tree (*Psorothamnus spinosus*) with an understory of big galleta grass (*Pleuraphis rigida*), desert starvine (*Brandegea bigelovii*) and intermixed with creosote scrub (*Larrea tridentata*) and Russian thistle (*Salsola tragus*) (Solar Millennium 2009a, AECOM 2010a). Desert dry wash woodland is most developed in the primary wash near I-10 where channel development is most pronounced and water supply more abundant. As the washes become shallower and eventually abate into the landscape further northward from I-10 within the Project Disturbance Area, desert dry wash woodland is eventually replaced by washes of mixed creosote and big bush galleta grass, and other upland and wash-dependent species. Outside of the major washes, desert dry wash woodland appears to be declining overall within the Project Disturbance Area as hydrological diversions upstream (collector ditches and the construction and placement of I-10) in the early 1960s interrupted natural flow paths that have reduced water flows either through obstruction and/or redistribution from the Corn Springs Wash (AECOM 2010a). This community type is also present along portions of the proposed natural gas pipeline and in discrete areas of the generation tie-in north of the Red Bluff sub-station.

Desert dry wash woodland habitat was surveyed for wildlife use during December 2009 and various signs of coyote (*Canis latrans*), fox (either kit fox or gray fox), burro deer (*Odocoileus hemionus eremicus*), and bobcat (*Lynx rufus*) were observed. This habitat provides value to various species of wildlife in the form as food, cover, dispersal, and refuge habitat (AECOM 2010a). This habitat type also provides habitat for species such as desert tortoise, American badger, and loggerhead shrike among many other common and special-status species.

Other Ephemeral Desert Washes

In the Project area, there are numerous smaller streams, which lack a continuous cover of desert dry wash woodland and consist largely of small compound channels. These are also recognized as regulated state waters. These smaller streams are subject to frequent channel avulsion and highly variable flow pathways contained within broad floodplains. Vegetative cover consists largely of mixed upland and wash-dependent shrubs and herbs and very widely scattered, small-statured, individual ironwood trees. These ephemeral streams provide movement corridors for small and large mammals and provide a seasonal water source not available in the surrounding dry uplands. Even the smaller washes have been shown to support a higher density of spring and summer annuals than the surrounding uplands and thus provide important habitat value. Wildlife use of the site as a movement corridor is described in detail in the former project owner’s Data Responses (Solar Millennium 2010a). Special-status species likely to benefit from the other ephemeral desert washes include desert tortoise.

Desert Sink Scrub

Desert sink scrub is considered sensitive by the CNDDB (CDFG 2003) and BLM (BLM CDD 2002). Desert sink scrub occurs below 4,000 feet in elevation and often exhibits poorly drained soils, a high water table with salt crust at the surface, and widely spaced shrubs (Holland 1986). This community occupies the salt clay pan and sandy areas around Palen Dry Lake in the northeastern portion of the Study area. Dominant and indicator plants of this community include four-wing saltbush (*Atriplex canescens*), allscale saltbush (*Atriplex polycarpa*), bush seepweed (*Suaeda moquinii*), Arizona honeysweet (*Tidestromia oblongifolia*), western sea purslane (*Sesuvium ventricosum*), and Russian thistle. Desert sink scrub was not mapped within the Project Disturbance Area (AECOM 2010a).

Stabilized and Partially Stabilized Desert Dunes

Stabilized and partially stabilized desert dunes are considered sensitive by the CNDDB (CDFG 2010) and the BLM (BLM CDD 2002). These dune systems are described as accumulations in the desert which are stabilized or partially stabilized by evergreen and/or deciduous shrubs and scattered, low grasses. These dunes typically occur lower than active dune systems and retain water just below the sand surface which allows deep-rooted, perennial vegetation to survive during longer drought periods (Holland 1986).

Desert sand dunes are unique insular habitats that support sand obligate plants, mammals, reptiles and insects, including some that are restricted to sand dunes. Desert sand dunes are very limited in their distribution in California, comprising less than 7 percent of California's desert, and are threatened by disturbance such as intensive recreational use and other development (Luckenbach and Bury 1983). The disjunct distribution and limited nature of sand dunes in California's deserts mean that they often function as habitat islands, with the resident biota showing distinctive adaptations to their sand dune environments. Sand dunes in the American west support a number of endemic species which are unique, sensitive to disturbance, and at high risk of extinction (Van Dam and Van Dam 2008).

In the Project area stabilized and partially stabilized desert dunes occupy the margins of Palen Dry Lake and extends into the PSEGS Project Disturbance Area. Dominant plants within the Study area of this community include mesquite, dye bush (*Psorothamnus emoryi*), and desert milk-vetch (*Astragalus aridus*). The dunes within the Study area are an important habitat type for the Mojave fringe-toed lizard, Harwood's milk-vetch, Harwood's phlox (a BLM Sensitive plant species), western burrowing owl, American badger, desert kit fox, as well as a variety of common plant and wildlife species (AECOM 2010a). A potentially new taxon of four-wing saltbush (*Atriplex canescens ssp.)* has been documented on the dunes just outside the Project Disturbance Area (Andre pers. comm., LaDoux pers. comm.) and other special-status plants and plant communities have been documented on the southern portion of Palen Dry Lake, including jack-ass clover (*Wislizenia refracta* ssp.) and mesquite bosque (Silverman pers. comm). The vegetation mapping provided in the Response to Staff Data Requests Set 1 (Palen 2013f) depicts the stabilized and partially stabilized desert dunes as a few discrete patches within the northern and eastern portion of the PSEGS Project Disturbance Area, totaling 187 acres.

Active Desert Dunes

Active desert dunes are considered sensitive by the CNDDB (CDFG 2010) and the BLM (BLM CDD 2002). This community is characterized by mostly unvegetated drifted sand dunes and sand fields of five feet or less in height. Dominant and indicator plants within the Study area for this community include desert twinbugs (*Dicoria canescens*), creosote bush, birdcage evening primrose (*Oenothera deltoides*), and Russian thistle. The active desert dunes are in the northeastern portion of the Study area and northeast of Palen Dry Lake. Despite the presence of Russian thistle, the active desert dunes within the Study area provide habitat values to many species of plants and wildlife since there was little sign of human activity on the low-lying dunes (AECOM 2010a).

Active desert dunes only occur in the buffer area, northeast of the PSEGS project boundaries within the most active part of the wind transport corridor; no active desert dune acreage occur within the Project Disturbance Area.

Groundwater-Dependent Vegetation Communities

Information presented herein was generated during the original proceedings for the PSPP project; no further surveys or data collection was determined to be necessary as part of analysis of the modified project. Groundwater-dependent ecosystems (GDEs) are an important component of biological diversity in the California desert region. Because they are rare or limited in distribution, they often support rare or special-status plants and animals. All GDEs depend upon groundwater for all or part of their survival. Characteristic GDEs of the California desert region include playas or dry lakes, seeps and springs, mesquite woodlands (mesquite “bosques”), microphyll woodland or desert dry wash woodland, palm oases, alkali sink scrubs, alkali meadows, alkali desert scrub, and spring mounds. Groundwater may also be a vital component of the base flows of rivers and streams, and wetlands (Howard & Merrifield 2010).

In the desert region, phreatophytes, or deep-rooted plant species that obtain water from a permanent ground supply or from the water table, are largely restricted to areas of high groundwater availability, such as larger desert washes, the fringe zone around ephemeral or dry lakes (Sawyer et al. 2009), dune areas, and alluvial riverine systems (Smith et al 1998). They are also found around seeps and springs, such as fan palm oases (*Washingtonia*). Several leguminous trees form extensive riparian woodlands, such as mesquite (*Prosopis*), ironwood (*Olneya*), and palo verde (*Cercidium*), and there are a number of halophytic shrubs that are indicative of shallow saline groundwater, including seep-weed (*Suaeda*), greasewood (*Sarcobatus*), iodine bush (*Allenrolfea*), and some saltbush species (*Atriplex canescens, A. spinifera*) (ibid). Other desert shrubs such as sagebrush (*Artemisia*) and rabbitbrush (*Chrysothamnus*) facultatively exploit groundwater (ibid). Cheesebush (*Hymenochlea*), a common desert wash shrub, is also included on some lists of desert phreatophytes.

The distinction between phreatophytes depending on groundwater or exploiting surface water or soil moisture is complicated in areas where groundwater levels are not shallow. However, groundwater elevation contour mapping by Steinemann (1989) suggests that groundwater levels around Palen Lake are within the known rooting depths for most of the phreatophytes documented within the zone potentially affected by the Project wells, including:

- mesquite woodlands (Solar Millennium 2009a, Appendix F; Sawyer 2009; Evens & Hartman 2007; Silverman pers. comm);
- alkali sink scrubs (Solar Millennium 2009a), dune communities along the margins of the playa (Solar Millennium 2009a, Silverman pers. comm.);
- and ironwood-palo verde woodlands (Evens & Hartman 2007, BLM CDD 2002).

Documented examples around Palen Dry Lake were also confirmed during staff site visits or through aerial photo interpretation. Groundwater levels drop to over 100 feet at Ford Dry Lake and are even deeper in other portions of the valley (Worley-Parsons 2009a). Desert phreatophytes are legendary for their deep-rooting (Barbour et al. 2007). Mesquite, for example, typically root to depths of 40 feet but have been documented to root as deep as 150 feet (Steinberg 2001) to over 250 feet in one example at a mine shaft (Sosebee and Wan 1989).

The potentially groundwater-dependent plant communities found or documented to occur within the area that would be affected by groundwater pumping (Solar Millennium 2010l) are described below, including their importance to wildlife and special-status species known to occur in these areas. All of these natural communities are recognized as rare or sensitive by either CDFW (CDFW 2003) or BLM (or both).

Mesquite Bosque and Microphyll Woodlands

Shrubby “bosques” (groves) of honey mesquite occur around the open, unvegetated playa along the northwest and southwest margins of Palen Dry Lake (Evans and Hartman 2007) on small coppice dunes (vegetated sand mounds) (Solar Millennium 2009a, Appendix F).

Mesquite bosques are a rare and sensitive community recognized by BLM and the CNDDB (CDFG 2003). They occur in areas with access to permanent and stable groundwater. When available, mesquite will exploit sources of deep water by growing a taproot. Mesquite can also persist on sites that have little or no ground water by growing lengthy shallow lateral roots. In some parts of their range they are considered “facultative phreatophytes” that function as phreatophytes if unlimited water is available, but are capable of surviving on sites with limited soil water. In California, however, they are very rare outside of washes or areas with available groundwater (Steinberg 2001). They also occur as a decumbent or running bush found on coppice dunes. These adaptations allow honey mesquite to retain most leaves in all but the most severe droughts (Ansley et al. 2004).

The fruit of honey mesquite is valuable forage for wildlife; it is quite predictable, even in drought years, annually providing an abundant and nutritious food source for numerous wildlife species upon ripening in summer (Steinberg 2001). The fruit's pericarp is high in sugars and the seeds contain large amounts of protein. Where they occur, honey mesquite seeds form an important part of the diet of mice, kangaroo rats, ground squirrels, quail, black-tailed jackrabbit, mule deer, and many other wildlife. Mesquite flowers are eaten by numerous bird species. Quail and many other birds eat mesquite buds and flowers in the spring and seeds during the fall and winter. Western honey mesquite communities often attract large numbers of birds that feed on the mistletoe fruit.

Other known phreatophytic woodlands in the project area include the native trees associated with desert wash dry woodland in the Sonoran Desert region: ironwood, palo verde, smoke tree, and cat’s claw (*Acacia greggii =syn. Senegalia greggii*); the invasive exotic salt cedar (also known as “tamarisk”). These microphyllous trees occur largely along desert washes but they can also be observed singly or in small stands outside of the stream channels on the valley floor or across the upper bajadas on very small channels. The best examples are found on the largest desert washes. The importance of these desert riparian ecosystems to wildlife is described above under “Desert Dry Wash Woodland”.

Bush Seepweed and Other Alkali Sink Scrubs

Other known phreatophytes observed in the Project vicinity (Evens & Hartman 2007) include succulent chenopod scrubs dominated by bush seepweed, which forms pure stands or co-occur with four-wing saltbush (*Atriplex canescens*) over large areas around the margins of Palen Dry Lake. Bush seepweed is a characteristic component of alkali sinks, a low-growing, grayish, succulent phreatophyte (Barbour et al. 2007) occupying fine-textured, often poorly drained, saline-alkaline soils on or around the playa margins. It is a ‘facultative’ wetland plant meaning that it can occur in wetlands or non-wetlands, and it is recognized as a phreatophyte, rooting at depths of several meters to access groundwater (Patten et al. 2007).

In the Project area, bush seepweed-dominant chenopod scrubs occur in the northern portion of the Project area and around Palen Dry Lake, predominantly in sand drifts over playa. This has also been confirmed in detailed surveys, mapping, and classification conducted by CNPS for the BLM NECO plan (Evens & Hartman 2007). Other sink scrubs documented in the Project vicinity around Palen Dry Lake include facultative wetland scrubs of iodine bush (*Allenrolfea californica*) and communities dominated by the special-status plant jackass clover (*Wislizenii refracta* ssp. *refracta*) (Evens & Hartman 2007). These communities often occur on the margins of dry lake beds in the Colorado, Sonoran, Mojave, and Great Basin deserts typically below 4,000 feet in elevation (Holland 1986). Chenopod scrub provides habitat value to many species of common and special-status plants, mammals, and reptiles as dispersal, foraging, and cover habitats especially in association with other upland and desert wash communities. Special-status species documented in the scrubs at the northeast portion of the Project area include Mojave fringe-toed lizard. Other observed wildlife or known associates include zebra-tailed lizard and kangaroo rat. Alkaline sink scrubs in the vicinity are also associated with the rare Abram’s spurge, which is documented from less than five viable occurrences statewide, including an occurrence at Ford Dry Lake in similar habitats.

Sand Dune Transport System

This subsection provides a brief explanation of wind transport of sand relative to the creation, preservation, and destruction of sand dunes in the Project area. **Biological Resources Appendix A**, provides a more detailed explanation, as does the Geomorphic Evaluation for Reconfigured Alternatives 2 and 3 (Kenney 2010) , the Preliminary Sand Transport Summary included in Response to CEC Data Request Set 2 (Palen 2013r) and staff’s Geomorphic Assessment of Sand Dune Morphology (including patterns of sand transport and deposition) for the Modified Project using the Numerical Model of Sand Transport Developed by PWA for the Approved Project Progress Report (CEC 2013l).

The PSEGS (proposed modified project) footprint covers several different land units that vary along a southwest to northeast gradient in the degree of aeolian sand transport they experience. The least sandy land unit is within the PSEGS’s western solar array which is almost entirely a stable, coarse gravel alluvial fan surface (referred to as Zone

IV in Solar Millennium 2010b). Refer to **Biological Resources Figure 5.** The sand dunes in the southern and western sector of the PSEGS site are a mixture of degraded vegetated dunes with thin coarse sand, and patches of alluvial gravel lag and desert varnish. This surface has been formed primarily by deposition of sand and gravel from alluvial fans (fluvial action) over hundreds of thousands of years, overlain with patches of vegetated sand dunes that formed from wind action during periods of greater sand availability. The sand dunes on the mid fan have subsequently degraded due to wind erosion and deflation (sand is being removed by the wind but not replaced). Deflation of the relict dunes is leaving behind the more resistant alluvial deposits as a protective lag of gravel. In many places the lag has formed desert varnish (a black coloration on the exposed surface of gravel particles). The presence of desert varnish suggests that parts of this surface have been stable and exposed in its current condition for many hundreds to thousands of years. There is little available sand for either transport to dunes down wind, and the sand that is present is coarse (1–2 millimeter (mm)) with abundant fine gravel (2 mm and larger). The vegetation cover is largely sparse creosote bushes and degraded dunes, with ironwood trees in the larger washes.

Northeast is a more active wind-blown sand area with relatively shallow sand deposits (Zone III) on the lower alluvial fan. This is an area of shallow vegetated sand dunes with a transition from creosote bushes to grasses. The dunes are in relative equilibrium – losses of sand due to wind erosion are matched by deposition of sand from upwind. Refer to **Biological Resources Figure 5.**

At the northeastern portion of the PSEGS project site within the lower alluvial fan is an area of deeper and more active vegetated sand dunes (Zone II). Refer to **Biological Resources Figure 5.** This area is characterized by hummocky vegetated dunes with greater topographic expression than the zone to the west, implying that they are more actively supplied by sand. This zone lies within the Palen Dry Lake–Chuckwalla sand transport corridor, a regionally significant geomorphic feature that provides sand build and supports sand dune habitat. This sand corridor stretches down the Chuckwalla Valley to Blythe and the Colorado River.

The most active area of sand transport is Zone I, northeast of the PSEGS project boundary. Two sand transport corridors come together just to the east of the PSEGS project: the Palen Valley corridor which runs from north to south along the eastern edge of the project and the Palen Dry Lake–Chuckwalla Valley corridor which runs northwest to southeast through the northeastern half of the Project.

Special-Status Species

Special-status species are plant and wildlife species that have been afforded special recognition by federal, state, or local resource agencies or organizations. Listed and special-status species are of relatively limited distribution and typically require unique habitat conditions. Special-status species are defined as meeting one or more of the following criteria:

1. Listed as threatened or endangered or candidates for future listing as threatened or endangered under CESA or FESA;

2. Protected under other regulations (e.g. Migratory Bird Treaty Act);

3. Listed as fully protected or species of special concern by CDFW;

4. A plant species considered by the CNPS to be "rare, threatened, or endangered in California" (CNPS List 1A, 1B, and 2) as well as CNPS List 3 and 4[2] plant species;

5. A plant listed as rare under the California Native Plant Protection Act[3];

6. Considered a locally significant species, that is, a species that is not rare from a statewide perspective but is rare or uncommon in a local context such as within a county or region or is so designated in local or regional plans, policies, or ordinances; or

7. Any other species receiving consideration during environmental review under CEQA.

The BLM designates Sensitive species as those requiring special management considerations to promote their conservation and reduce the likelihood and need for future listing under FESA. BLM Sensitive species include all Federal Candidate and Federally Delisted species which were so designated within the last 5 years, and CNPS List 1B species that occur on BLM lands. For the purposes of this analysis, Energy Commission staff considers all BLM Sensitive species as special-status species.

Biological Resources Table 3 lists all special-status species evaluated during the analysis that are known to occur or could potentially occur in the Project area and vicinity. Special-status species detected or considered possible or likely to occur based on known occurrences in the vicinity and suitable habitat present within the Project area are discussed in more detail below. Special-status species observed during the field surveys conducted in 2009 and 2010 as well as staff site visits in 2013 are indicated by **bold-face type** (Solar Millennium 2009a, AECOM 2010a, Palen 2013m). Staff is awaiting the final results of biological resource surveys conducted in spring 2013 and any updates to the table will be included in the Final Staff Assessment (FSA).

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[2] List 3 plants may be analyzed under CEQA §15380 if sufficient information is available to assess potential impacts to such plants. Factors such as regional rarity vs. statewide rarity should be considered in determining whether cumulative impacts to a RPR 4 plant are significant even if individual project impacts are not. RPR 3 and 4 may be considered regionally significant if, e.g., the occurrence is located at the periphery of the species' range, or exhibits unusual morphology, or occurs in an unusual habitat/substrate. For these reasons, RPR List 3 and 4 plants should be included in the field surveys. RPR 3 and 4 plants are also included in the California Natural Diversity Database's (CNDDB) Special Plants, Bryophytes, and Lichens List. [Refer to the current online published list available at: http://www.dfg.ca.gov/biogeodata.] Data on RPR 3 and 4 plants should be submitted to CNDDB. Such data aids in determining or revising priority ranking (CDFG 2009).

[3] As defined by the California Native Plant Protection Act, a plant is rare when, although not presently threatened with extinction, the species, subspecies, or variety is found in such small numbers throughout its range that it may be endangered if its environment worsens (Fish and Game Code §1901) (CDFG 2009).

Biological Resources Table 3
Special-Status Species Known to or With Potential to Occur in the Palen Solar Electric Generating System Biological Resources Study Area

PLANTS		
Common Name	**Scientific Name**	**Status State/Fed/CNPS/BLM/ Global Rank/State Rank**
Chaparral sand verbena	*Abronia villosa var. aurita*	__/__/1B.1/Sensitive/G5T3T4/S2
Angel trumpets	*Acleisanthes longiflora*	__/__/2.3/__/G5/S1
Desert sand parsley	*Ammoselinum giganteum*	__/__/2.3/__/G2G3/SH
Small-flowered androstephium	*Androstephium breviflorum*	__/__/2.2/__/G5/S2S3
Harwood's milk-vetch	***Astragalus insularis var. harwoodii***	**__/__/2.2/__/G5T3/S2**
Coachella Valley milk-vetch	*Astragalus lentiginosus var. coachellae*	__/FE/1B.2./Sensitive/G5T2/S2
California ayenia	*Ayenia compacta*	SE/__/2.3/__/G4/S3?
Pink fairy duster	*Calliandra eriophylla*	__/__/2.3/__/G5/S2S3
Sand evening-primrose	*Camissonia arenaria*	__/__/2.2/__/G4?/S2
Crucifixion thorn	*Castela emoryi*	__/__/2.3/__/G3/S2S3
Abram's spurge	*Chamaesyce abramsiana*	__/__/2.2/__/G4/S2S3
Arizona spurge	*Chamaesyce arizonica*	SR/__/2.3/__/G5/S2
Flat-seeded spurge	***Chamaesyce platysperma***	**__/__/1B.2/ Sensitive/G3/S1**
Las Animas colubrina	*Colubrina californica*	__/__/2.3/__/G4/S2S3.3
Spiny abrojo/Bitter snakeweed	*Condalia globosa var. pubescens*	__/__/4.2/__/G5T3T4/S3.2
Foxtail cactus	*Coryphantha alversonii*	__/__/4.3/__/G3/S3.2
Ribbed cryptantha	***Cryptantha costata***	**__/__/4.3/__/G4G5/S3.3**
Winged cryptantha	*Cryptantha holoptera*	__/__/4.3/__/G3G4/S3?
Wiggins' cholla	*Cylindropuntia wigginsii (syn=Opuntia wigginsii)*	__/__/3.3/__/G3?Q/S1
Utah vining milkweed	*Cynanchum utahense*	__/__/4.2/__/G4/S3.2
Glandular ditaxis	*Ditaxis claryana*	__/__/2.2/__/G4G5/S1
California ditaxis	***Ditaxis serrata var. californica***	**__/__/3.2/__/G5T2T3/S2**
Cottontop cactus	***Echinocactus polycephalus var. polycephalus***	**__/__/__/__/__/__**
Harwood's eriastrum	***Eriastrum harwoodii***	**__/__/1B.2/ Sensitive/G2/S3**
Morning-glory heliotrope	*Heliotropium convolvulaceum*	**__/__/__/__/__/__**
California satintail	*Imperata brevifolia*	__/__/2.1__/G2/S2.1
Pink velvet mallow	*Horsfordia alata*	__/__/4.3/__/G4/S3.3
Bitter hymenoxys	*Hymenoxys odorata*	__/__/2.1/__/G5/S2
Spearleaf	*Matelea parvifolia*	__/__/2.3/__/G5?/S2.2
Darlington'sblazing star	*Mentzelia puberula*	__/__/2.2/__/G4/S2
Slender woolly-heads	*Nemacaulis denudata var. gracilis*	__/__/2.2/__/G3G4T3?/S2
Lobed cherry	*Physalis lobata*	__/__/2.3/__/G5/S2
Desert portulaca	*Portulaca halimoides*	__/__/4.2/__/G5/S3
Desert unicorn plant	*Proboscidea althaeifolia*	__/__/4.3/__/G5/S3.3
Orocopia sage	***Salvia greatae***	**__/__/1B.3./Sensitive/G2/S**

PLANTS		
Common Name	**Scientific Name**	**Status State/Fed/CNPS/BLM/ Global Rank/State Rank**
		2
Desert spikemoss	*Selaginella eremophila*	__/__/2.2./__/G4/S2.2?
Cove's cassia	*Senna covesii*	__/__/2.2/__/G5?/S2
Mesquite nest straw	*Stylocline sonorensis*	__/__/1A/__/G3G5/SX
Dwarf germander	*Teucrium cubense ssp. depressum*	__/__/2.2/__/G4G5T3T4/S2
Jackass clover	*Wislizenia refracta ssp. refracta*	__/__/2.2/__/G5T5?/S1
Palmer's jackass clover	*Wislizenia refracta ssp. palmeri*	__/__/2.2/ __/G5T2T4/S1
"Palen Lake atriplex"[4]	***Atriplex* sp. nov. J. Andre (*Atriplex canescens* ssp?)**	**__/_ / _/Sensitive/__/__**

WILDLIFE		
Common Name	**Scientific Name**	**Status State/Federal/BLM**
Reptiles/Amphibians		
Desert tortoise	***Gopherus agassizii***	**ST/FT/__**
Couch's spadefoot toad	*Scaphiopus couchii*	CSC/__/Sensitive
Mojave fringe-toed lizard	***Uma scoparia***	**CSC//Sensitive**
Birdsstaff has provided expanded avian and bat species lists**		
Eared grebe**±	*Podiceps nigricollis*	__/__/__
Black vulture	*Coragyps atratus*	__/__/__
Turkey vulture**	*Cathartes aura*	__/__/__
Northern harrier	*Circus cyaneus*	SSC/__/__
Swainson's hawk**	*Buteo swainsoni*	ST/__/__
Ferruginous hawk**	*Buteo regalis*	WL/BCC/S
Red-tailed hawk**	*Buteo jamaicensis*	_/__/__
Golden eagle	*Aquila chrysaetos*	FP/BCC/S
Bald eagle	*Haliaeetus leucocephalus*	SSC, FP/ BCC /S
American kestrel**	*Falco sparvius*	__/__/__
Prairie falcon**	*Falco mexicanus*	WL/BCC/__
American peregrine falcon	*Falco peregrinus anatum*	FP/BCC/__
Gambel's quail**	*Callipepla gambelii*	_/__/__
Yuma clapper rail	Rallus longirostris yumanensis	FP, T/E/__
Vaux's swift	*Chaetura vauxi*	SSC/__/__
Killdeer**	*Charadrius vociferus*	_/__/__
Mountain plover	*Charadrius montanus*	SSC/BCC/S
White-winged dove**	*Zenaida asiatica*	__/__/__
Mourning dove**	*Zenaida macroura*	__/__/__
Greater roadrunner**	*Geococcyx californianus*	__/__/__
Barn owl**	*Tyto alba*	__/__/__
Western burrowing owl	*Athene cunicularia hypugaea*	SSC/BCC/S
Short-eared owl	*Asio flammeus*	SSC/__/__

[4] Proposed new taxon (Andre, pers. comm.). BLM may consider proposed new taxa as BLM Sensitive (Lund, pers. comm.)

WILDLIFE		
Common Name	**Scientific Name**	**Status State/Federal/BLM**
Lesser nighthawk**	*Chordeiles acutipennis*	__/__/__
Great horned owl	*Bubo virginianus*	__/__/__
Long-eared owl	*Asio otus*	SSC/__/__
Short-eared owl	*Asio flammeus*	SSC/__/__
White-throated swift**	*Aeronautes saxatalis*	__/__/__
Costa's hummingbird**	*Calypte anna*	__/__/__
Say's phoebe**	*Sayornis saya*	__/__/__
Gilded flicker	*Colaptes chrysoides*	SE/BCC/__
Gila woodpecker	*Melanerpes uropygialis*	SE/BCC/S
Ash-throated flycatcher**	*Myiarchus cinerascens*	__/__/__
Vermilion flycatcher	*Pyrocephalus rubinus*	SSC/__/__
Western kingbird**	*Tyrannus verticalis*	__/__/__
Yellow warbler	*Dendroica petechia sonorana*	SSC/BCC/__
Yellow-breasted chat	*Icteria virens*	SSC/__/__
Loggerhead shrike**	*Lanius ludovicianus*	SSC/BCC/__
Common raven**	*Corvus corax*	__/__/__
California horned lark	*Eremophila alpestris actia*	WL/__/__
Northern rough-winged swallow**	*Stelgidopteryx serripenis*	__/__/__
Barn swallow**	*Hirundo rustica*	__/__/__
Cliff swallow**	*Petrochelidon pyrrhonota*	__/__/__
Purple martin	*Progne subis*	SSC/__/__
Verdin**	*Auriparus flaviceps*	__/__/__
Bewick's wren**	*Thryomanes bewickii*	__/__/__
Black-tailed gnatcatcher**	*Polioptila melanura*	__/__/__
Bendire's thrasher	*Toxostoma bendirei*	SSC/BCC/S
Crissal thrasher	*Toxostoma crissale*	SSC/__/__
Le Conte's thrasher	*Toxostoma lecontei*	WL/BCC/S
Orange-crowned warbler**	*Vermivora celata*	__/__/__
Nashville warbler**	*Vermivora ruficapilla*	__/__/__
Black-throated gray warbler**	*Dendroica nigrescens*	__/__/__
Yellow-rumped warbler**	*Dendroica coronata*	__/__/__
Chipping sparrow**	*Spizella passerina*	__/__/__
Brewer's sparrow**	*Spizella breweri*	__/BCC/__
Lark sparrow**	*Chondestes grammacus*	__/__/__
White-crowned sparrow**	*Zonotrichia leucophrys*	__/__/__
House finch**	*Carpodacus mexicanus*	__/__/__
Mammals		
Pallid bat	*Antrozous pallidus*	CSC/__ / Sensitive
Townsend's big-eared bat	*Corynorhinus townsendii*	CSC/__/ Sensitive
Small-footed myotis	*Myotis ciliolabrum*	__/__/SSSensitive
Western yellow bat	*Lasiurus xanthinus*	SSC/__/SSSensitive
Western mastiff bat	*Eumops perotis californicus*	CSC/__/ Sensitive

WILDLIFE		
Common Name	**Scientific Name**	**Status State/Federal/BLM**
California leaf-nosed bat	*Macrotus californicus*	CSC/__/ Sensitive
Yuma myotis	*Myotis yumanensis*	__/__/ Sensitive
Colorado Valley woodrat	*Neotoma albigula venusta*	__/__/__
Burro	*Equus asinus*	__/__ __/__/__
Burro deer	***Odocoileus hemionus eremicus***	__/__/__
Nelson's bighorn sheep	*Ovis canadensis nelson*	__/__/ Sensitive
Yuma mountain lion	*Puma concolor browni*	CSC/__/__
American badger	***Taxidea taxus***	**CSC**/__/__
Desert kit fox	***Vulpes macrotis arsipus***	__/__/__
Insects		
Riverside cuckoo wasp	Hedychridium argenteum	__/__/ Sensitive
Casey's June beetle	Dinacoma caseyi	__/**E**/__
California mellitid bee	Melitta californica	__/__/__
Bradley's cuckoo wasp	Ceratochrysis bradleyi	__/__/__
Desert cuckoo wasp	Ceratochrysis longimala	__/__/__
Senile tiger beetle	Cicindela senilis frosti	__/__/__
Greenest tiger beetle	Cicindela tranquebarica viridissima	__/__/__

Sources: CNDDB 2013
**These species were observed by staff at the Palen Project site during site visits performed April 9 and 10, 2013.
±These species were observed by staff immediately adjacent to the Palen site within ponds located in the agricultural areas.

Status Codes:

Federal FE = Federally listed endangered: species in danger of extinction throughout a significant portion of its range
FT = Federally listed, threatened: species likely to become endangered within the foreseeable future
BCC: Fish and Wildlife Service: Birds of Conservation Concern: identifies migratory and non-migratory bird species (beyond those already designated as federally threatened or endangered) that represent highest conservation priorities <www.fws.gov/migratorybirds/reports/BCC2002.pdf>

State CSC = California Species of Special Concern: species of concern to CDFW because of declining population levels, limited ranges, and/or continuing threats have made them vulnerable to extinction.
CFP = California Fully Protected
SE = State listed as endangered
ST = State listed as threatened
SR = State listed as rare
WL = State watch list

California Native Plant Society
List 1B = Rare, threatened, or endangered in California and elsewhere
List 2 = Rare, threatened, or endangered in California but more common elsewhere
List 3 = Plants which need more information
List 4 = Limited distribution – a watch list
0.1 = Seriously threatened in California (high degree/immediacy of threat)
0.2 = Fairly threatened in California (moderate degree/immediacy of threat)
0.3 = Not very threatened in California (low degree/immediacy of threats or no current threats known)

Bureau of Land Management
BLM Sensitive = Species requiring special management consideration to promote their conservation and reduce the likelihood and need for future listing under the ESA. BLM Sensitive species also include all Federal Candidate species and Federal Delisted species which were so designated within the last 5 years and CNPS List 1B plant species that occur on BLM lands. http://www.blm.gov/style/medialib/blm/wo/Information_Resources_Management/policy/blm_manual.Par.43545.File.dat/6840.pdf.

Global Rank/State Rank

Global rank (G-rank) and State rank (S-rank) is a reflection of the overall condition of an element throughout its global (or State) range. Subspecies are denoted by a T-Rank; multiple rankings indicate a range of values. State rank (S-rank) is assigned much the same way as the global rank, except state ranks in California often also contain a threat designation attached to the S-rank. An H-rank indicates that all sites are historical
G1 or S1 = Critically imperiled; Less than 6 viable element occurrences (EOs) OR less than 1,000 individuals
G2 or S2 = Imperiled; 6-20 EOs OR 1,000-3,000 individuals
G3 or S3 = Rare, uncommon or threatened, but not immediately imperiled; 21-100 EOs OR 3,000-10,000 individuals
G4 or S4 = Not rare and apparently secure, but with cause for long-term concern; this rank is clearly lower than G3 but factors exist to cause some concern; i.e., there is some threat, or somewhat narrow habitat.
G5 or S5= Demonstrably widespread, abundant, and secure.

Threat Rank
.1 = very threatened
.2 = threatened
.3 = no current threats known

Special-Status Plant Species

As shown in **Biological Resources Table 3,** several special-status plant species have the potential to occur within the Study area. Four of these were observed within the Study Area: Harwood's milk-vetch, Harwood's eriastrum, California ditaxis, and ribbed cryptantha. Utah vining milkweed was observed outside the Study area to the east and was documented in the Solar Millennium's (former project owner) July 2010 spring survey report (Solar Millennium 2010m). A potential new taxon of saltbush was reported and documented in the dunes just north of the Project boundary (Andre, pers. comm.), and was mapped in the former project owner's preliminary spring 2010 survey report (AECOM 2010d). It has no official status or recognition at this time; however, the BLM State Botanist has indicated that potential new taxa may be treated as BLM Sensitive species (Lund, pers. comm.), and thus it is included here as a special-status species. Of the six species observed during the surveys, only the Harwood's milk-vetch, California ditaxis, and ribbed cryptantha occur within the Project Disturbance Area. Refer to **Biological Resources Figure 6**.

Several additional species were included in Staff's analysis for the PSPP because they are documented or reported to occur within Chuckwalla Valley in similar habitats, or along washes in the surrounding foothills; however, they were not observed in the Study area during the spring 2009 or 2010 surveys (AECOM 2010d, Solar Millennium 2009a, Solar Millennium 2010k, Solar Millennium 2010l): Jack-ass clover, Palmer's jackass clover, mesquite nest straw, dwarf germander, Abram's spurge, glandular ditaxis, desert unicorn plant, winged cryptantha, and Las Animas colubrina. Another rare species, morning-glory heliotrope, has been observed in the Chuckwalla Valley and Palo Verde mesa, but this new range extension from the Arizona flora has no status yet in California (Silverman, pers. comm.).

Staff considers that, at a minimum, the following late-blooming special-status plants have some potential to occur based on suitable habitat and known occurrences within the Sonoran Desert region of California: Abram's spurge, flat-seeded spurge, lobed ground cherry, and glandular ditaxis. Surveys for late-season special-status plants were completed in fall 2010. Fall 2010 botanical surveys were conducted in the PSPP project area, which included all areas within one mile of the approved project site, on October 11, 2010 through October 15, 2010. Summer/fall annual plant species were detected in bloom and/or fruit within and in the vicinity of the Project, confirming that late season surveys were being conducted at the appropriate time, but no special-status plant species were detected in the PSPP Project area during the October 2010 surveys. Surveys have not been completed for late-season special-status plants along the along the modified generation tie-line route and new gas pipeline corridor. The botanical survey report for the fall 2013 surveys is expected in November 2013.

The special-status plants found in the Study area during the 2009 and 2010 spring surveys for the PSPP are described below, followed by a discussion of the late-season special-status plants that may be detected during the fall 2013 surveys for PSEGS, or that are considered to have some potential for occurrence in the Study area for PSEGS based on the presence of suitable habitat and known occurrences in the region. Staff has requested additional information for all new areas of the PSEGS including the natural gas line corridor and the unsurveyed segment of the generation tie-line corridor. The project owner has submitted preliminary information regarding rare plant surveys conducted in March 2013 for the PSEGS and no additional special-status plants were found. However, the project owner has not yet submitted the final rare plant survey report requested as part of Data Request Set 1 that includes a complete floristic inventory for the spring 2013 surveys. Staff will work with the project owner to resolve this outstanding information need prior to publication of the Final Staff Assessment (FSA).

Harwood's Milk-vetch

Harwood's milk-vetch is a California Rare Plant Rank (RPR) 2.2 species, meaning that is it fairly threatened in California, but more common elsewhere. It is also a covered species under the NECO Plan. It is an annual herb that mainly occurs in Sonoran desert scrub habitat throughout the Colorado Desert (BLM CDD 2002). This subspecies is found in desert dunes and sandy or gravelly areas throughout the Mojave and Sonoran deserts covering portions of Imperial, Riverside, and San Diego counties (CNPS 2009). Historic and recent collections include Ogilby Road in Imperial County and three locales west of Blythe, the Pinto Basin, and Chuckwalla Basin in Riverside County. Harwood's milk-vetch has also been reported from Baja California, Sonora Mexico, and portions of Yuma County, Arizona (Reiser 1994). There are several CNDDB records for this species within the Project vicinity (CNDDB 2010).

Staff reviewed the occurrence data in the Consortium of California Herbaria and detected 3 new occurrences that were not in the CNDDB. All of these are historical occurrences. Of the total 46 occurrences in California (CNDDB plus new additional occurrences), 9 of these are protected under Park Service or State Park ownership. A total of 11 records are historical records. Sixteen of these occurrences have documented threats including development, OHV, agriculture, transmission lines, road maintenance, and trash dumping.

A total of 146 Harwood's milk-vetch plants were documented in the Study area during the 2009 and 2010 surveys for the PSPP (Solar Millennium 2010k). Only three of these occur within the Project Disturbance Area for the PSEGS. Many new occurrences were documented in Chuckwalla Valley and the Palo Verde mesa during the 2010 surveys for the Blythe Solar Power Project (Solar Millennium 2010k) and the Genesis Solar Energy Project (Solar Millennium 2010k) study areas. This species was not observed during March 2013 surveys for the PSEGS along the proposed generation tie-line or the natural gasline route. Staff is awaiting the submittal of the final rare plant survey report requested as part of Data Request Set 1 that includes a complete floristic inventory for the spring 2013 surveys.

Ribbed Cryptantha

Ribbed cryptantha is a RPR 4.3 species, meaning that it has limited distribution in California, but it is not very threatened in California. It typically occurs in loose friable soils in the eastern Mojave and Sonoran deserts in Imperial, Riverside, San Diego, and San Bernardino counties and into Arizona and south to Baja California, Mexico (CNPS

2009). It commonly occurs in stabilized and partially stabilized desert dunes and sandy areas of Sonoran and Mojavean desert creosote bush scrub. There are 116 records of this species from several locations throughout Riverside, Imperial, San Diego, and Imperial counties in the Consortium of California Herbaria database; the nearest collection is from the Palen Valley approximately three miles east of the Desert Center Airport (CCH 2010).

CDFW protocols for botanical surveys specify: *"Factors such as regional rarity vs. statewide rarity should be considered in determining whether cumulative impacts to a List 4 plant are significant even if individual project impacts are not. CNPS List 3 and 4 may be considered regionally significant if, e.g., the occurrence is located at the periphery of the species' range, or exhibits unusual morphology, or occurs in an unusual habitat/substrate. For these reasons, CNPS List 3 and 4 plants should be included in the field surveys."* (CDFG 2009). The protocols also recommend that cumulative impacts should be considered in the assessment of impacts to RPR 4 plants.

A large local population of this RPR watch list (RPR 4) species was found during the 2010 surveys for the PSPP for this and other projects in the vicinity (Solar Millennium 2010k, TTEC 2010m, AECOM 2010v). None of the surveyors have reported that the occurrences exhibit a local or regional significance. Plant estimates of this species were made using sub-sampling methods and an estimate of 8,903 plants per acre was used. Approximately 285 acres and 1,309 acres of occupied ribbed cryptantha acreage were estimated within the PSPP Project Disturbance Area and buffer area, respectively (Solar Millennium 2010m, Table 3). It is unclear to staff how many acres of occupied ribbed cryptanthaare within the PSEGS Project Disturbance Area as the project owner utilized estimates of plant counts based on subsampling date from within the ribbed crypthantha population. Staff will request in Data Request Set 4 that the project owner provide an impacts analysis similar to the impact analysis provided for the PSPP for this species and all other special-status plant species that includes an estimate of the acres of impact or number of individuals in the PSEGS Project Disturbance Area prior publication of the Final Staff Assessment. This species was not observed during March 2013 surveys for the PSEGS along the proposed generation tie-line or the natural gasline route. Staff is awaiting the submittal of the final rare plant survey report requested as part of Data Request Set 1 that includes a complete floristic inventory for the spring 2013 surveys.

Harwood's Eriastrum

Harwood's eriastrum, also known as Harwood's phlox, or Harwood's woollystar, is a BLM Sensitive spring annual currently known from only 14 documented locations worldwide. It is RPR 1B.2 species, which indicates it is rare, threatened, or endangered throughout its range. It is a California endemic with a global range restricted to San Diego, Riverside, and San Bernardino counties, typically in dunes associated with the margins around dry lakes such as Dale, Cadiz, and Soda lakes. Recently, surveys conducted in spring of 2010 for the Blythe Solar Power Project located this plant primarily in the sandy areas south of I-10, where 2,134 plants were located and mapped (AECOM 2010v). All of these plants were identified in the general vicinity of the Southern California Edison Colorado River Substation. Staff considers all stabilized and partially stabilized dunes to be suitable habitats for this species in the study area.

Staff reviewed the occurrence data in the Consortium of California Herbaria and detected 2 new occurrences that were not in the CNDDB. Both of these are historical records from 1939 and 1958. Of the total of 14 occurrences in California (12 CNDDB plus two additional historic records), three of these are protected under Park Service or State Park ownership. A total of three records are historical records. Four of these occurrences have documented threats, including OHV and non-native plant impacts.

This species was not observed during 2009 field surveys for the PSPP; however, a total of two Harwood's eriastrum plants were observed in the partially stabilized dunes in the northeast corner of the Study area during spring 2010 field surveys for the PSPP (Solar Millennium 2010m, Table 3). No Harwood's eriastrum were found within the Project Disturbance Area. This species does not occur in the PSEGS Project Disturbance Area. This species was not observed during March 2013 surveys for the PSEGS along the proposed generation tie-line or the natural gasline route. Staff is awaiting the submittal of the final rare plant survey report requested as part of Data Request Set 1 that includes a complete floristic inventory for the spring 2013 surveys.

Utah Vining Milkweed

This twining perennial occurs in sandy or gravelly soils in Mojavean and Sonoran desert scrub habitats or washes from approximately 500 feet to 4,300 feet in elevation (CNPS 2009). The distribution of this species covers San Diego, Imperial, Riverside, and San Bernardino counties and portions of Arizona, Nevada, and Utah.

Until recently discovered growing on the Palo Verde Mesa (AECOM 2010v), it was believed that the Project was outside of the range of Utah vining milkweed. As a RPR List 4, it is not tracked in CNDDB but there are 58 records of this species from the Consortium of California Herbaria database primarily from San Bernardino and San Diego counties; there is one record from the Big Maria Mountains from wash and stabilized dune habitat at approximately 1,200 feet elevation (CCH 2010). This species was not found during 2009 field surveys; however, this plant was observed incidentally at a single location outside of the study area, east of Palen Lake. No Utah vining milkweed plants were observed within the Project Disturbance Area or buffer area during 2009 or 2010 field surveys for the PSPP (Solar Millennium 2010m, Figure 7). This species was not observed during March 2013 surveys for the PSEGS along the proposed generation tie-line or the natural gasline route. Staff is awaiting the submittal of the final rare plant survey report requested as part of Data Request Set 1 that includes a complete floristic inventory for the spring 2013 surveys.

California Ditaxis

California ditaxis is a RPR 3.2 species (a review list), meaning that its taxonomic status is questionable and more information is needed. It may be a glabrous variety of the common *Ditaxis neomexicana* but appears to be a rare variety of the common species. Its occurrences in California are fairly endangered (CNPS 2009). This species occupies Sonoran desert scrub habitat, and prefers sandy washes and alluvial fans of the foothills and lower desert slopes, from 100 to 3,000 feet above mean sea level. Reports of this species are known from San Bernardino, Riverside, Imperial, San Diego, and Sonora, Mexico (CNPS 2009). There are 17 records from the CNDDB (2010) primarily from Riverside.

Staff reviewed the occurrence data in the Consortium of California Herbaria and detected four new occurrences that were not in the CNDDB. Three of these are historical records from between 1921 and 1952; however, one more recent occurrence was found at Anza-Borrego Desert State Park near Starfish Cove Canyon. Of the total 21 occurrences in California (CNDDB plus new additional occurrences), two of these are protected under Park Service ownership. A total of four records are historical records. Five of these occurrences have documented threats, including, OHV, road grading, and construction of a new power line.

A total of 22 plants were documented in the Study area during the 2010 surveys for the PSPP; half of these (11) occur within the PSPP Project Disturbance Area along the gen-tie line (Solar Millennium 2010m, Table 3). These 11 plants are also in the PSEGS Project Disturbance Area. This species was not observed during March 2013 surveys for the PSEGS along the proposed generation tie-line or the natural gasline route. Staff is awaiting the submittal of the final rare plant survey report requested as part of Data Request Set 1 that includes a complete floristic inventory for the spring 2013 surveys.

Atriplex sp. nov

A potentially new taxon of saltbush (*Atriplex*) was discovered on the saline playa margins of Palen Dry Lake last year by a botanist with the U.C. Reserve System (Andre and La Doux, pers. comm.). It resembles the common four-wing saltbush (*Atriplex canescens*), a common plant of dunes which has very linear leaves, but the new taxon has obovate leaves that distinguish it from all *Atriplex canescens* and its subspecies (Andre, pers. comm.). The Solar Millenium's botanical consultant tentatively treated it as a variety of the common four-wing saltbush. Although plasticity in fruit and vegetative characters hinders description and identification, many of the subspecies of four-wing saltbush have been demonstrated to differ in ploidy level and chemical constituents and thus their biological validities are confirmed, including *Atriplex canescsens* ssp. *linearis* (Sanderson & Stutz 1994).

The undescribed *Atriplex* was first collected in 2005 at the "dry lake" just northeast of the Interstate 15 and Highway 95 junction approx 35 miles east and northeast of Las Vegas, Nevada. The first voucher/observation of it in California was at Palen Lake 2009. There is also potential for it to occur along the I-8 corridor in Imperial County. Although it is distinct from the common *Atriplex canescens* in its obovate leaves, it would be easy to overlook the new taxon where they co-occur, even by experienced botanists. The new taxon is more confined to subsaline or saline playa margins, though not necessarily so. Andre (pers. comm.) indicated that it may also have been observed in the Ford Dry Lake area (unconfirmed) and it has been observed in other saline (but non-playa) habitats on remnants of the lower Colorado River flood plain.

Several plants of four wing saltbush were found within in the buffer area, northeast of the PSPP Project site during spring 2010 field surveys for the PSPP (Solar Millennium 2010m, Figure 7). This species has been observed in other saline (but non-playa) habitats on remnants of the lower Colorado River flood plain (Andre, Silverman, pers. comm.). It is not known if this species was observed during March 2013 surveys for the PSEGS along the proposed generation tie-line or the natural gasline corridor. Staff is awaiting the submittal of the final rare plant survey report requested as part of Data Request Set 1 that includes a complete floristic inventory for the spring 2013 surveys.

Desert Unicorn Plant

Desert unicorn plant is a RPR 4.3 plant species, meaning it has limited distribution, but is not very threatened in California. This is a covered species under the NECO Plan. This is a low-growing, perennial species that occurs in sandy washes within Sonoran desert scrub habitats in San Bernardino, Imperial, Riverside, and San Diego counties of California. There are 13 records known from the NECO planning area in Milipitas Wash, Chuckwalla Valley, and Chemehuevi Valley (BLM CDD 2002). The blooming period for this species is from May to August (CNPS 2009). It is a late-season bloomer but it has large and distinctive seed pods that can be detected during routine spring surveys. It has a fleshy root system that can remain dormant in dry years. As a RPR 4, it is not tracked in CNDDB but there are 36 records in the Consortium of California Herbaria, several of which are from the Chuckwalla Mountains and Desert Center area, including the Project area (CCH 2010). This species was not observed during spring 2009 or 2010 field surveys performed for the PSPP; however this plant has been identified in the Project region for other solar projects (AECOM 2009d, 2009a and b). This species was not observed during March 2013 surveys for the PSEGS along the proposed generation tie-line or the natural gasline but surveys were not conducted during a time of year adequate for detecting this species; additional surveys are required to confirm if this species is present.

Abram's Spurge

Abram's spurge is a late-season, ephemeral annual that responds to summer monsoonal rains but dries quickly and cannot be detected during routine spring surveys. It is a RPR 2.2 species meaning it is fairly rare in California but more common elsewhere (CNPS 2009). Habitat consists of sandy flats in creosote bush scrub habitat from approximately 600 to 2,700 feet above mean sea level. This summer annual occurs in halophytic (saline-alkaline) scrub flats, playas, and along inlets and floodplains of playas and always seems to prefer the lower floodplain ecotone but can also extend higher up in the floodplain drainages (Silverman, pers. comm.). Based on fourteen Consortium of California Herbaria database records for this species, habitats in Riverside, San Diego, and Imperial counties consist of sandy soil habitats often along dry lake margins, whereas documented occurrences in San Bernardino County occur on coarser, possibly sandy loams. Abram's spurge occurs from San Bernardino County to Imperial and eastern San Diego counties to Arizona, Nevada, Mexico, and Baja California (GSEP 2009a, b). The CNDDB (CNDDB 2010) lists 15 occurrences of this plant within the Riverside, Imperial, San Bernardino, and San Diego counties in California, east through Nevada to Arizona, and as far south as Baja California, Mexico. Of the total of 15 occurrences in California, seven of these are protected under Park Service, CDFW, or State Park ownership. A total of four records are historical records and one of these occurrences has documented threats which include grazing. A recent 2000 CNDDB record is from a location near the Project site; approximately 0.5 mile east of Ford Dry Lake on Gasline Road just south of I-10, and reported as a "substantial population" (CNDDB 2010).

The blooming period is identified by CNPS as September through November (CNPS 2009). Since the Project site occurs in the Chuckwalla Valley of the Sonoran Desert, an area known for bi-modal rain patterns and late summer/fall rains, this species typically only blooms during summer or fall months following monsoonal rains (>+/- 0.10 inch)

(Silverman pers. comm.). On average, August receives the most rainfall, although rainfall is also received during winter months of December, January, and February. Regional botanical experts have concluded that this, and other summer annuals, may be missed if surveys are only conducted within the mid-March through mid-April window, and that a full inventory at multiple temporal windows are necessary in order to capture all appropriate growing conditions (typically following 12 to 18 mm rain events) (CEC 2009a).

This species was not identified during fall 2010 botanical surveys for the PSPP. This species was not observed during March 2013 surveys for the PSEGS along the proposed generation tie-line or the natural gasline but surveys were not conducted during a time of year adequate for detecting this species; late season surveys will occur in fall 2013 and the survey report is expected in November 2013.

Flat-seeded Spurge

Flat-seeded spurge is a RPR 1B.2 species meaning it is rare, threatened, or endangered in California and elsewhere; fairly endangered in California. It is a BLM Sensitive species. This species occurs in desert dunes and Sonoran desert scrub habitat types, in sandy places or shifting dunes, at elevations from approximately 200 to 300 feet. Some experts speculate that the species may be a “waif” in California, or a species that is not naturalizing, and note that it is more common in Arizona and Mexico (CNDDB 2010) but overall little is known or can be concluded (LaDoux pers. comm.). This ephemeral summer annual blooms February through September (CNPS 2009). There are four CNDDB records of this species for the entire state of California, only one of which is from Riverside County; the closest occurrences are approximately 50 miles away.

Staff reviewed the occurrence data in the Consortium of California Herbaria and detected 1 new occurrence that were not in the CNDDB. This occurrence is a historical record from 1933. Of the total five occurrences in California (CNDDB plus new additional occurrences), one of these are protected under State Park ownership. A total of three records are historical records and none of these occurrences have documented threats.

This species was not observed during spring 2009 or 2010 botanical surveys for the PSPP. Although there are no documented nearby occurrences, the Project occurs within its range, suitable habitat is present, and as an ephemeral summer annual it may be under-surveyed and its potential to occur cannot be dismissed (LaDoux pers. comm.). This species was not observed during March 2013 surveys for the PSEGS along the proposed generation tie-line or the natural gasline route. Staff is awaiting the submittal of the final rare plant survey report requested as part of Data Request Set 1 that includes a complete floristic inventory for the spring 2013 surveys. Glandular Ditaxis

This is a RPR 2.2 species meaning that is it rare, threatened, or endangered in California, but more common elsewhere, fairly endangered in California. It is a CNDDB state rank S1/S2. This plant species grows from sea level to approximately 1,400 feet above mean sea level in Mojavean and Sonoran desert scrub habitat, in the sandy soils of dry washes and rocky hillsides. Glandular ditaxis (an annual or short-lived perennial) blooms from October through March (CNPS 2009); while it can be detected during spring surveys; it is easier to detect in fall following the start of the rainy season (Silverman pers. comm.).

Staff reviewed the occurrence data in the Consortium of California Herbaria and detected 3 new occurrences that were not in the CNDDB. All of these are historical records from 1932. Of the total 21 occurrences (CNDDB plus new additional occurrences), one of these is protected on under CDFW land ownership. A total of six records are historical occurrences. One of these has documented threats, including land development, and is likely extirpated. This species was not observed during spring 2009 or 2010 botanical surveys performed for the PSPP. This species was not observed during March 2013 surveys for the PSEGS along the proposed generation tie-line or the natural gasline route. Staff is awaiting the submittal of the final rare plant survey report requested as part of Data Request Set 1 that includes a complete floristic inventory for the spring 2013 surveys.

Lobed Ground Cherry

Lobed ground cherry is a late season perennial that blooms September to January. It is a RPR 2.3 species, meaning that is rare, threatened, or endangered in California, but more common elsewhere and not very endangered in California. This species occurs in Mojavean desert scrub on decomposed granite soils, playas, and alkaline dry lake beds. This species occurs from approximately 1,500 feet to 2,400 feet above mean sea level. There are six records from the Consortium of California Herbaria database, all from San Bernardino County (CCH 2010).

Staff reviewed the occurrence data in the Consortium of California Herbaria and detected two new occurrences that were not in the CNDDB. Both of these are more recent occurrences, including one from Joshua Tree National Monument and one in the eastern Mojave Desert. Of the total six occurrences in California (CNDDB plus new additional occurrences), none of these are protected under Park Service or other agency land ownership. None of these are historical records and none of these occurrences have documented threats. This species was not observed during spring 2009 or 2010 botanical surveys performed for the PSPP. This species was not observed during March 2013 surveys for the PSEGS along the proposed generation tie-line or the natural gasline but surveys were not conducted during a time of year adequate for detecting this species; additional surveys are required to confirm if this species is present.

Dwarf Germander

Dwarf germander is a RPR 2.2 meaning that is it rare, threatened, or endangered in California, but more common elsewhere, fairly endangered in California. It is a CNDDB state rank 2. This species occurs in desert dune, playa margins, and Sonoran desert scrub habitats from approximately 100 feet to 1,200 feet. This species typically blooms from March to May but may also bloom from September through November. This species typically occurs in sandy soils and wash habitats and is known from fewer than 10 occurrences in California (CNPS 2009).

Staff reviewed the occurrence data in the Consortium of California Herbaria and detected 2 new occurrences that were not in the CNDDB. Both of these are historic records from 1905 and 1949. Of the total seven occurrences in California (CNDDB plus new additional occurrences), one occurs in a BLM Desert Wildlife Management Area. A total of three records are historical records and none of these occurrences have documented threats. This species was not observed during spring 2009 or 2010 botanical surveys performed for the PSPP. This species was not observed during March 2013 surveys for the PSEGS along the proposed generation tie-line or the natural gasline route. Staff is awaiting the submittal of the final rare plant survey report requested as part of Data Request Set 1 that includes a complete floristic inventory for the spring 2013 surveys.

Palmer's Jackass Clover

Palmer's jackass clover is a proposed new addition to the CNPS inventory (Silverman, pers. comm.)It is a perennial herb that occupies sandy washes, and Sonoran desert scrub habitat from sea level to 650 feet. There are no CNDDB records for this species (CNDDB 2010). Staff reviewed the occurrence data in the Consortium of California Herbaria and detected seven occurrences that were not in the CNDDB. Four of these are historical records from between 1937 and 1952; however, two more recent occurrences were found in the Chocolate-Chuckwalla Mountains region, one southeast of Palen Dry Lake and one near the Palen Sand Dunes. No information on land ownership or documents of threats is available from the Consortium of California Herbaria. This species was not observed during spring 2009 or 2010 botanical surveys performed for the PSPP. This species was not observed during March 2013 surveys for the PSEGS along the proposed generation tie-line or the natural gasline route. Staff is awaiting the submittal of the final rare plant survey report requested as part of Data Request Set 1 that includes a complete floristic inventory for the spring 2013 surveys.

Jackass Clover

This is a RPR 2.2 species and considered rare, threatened, or endangered in California, but more common elsewhere, fairly endangered in California. Jackass-clover inhabits desert dunes Mojavean desert scrub, playas, or Sonoran desert scrub. This species is commonly associated with sandy washes, roadsides, or alkaline flats, of elevations from 425 to 2,630 feet.

Staff reviewed the occurrence data in the Consortium of California Herbaria and detected 2 new occurrences that were not in the CNDDB. One of these occurrences is a historical record from 1937; however one more recent occurrence was found at the Junction I-5 and Stockdale Highway west of Bakersfield. Of the total 9 occurrences in California (CNDDB plus new additional occurrences), three of these are protected under Park Service ownership. A total of three records are historical records. One of these occurrences has documented threats, including development. Jackass clover was also documented at several locations from the northern to southern end of Palen Lake in dune habitats during a detailed vegetation mapping and classification project conducted by CNPS Vegetation Program for BLM (Evens & Hartman 2007). This species was not observed during spring 2009 or 2010 botanical surveys performed for the PSPP. This species was not observed during March 2013 surveys for the PSEGS along the proposed generation tie-line or the natural gasline route. Staff is awaiting the submittal of the final rare plant survey report requested as part of Data Request Set 1 that includes a complete floristic inventory for the spring 2013 surveys.

Winged Cryptantha

This is a spring-blooming annual that occurs in Mojavean and Sonoran desert scrub habitats from 300 feet to approximately 5,000 feet above mean sea level. This species blooms from March through April (CNPS 2009). Winged cryptantha is found in Mojavean and Sonoran deserts within California, Arizona, and Nevada. There are 79 records of this species in the Consortium of California Herbaria database from Riverside, Imperial, San Bernardino, and San Diego counties (CCH 2010). This species has low to moderate potential to occur at the Project site. There are no CNDDB records for this species for the entire state of California (CNDDB 2010). This species was not observed during spring 2009 or 2010 botanical surveys performed for the PSPP but was observed near the proposed Colorado Substation at the southeastern end of Chuckwalla Valley, south of I-10 (Solar Millennium 2010l). This species was not observed during March 2013 surveys for the PSEGS along the proposed generation tie-line or the natural gasline route. Staff is awaiting the submittal of the final rare plant survey report requested as part of Data Request Set 1 that includes a complete floristic inventory for the spring 2013 surveys.

Las Animas Colubrina

Las Animas colubrina is a RPR 2.3 species indicating it is not very endangered in California and more common elsewhere (CNPS 2009). This is a covered species under the NECO Plan. It is an evergreen to semi-evergreen shrub that occurs in Mojavean and Sonoran desert scrub (creosote bush series) and occurs at elevations from approximately 30 to 3,000 feet. It primarily occurs in dry canyons or headwater reaches of desert washes with gravelly, sandy soils. The distribution of this species includes San Diego, Imperial, and Riverside counties; portions of Arizona; Baja California; and Sonora, Mexico. This species has been reported from isolated desert locales in Joshua Tree National Monument, the Eagle Mountains, and Chuckwalla Mountains (Reiser 1994). There are approximately 27 occurrences primarily from the Chocolate Mountains area (BLM CCD 2002). This species typically blooms from April through June.

Staff reviewed the occurrence data in the Consortium of California Herbaria and detected 12 new occurrences that were not in the CNDDB. Of these eight are historical records from between 1930 and 1966; however four of these are more recent occurrences found in the Sonoran (Colorado) Desert, including several occurrences in the mountains and foothills surrounding Chuckwalla Valley (CCH 2010). Of the total 36 records in California (CNDDB plus new additional occurrences), six of these are protected under Park Service, State Park, or BLM DWMA land ownership. A total of 11 records are historical records. None of these occurrences have documented threats. This species was not identified during spring 2009 or 2010 botanical surveys performed for the PSPP; however this plant has been identified in the Project region during surveys performed for other solar projects (AECOM 2009d, GSEP 2009a and b). This species was not observed during March 2013 surveys for the PSEGS along the proposed generation tie-line or the natural gasline route. Staff is awaiting the submittal of the final rare plant survey report requested as part of Data Request Set 1 that includes a complete floristic inventory for the spring 2013 surveys.

Special-status Wildlife Species

Biological Resources Table 4, below, was generated for analysis of the PSPP project, and provides a summary of special-status plants and animals also considered in this assessment. Some of these species were originally considered to have a lower potential for occurrence at the Project site than the species discussed above because the general or micro-habitats known to support them were not found at the site, and/or there are no known occurrences in the Project vicinity.

In consideration of potential effects from the PSEGS project, conclusions regarding the potential for several of the wildlife species to occur at the site have changed, particularly with respect to avifauna. These changes are due to several factors. Each species' habitat needs and behavioral traits were considered and evaluated with respect to the modified project's footprint, profile, and operating characteristics. In several instances, the modified project has introduced a previously unidentified risk to the species which requires further analysis, and for other species such as Swainson's hawk, ongoing surveys have detected additional species at the site or general vicinity. The species list has been updated to indicate that species that have the potential to occur are marked in ~~strikeout~~ in **Table 4**, and are included in **Biological Resources Table 3**.

Bats

Project owner's biologists conducted a habitat suitability survey for bat species and recorded any potential roosting locations or potential sign (guano piles, staining on trees, etc.). To determine how bats may be using the PSPP site and surrounding area the Project owner's biologist conducted a one-day survey to look for bat sign (i.e., roosting locations, guano piles, staining on trees, etc.) in December 2009. Species specific habitat requirements were considered when conducting bat habitat reconnaissance surveys. In order to assess potential bat use of the PSPP and surrounding area, biologists searched portions of large washes both within, and adjacent to the PSPP within the project buffer. This involved walking slowing up and down some of the main washes searching trees, rock crevices, and other potential locations for bats, bat sign and potential roosting locations.

Desert dry wash (microphyll) woodland areas have been documented as important habitat to several bat species (Brown 2010). Primary suitable roosting habitat for bats within the proposed project site and larger project area includes washes with large trees within the southern portions of the project site in the central wash, and around the transmission line (that connects the Facility Footprint to the substation south of I-10) and substation, and within tall palms located in the adjacent agricultural areas. Large washes with riparian vegetation meander through the southern portion of the buffer around the transmission line and substation south of I-10. Some large trees are located within the southern portion of the central wash in the project site. Large trees with exfoliating bark, tree cavities, rock crevices, bridges, and other locations may provide suitable roosting habitat for a variety of bat species within the project site and buffer area. Any large trees with cavities or rock crevices with potential for bats were observed for any potential bat sign. Staff has requested the project owner perform additional surveys for bats within one mile of the project site, as per the NECO plan, (Data Requests Set 3 TN 70824), as well install acoustic bat sensing devices on the project site. Survey data from these efforts will be available in the FSA.

California leaf-nosed bat

This bat may occur in the general vicinity of the project site, and there is a potential for this species to forage within the modified project site. Desert dry wash woodland vegetation attracts foraging bats due to increased insect concentration. This is especially true for California leaf-nosed bats that feed on large arthropods which they glean off of foliage. This bat feeds off a variety of insects, such as moths, butterflies, dragonflies, and beetles (Adams, 2003). This species roosts in caves, mines, abandoned buildings, etc. (Brown 2005, Piaggio 2005). Roosts for California leaf-nosed bats have been identified in existing mines in the Eagle and Coxcomb Mountains. During the warmer months, California leaf-nosed bats night roost in ironwood trees between foraging bouts.

Pallid bat

The closest known historical location of pallid and western mastiff bats based on the CNDDB search is approximately 4.3 miles southwest of the project site near Corn Springs. Only the pallid bat was identified by the project owner's biologists as potentially roosting within the project site and buffer. The pallid bat may roost in rocky outcrops, cliffs, mines, caves, trees, exfoliating bark, tree cavities, bridges, and man-made structures (Rambaldini 2005). The pallid bat is historically known to occur in the Chuckwalla Mountains, as reported in a Biological Resources Technical Report (AECOM 2009a). Roosts for pallid bats have been identified in existing mines in the Eagle and Coxcomb Mountains. This bat feeds by gleaning insects and even scorpions off the ground, or off of vegetation, and is known for "walking" on the ground using both legs and wing bones. Pallid bats may migrate into or out of the site during various times of the year, although they generally do not migrate long distances between summer and winter sites (Rambaldini 2005).

Western mastiff bat

The western mastiff bat lacks suitable roosting habitat (large rock formations with cliffs and exfoliating rock) within the project and buffer, but may occur in the general vicinity and there is a potential for this species to forage within the modified project site and buffer (Siders 2005). The western mastiff bat is historically known to occur in the Chuckwalla Mountains Biological Resources Technical Report (AECOM 2009a). It is also known from CNDDB records near Corn Springs. These bats feed primarily by echolocation, and their diet consists primarily of moths (Lepidoptera), but also includes crickets and katydids. Unlike most North American bats, they do not undergo either migration or prolonged hibernation, but are periodically active all winter.

Cave myotis

The cave myotis has a limited potential to roost within the project area due to the presence of two bridges along Corn Springs Road. The cave myotis is known to occasionally roost in crevices in bridges (Peckham 2005). These species were not detected during the CNDDB search of the project area, but are known from locations in similar habitat around Blythe, California. Therefore this bat species has the potential to forage within the project area. This species will roost in caves, mines, or buildings. Foraging is accomplished by echolocation; small moths make up the largest portion of the diet although small beetles, weevils, and antlions are also eaten. Colonies hibernate from mid October until April.

During surveys performed in 2009, a bat was detected roosting between large wood structural components underneath a bridge on Corn Springs Road, near the substation south of I-10, but identification was not possible. Based on features observed, the individual was likely a Myotis species. Since the individual could not be identified to species, it was not possible to confirm if it was a species of special concern.

Western yellow bat

This species - relative to most of our locally occurring bats - is still poorly understood and its occurrence and ecology only recently described. The species was discovered in southern California in 1945 (Pierson and Rainey, 1998) and its continuing expansion is typically linked to the distribution of exotic palms (Williams, O'Farrell, and Riddle, 2006). However, the distribution of the species may also be associated with that of yucca plants (Higginbotham, Dixon, and Ammerman, 2000). The first known occurrence of the western yellow bat in the United States was from Palm Springs, California, in November 1945 (Constantine 1946). They were not found again in the U.S. until 1960 when two yellow bats were found roosting in dead palm fronds while trees were being trimmed at the University of Arizona in Tucson (Cockrum 1961). Locally, the species is known from the Palm Springs area as well as the Lower Colorado River including the vicinity of Blythe.

There are oases in the Desert Center area near Lake Tamarisk that have the potential to support western yellow bat. These may or may not be sufficiently close to support use of the project area by this species. Approximately 850 acres of agricultural development (jojoba and palm farms) occur immediately adjacent to the project. Associated with these farms are two private pools, approximately 2 acres or less in size. The relatively short plantation palms are not expected to support use by this species; however larger palms may provide habitat and the area could support foraging by the species if the trees support appropriate insect fauna. Irrigation at the plantation is expected to provide an important water source to many species and may attract and support a host of insects. Foraging is typically associated with water features and may occur across a variety of habitat, from desert scrub to riparian areas. Foraging has been observed over swimming pools, lawns, and orchards. It is unknown if some individuals or populations migrate and it is likely this species does not hibernate.

Desert Tortoise

The desert tortoise was state-listed in California as threatened on August 3, 1989. The Mojave population was federally listed as threatened on April 2 1990. Critical habitat for this species was designated on February 8, 1994. The desert tortoise is a large slow growing herbivorous reptile that is well adapted to a variable and often harsh desert environment (USFWS 2011b2011). In the United States the desert tortoise's range includes portions of the Mojave and Sonoran desert regions of southern California, southern Nevada, southwestern Utah, and western Arizona. In Mexico, the species is found throughout most of Sonora and into portions of Sinaloa. Based on genetic differences there are two recognized populations of desert tortoise in the United States; these are the Mojave and Sonoran populations (USFWS 2011b2011). Recently, genetic data suggest these groups are unique species. Although the species often look similar, the differentiation between the Mojave and Sonoran assemblages of the desert tortoise are supported via multiple forms of evidence, including morphology, ecology, and genetics (Weinstein and Berry 1987; Lamb et al. 1989; Lamb and Lydehard 1994; Berry et al. 2002; Van Devender 2002a; 2002b; Murphy et al. 2007). The Mojave population includes those animals living north and west of the Colorado River in the Mojave Desert of California, Nevada, Arizona, southwestern Utah, and in the Colorado Desert in California (a division of the Sonoran Desert). Desert tortoises are adapted to living in a highly variable and often harsh desert environment. They spend much of their lives in burrows, even during their seasons of activity, which generally coincides with the greatest annual forage availability. In late winter or early spring, they emerge from over-wintering burrows and typically remain active through fall. Activity does decrease in summer, but tortoises often emerge after summer rain storms to drink (Henen et al. 1998). Desert tortoises in the project region are active during the late summer months often in response to seasonal rainfall. Because up to 30 percent of the annual precipitation falls in response to summer monsoons; the region supports two distinct annual floras on which tortoises can feed (USFWS 2011a).

During activity periods, desert tortoises eat a wide variety of herbaceous vegetation, particularly grasses and the flowers of annual plants (Berry 1974; Luckenbach 1982; Esque 1994). During periods of inactivity, they reduce their metabolism and water loss and consume very little food. Adult desert tortoises lose water at such a slow rate that they can survive for more than a year without access to free water of any kind and can apparently tolerate large imbalances in their water and energy budgets (Nagy and Medica 1986; Peterson 1996a, b; Henen et al. 1998).

The size of desert tortoise home ranges varies with respect to location and year (Berry 1986a) and also serves as an indicator of resource availability and opportunity for reproduction and social interactions (O'Connor *et al.* 1994). Females have long-term home ranges that may be as little or less than half that of the average male, which can range to up to 200 acres (Burge 1977; Berry 1986a; Duda *et al*. 1999; Harless *et al*. 2009). Core areas used within larger home ranges of desert tortoise depend on the number of burrows used within those areas (Harless *et al*. 2009). Thus, an individual home range is best viewed as a network of burrows, connected by somewhat linear corridors, which the desert tortoise visits serially through the year (O'Connor et al 1994). Over its lifetime, each desert tortoise may use more than 1.5 square miles of habitat and may make periodic forays of more than 7 miles at a time (Berry 1986a).

Tortoises are long-lived and grow slowly, requiring 13 to 20 years to reach sexual maturity, and have low reproductive rates during a long period of reproductive potential (Turner et al. 1984a; Bury 1987; Germano 1994). Mating occurs both during spring and fall (Black 1976; Rostal *et al.* 1994), and the number of eggs as well as the number of clutches (set of eggs laid at a single time) that a female desert tortoise can produce in a season is dependent on a variety of factors including environment, habitat, availability of forage and drinking water, and physiological condition (Turner et al. 1986, 1987; Henen 1997; McLuckie and Fridell 2002). Egg-laying occurs primarily from April to July (Rostal et al. 1994; USFWS 1994a); the female typically lays 2-14 eggs (average 5-6) eggs in an earthen chamber excavated near the mouth of a burrow or under a bush (Woodbury and Hardy 1948; USFWS 1994a). The eggs typically hatch 90 to 120 days later, between

August and October. The success rate of clutches has proven difficult to measure, but predation, while highly variable (Bjurlin and Bissonette 2004), appears to play an important role in clutch failure (Germano 1994).

The majority of threats to the desert tortoise and its habitat are associated with human land uses. Many of the threats identified in the 1994 and 2011 Recovery Plans, which formed the basis for listing the species as threatened, continue to affect the tortoise today (USFWS 2011b2011). Some of the threats identified at the time of listing include urbanization, upper respiratory tract disease and possibly other diseases, predation by common ravens and domestic and feral dogs, unauthorized off-road vehicle activity, authorized vehicular activity, illegal collecting, mortality on paved roads, vandalism, drought, livestock grazing, feral burros, non-native plants, changes to natural fire regimes, and environmental contaminants (USFWS 1994a).

Even though a wide range of threats are known to affect desert tortoises and their habitat, very little is known about their demographic impacts on tortoise populations or the relative contributions each threat makes to tortoise mortality (Boarman 2002a). Extensive research shows that all of these threats can directly kill or indirectly affect tortoises; research has also clarified many mechanisms by which these threats act on individuals. While current research results can lead to predictions about how local tortoise abundance should be affected by the presence of threats, quantitative estimates of the magnitude of these threats, or of their relative importance, have not yet been developed. Thus, the Draft Revised Recovery Plan focuses on expanding the knowledge of individual threats and places emphasis on understanding their multiple and combined effects on tortoise populations (USFWS 2008a).

The original *Desert Tortoise (Mojave Population) Recovery Plan* identified six recovery units (Upper Virgin River, Northeastern Mojave, Eastern Mojave, Eastern Colorado, Northern Colorado, and Western Mojave) and recommended the establishment of 14 Desert Wildlife Management Areas (DWMAs) throughout the recovery units (USFWS 1994a). Since 1994, greater insight into patterns of both ecological and genetic variation within the Mojave desert tortoise population has been gained. Based on this information the USFWS 2011 *Desert Tortoise (Mojave Population) Recovery Plan* identifies revised recovery unit boundaries and identified five recovery units for the Mojave population of desert tortoise. These include the Upper Virgin River; Northeastern Mojave; Eastern Mojave; Western Mojave; and Colorado Desert. Although the Recovery Unit designation does not provide special legal protection, the USFWS defines recovery units as special units that are geographically identifiable and are essential to the recovery of the entire listed population; that is recovery units are individually necessary to conserve the genetic, behavioral, morphological, and ecological diversity necessary for long-term sustainability of the entire listed population (USFWS 2011a).

The PSEGS project is located in the Colorado Desert Recovery Unit. This recovery unit combines the 1994 Eastern Colorado and Northern Colorado recovery units, as well as a portion of the Eastern Mojave Recovery Unit in Piute and Fenner valleys (USFWS, 2012). Desert tortoise in this recovery unit are found primarily in “well-developed washes, desert pavements, piedmonts, and rocky slopes characterized by relatively species-rich succulent scrub, creosote bush scrub, and blue palo verde-ironwood-smoke tree communities” (USFWS 1994a). Habitat within this recovery unit has been described as being in excellent condition despite declines in tortoise densities over the past several decades; disturbance was estimated at less than 1.3 percent throughout the recovery unit (USFWS 2005). The highest desert tortoise densities within this recovery unit occur in Chemehuevi and Ward valleys (approximately 60 miles north of the Project); on the Chuckwalla Bench within the Chuckwalla DWMA and associated Critical Habitat Unit (CHU); and in Joshua Tree National Park (approximately 40 miles northwest of the Project). Desert tortoise densities at the Chuckwalla Bench in 1992 were estimated between 22 and 49 adults per square kilometer (approximately 57–127 adults per square mile) but have shown declining trends (Berry 1997; Tracey et al. 2004).

Density estimates from range-wide sampling over the past decade have resulted in general estimates of desert tortoise density for the entire Eastern Colorado Recovery Unit of approximately 5.9 animals per square kilometer, with estimates of 3.7 per square kilometer on BLM-managed lands (USFWS 2010). Generally the data suggest the species may still be in decline across most of its range.

Protocol-level surveys of the project site and linear facilities for the PSPP project were conducted between March 17 and May 22, 2009 (Study area except substation) and October 24 to 25, 2009 (substation site and buffer). Post certification clearance surveys were conducted on portions of the site in 2010. Survey results conducted in 2009 detected 17 burrows (Class 3–5), 15 tortoise pallets (Class 4 or 5), and 19 tortoise shell remains (Class 5) in the project area (AECOM 2010a). Pallets are shallow excavations or non-covered depressions used by desert tortoise. Surveys conducted in 2010 identified seven tortoises (adult and juvenile) in the Project area including four along the generation tie line and three tortoises south of I-10, the latter being outside of the Project Disturbance Area and buffer area. Only one tortoise was detected in the Project Disturbance Area along the gen-tie line for the PSPP project (Solar Millennium 2010k, Table 1 and Figure 1). Desert tortoises were not detected on the proposed solar field. Refer to **Biological Resources Figure 7**.

To address changes to the project footprint (e.g., the linear facilities) for the PSEGS project protocol surveys for desert tortoise were conducted from 7 to 30 April 2011. Desert tortoises were not detected during these surveys (Palen 2013m). Two desert tortoise burrows showing sign of recent occupation were detected on the generation tie-in south of I-10 and a possible burrow was noted in a survey buffer north of the freeway (Palen 2013m Table 3, Figure 1). Surveys for desert tortoise were not conducted in the Project Disturbance Area (i.e., the solar field) in 2013 for the PSEGS project.

Desert tortoises were not detected on the PSPP project site although this species is known to occur in the project region. Desert tortoise sign is present on the project site and the species is periodically detected in habitat adjacent to the PSEGS project. Additional observations of desert tortoise from Project buffers are included in the Revised Desert Tortoise Technical Report (Galati & Blek 2010b, Revised Desert Tortoise Technical Report). In addition, for the PSPP project resource agency staff located a possible desert tortoise burrow near the bridge associated with the large wash that flows into the center of the Project Disturbance Area (LaPre, pers. comm.). Based on available data for the region the site is expected to support a relatively low number of desert tortoise.

To support the preparation of the Biological Opinion (BO) for the Approved PSPP project the USFWS developed assumptions in an effort to estimate the number of desert tortoises that may occur in the Project Disturbance Area. The estimates of desert tortoise density predicted by the USFWS was based on desert tortoises found in the buffer transects of the generation tie-in (Palen 2013m). Using this information the FWS concluded that two subadult or adult tortoises occupy the Project (FWS 2011:18). Regional population estimates were used to further extrapolate the number of animals that may occur and using this data the USFWS concluded that 2-12 adult tortoises may occupy the site. This data was used to estimate the number of juvenile tortoises and eggs that may occur. Because desert tortoises were not detected in 2013; surveys conducted by the project owner of the Modified Linear Facilities do not provide any information that would alter this analysis.

Habitat in the Project Disturbance Area north of I-10 (including the Chuckwalla CHU) supports lower quality desert tortoise habitat and the only moderate quality habitat within the Project Disturbance Area occurs south of I-10 (Galati & Blek 2010b, Revised Desert Tortoise Technical Report, Solar Millennium 2010m, Table 5). Staff agrees with the project owners assessment that higher value habitat is found south of I-10 corresponding with higher elevation alluvial fan plant communities. However, staff has concluded that, aside from developed areas and sand dunes, the entire Project Disturbance Area contains suitable habitat for this species.

Critical Habitat

The PSEGS project area overlaps with a portion of the Chuckwalla Desert Tortoise Critical Habitat Unit (Chuckwalla CHU).

Mojave Fringe-toed Lizard

The Mojave fringe-toed lizard is endemic to southern California and a small area of western Arizona, where it is restricted to aeolian sand habitats in the deserts of Los Angeles, Riverside, and San Bernardino counties in California and La Paz County in Arizona (Hollingsworth and Beaman 1999; Stebbins 1985). Nearly all records for this species are associated with present-day and historical drainages and associated sand dune complexes of the Mojave and Amargosa rivers (Norris, 1958).

The distribution of Mojave fringe-toed lizards is naturally fragmented because of its obligate habitat specificity to loose sand, a patchy habitat type (Murphy et al. 2007). Many local populations of this species are quite small, with small patches of sand supporting small populations of lizards. This fragmented pattern of distribution leaves the species vulnerable to local extirpations from additional habitat disturbance and fragmentation (Murphy et al. 2007). The loose, wind-blown sand habitat, upon which the species is dependent, is a fragile ecosystem requiring protection against both direct and indirect disturbances (Weaver, 1981; Barrows, 1996). Environmental changes that stabilize sand, affect sand sources, or block sand movement corridors will also affect this species (Turner et al. 1984; Jennings and Hayes 1994). Additional threats to this species include habitat loss or damage from urban development, off-highway vehicles (OHV), and agriculture. Aside from the direct loss of land, development can also increase predators, such as the common raven, to occupied habitat.

Murphy et al. (2006) identified two maternal lineages of this species; the northern lineage is associated with the Amargosa River drainage system, and the southern with the Mojave River drainage system, Bristol Trough, Clark's Pass (including Palen Lake and Pinto Wash), and the Colorado River sand transport systems.

The Mojave fringe-toed lizard is found in arid, sandy, sparsely vegetated habitats and is associated with creosote scrub throughout much of its range (Norris 1958; Jennings and Hayes 1994). This species is totally restricted to habitats of fine, loose, aeolian sand, typically with sand grain size no coarser than 0.375 mm in diameter (Turner et al. 1984; Jennings and Hayes 1994; Stebbins 1944). It burrows in the sand for both cover from predators and protection from undesirable temperatures (Stebbins 1944), though it will also seek shelter in rodent burrows. They are primarily insectivorous, but also eat plant food including leaves, seeds, and buds (Stebbins 1944).

Mojave fringe-toed lizards normally hibernate from November to February, emerging from hibernation sites from March to April. The breeding season is April to July, and adult Mojave fringe-toed lizards reach sexual maturity two summers after hatching. Females deposit 2-5 eggs in sandy hills or hummocks May through July (Mayhew 1964, Jennings and Hayes 1994). From April to May, while temperatures are relatively cool, this species is active during mid-day; from May to September, they are active in mornings and late afternoon, but seek cover during the hottest parts of the day. Common predators of the Mojave fringe-toed lizard include burrowing owls, leopard lizards, badgers, loggerhead shrikes, roadrunners, various snakes, and coyotes (Jennings and Hayes 1994).

Nearly half of the Project Disturbance Area for the PSPP (1,503 for Reconfigured Alternative 2 and 1,542 acres for Reconfigured Alternative 3) contained suitable Mojave fringe-toed lizard habitat, including in stabilized and partially stabilized sand dunes, some wash habitat, and other areas within Sonoran creosote scrub bush habitat with appropriate soils (Solar Millennium 2009a-AFC Volume II, Appendix F). Numerous Mojave fringe-toed lizards were found in the northeastern half of the Study area during Spring 2009 and 2010 surveys, including 105 within the PSPP Reconfigured Alternative 2 Project Disturbance Area and 91 within the PSPP Reconfigured Alternative 3 Project Disturbance Area (Solar Millennium 2009a-AFC Volume II, Appendix F; Figure 11). An additional 62 Mojave fringe-toed lizards were observed within the buffer area based on preliminary spring2010 survey results (Solar Millennium 2010k, Table 3). The Project Disturbance Area for the PSEGS reduces impacts to suitable Mojave fringe-toed lizard habitat to1, 480 acres. Refer to **Biological Resources Figure 5**. A total of 95 Mojave fringe-toed lizard observations from 2009 and 2010 surveys occur within the PSEGS Project Disturbance Area. This species or its sign was not reported to be observed during spring 2013 surveys for the PSEGS along the proposed generation tie-line or the natural gasline route. Staff is awaiting a final survey report including an inventory of all wildlife detected to supplement the summary submitted by the project owner on May 21, 2013 (Palen 2013s).

Couch's Spadefoot Toad

This species lives in a variety of plant communities, including desert dry wash woodland, creosote bush scrub, and alkali sink scrub. They require habitat with substrate capable of sustaining temporary pools for breeding, and loose enough to permit burial in subterranean burrows (Jennings and Hayes 1994, BLM CDD 2002). Breeding habitat includes temporary impoundments at the base of dunes as well as road or railroad embankments, temporary pools in washes or channels, pools that form at the downstream end of culverts, and playas (Morey 2005; Morey, pers. comm.; Mayhew 1965). Natural scour sites in washes with breeding toads (included in Dimmitt 1977) had washed down to a hardpan, which enabled ponding (Dimmitt, pers. comm.). The majority of known Couch's spadefoot toad breeding ponds are artificial, though this may be because of the difficulty of locating natural ponds within the limited amount of time ponds may retain water. Couch's spadefoot toads consume termites, beetles, ants, grasshoppers, solpugids, scorpions, and centipedes.

This species is dormant from 8–10 months of the year, emerging from burrows at the onset of warm summer rains. Emergence appears to be triggered by the low frequency sound caused by falling rain, low-frequency sound created by off-highway vehicles, and construction vehicles (Dimmitt, pers. comm.). These sounds may trigger emergence, and result in emergence in poor environmental conditions (Jennings and Hayes 1994).

At the time the PSPP was permitted, the closest known record for this species was a very old record: an individual in a breeding pond in a borrow pit near the east end of Chuckwalla Road, south of I-10 (about 15 miles east of the Project site) (Dimmitt 1977). Based on these and other records the Project site was considered west of the range for this species (NECO, Jennings and Hayes (1994)), although other information indicated the Palen Mountains and surrounding bajadas could support marginal populations (Dimmitt 1977). Couch's spadefoot toads require substrate capable of sustaining ponding for at least nine days (Morey 2005). Staff reviewed aerials of the Project area and were unable to identify any areas of obvious ponding, and determined that there was limited potential for breeding habitat at the Project site. Because there was uncertainty regarding adult dispersal (Dimmitt, pers. comm.) and existence of offsite breeding ponds (such as the Palen Lake area) within adult dispersal distance, staff ultimately concluded that spadefoot toads could occur on the PSEGS site.

In August 2012 several spadefoot toads were found on the Genesis Solar Energy Project site, following a storm event. The toads were located both in and adjacent an engineered concrete lined drainage channel with standing water, and captured and released offsite at the Ford Dry Lake. In addition, in May of 2012, a desiccated specimen was found adjacent an access road at the Genesis project site (AECOM 2012). This toad was found on bare ground with evidence of recent ponding, located in a low area between creosote shrubs. The Genesis Solar Energy Project is located approximately 10 miles east of the proposed project site, just north of the I-10. In light of this new information, staff suggests a conservative approach in considering the potential of Couch's spadefoot toad to occur on or adjacent to the project site, and we encourage the project owner to have low areas of potential ponding and washes surveyed after rain events during spring and summer of 2013. To finish the FSA, staff is awaiting the results of spadefoot toad microhabitat mapping performed in spring of 2013 (Palen 2013g).

Western Burrowing Owl

The western burrowing owl inhabits arid lands throughout much of the western United States and southern interior of western Canada (Haug et al. 1993) and is typically a year-round resident in much of California (Gervais et al. 2008).

Burrowing owls are unique among the North American owls in that they nest and roost in abandoned burrows, especially those created by California ground squirrels, kit fox, desert tortoise, and other wildlife. Burrowing owls have a strong affinity for previously occupied nesting and wintering habitats. They often return to burrows used in previous years, especially if they were successful at reproducing there in previous years (Gervais et al. 2008). The southern California breeding season (defined as from pair bonding to fledging) generally occurs from February to August with peak breeding activity from April through July (Haug et al. 1993).

Burrowing owls are rare in the undisturbed desert areas of the eastern and southeastern portion of California (Small 1994). By the 1940s', burrowing owls had become scarce in many portions of the desert southwest as a result of shooting and elimination of ground squirrel burrows (Grinnell and Miller 1944). Limited data suggest that they are decreasing in some areas, but may be stable or increasing in others (Klute et al. 2003). Surveys in California in 1986-91 found population decreases of 23-52 percent in the number of breeding groups and 12-27 percent in the number of breeding pairs of owls (DeSante et al. 1997). In addition, in a 2003 report by the U.S. Fish and Wildlife Service, breeding burrowing owls were thought to be largely extirpated during the last 10-15 years from multiple areas in California, including Napa, Marin, San Francisco, Santa Cruz, and Ventura counties, coastal San Luis Obispo county and the Coachella Valley (http://burrowingowlconservation.org/PR12-09-2010.html).

In the Colorado Desert, western burrowing owls generally occur at low densities in scattered populations, but they can be found in much higher densities near agricultural lands where rodent and insect prey tend to be more abundant, including along the lower Colorado River (Gervais et al. 2008). Western burrowing owls tend to be opportunistic feeders. Large arthropods, mainly beetles and grasshoppers, comprise a large portion of their diet. Small mammals, especially mice and voles (*Microtus, Peromyscus,* and *Mus* spp.), are also important food items for this species. Other prey animals include reptiles and amphibians, young cottontail rabbits, bats, and birds, such as sparrows and horned larks. Consumption of insects increases during the breeding season (Haug et al. 1993).

Threats to burrowing owls include habitat modification and destruction of ground squirrel burrows. Other threats include pesticide accumulation, burrow destruction from farming practices and canal and road maintenance, roadside shooting, and direct mortality from squirrel poisons (BLM CDD 2002; Gervais et al. 2008).

Phase I through III protocol-level surveys of part of the Project Disturbance Area (except the substation) were conducted in spring and summer 2009 for the approved PSPP project. A habitat assessment was completed for this site in fall 2009. Part of the northern end of the Project Disturbance Area is densely covered in Sahara mustard; other than this area, the entire Project Disturbance Area is suitable western burrowing owl habitat. Two pairs with juveniles and four active burrows with sign were identified during 2009 protocol surveys (Solar Millennium 2009b, Appendix F, Attachment J). Survey results from 2010 indicate that a total of four burrowing owls with active burrows have been observed within the Project Disturbance Area, to date (Solar Millennium 2010m, Table 6). Refer to **Biological Resources Figure 8**. During golden eagle surveys in the winter of 2013, approximately ten observations of burrowing owl were recorded (Palen 2013m). Protocol surveys for burrowing owl are currently being conducted in 2013 for the PSEGS project linears including the natural gas pipeline and modified generation tie-line. One burrowing owl was detected near the generation tie-line corridor during the first survey effort; however the project owner did not detect an active burrow in the area. Staff requires the results of all additional surveys to be conducted following the CDFW recommend protocol as requested in Staff Data Request Set 1 and during a workshop held on April 17, 2013 (CEC 2013a) in time to be included in the Final Staff Assessment (FSA). Staff will work with the project owner to get the necessary information in time for inclusion in the staff's analysis for the FSA.

Golden Eagle

Golden eagles are typically year-round residents throughout most of their western United States range. They breed from late January through August with peak activity March through July (Kochert et al. 2002). Migratory patterns are usually fairly local in California where adults are relatively sedentary, but dispersing juveniles sometimes migrate south in the fall. This species is generally considered to be more common in southern California than in the northern part of the state (USFWS 2008).

Habitat for this species typically includes rolling foothills, mountain areas, and deserts. Golden eagles need open terrain for hunting and prefer grasslands, deserts, savanna, and early successional stages of forest and shrub habitats. Golden eagles primarily prey on lagomorphs and rodents but will also take other mammals, birds, reptiles, and some carrion (Kochert et al. 2002). This species prefers to nest in rugged, open habitats with canyons and escarpments, with overhanging ledges and cliffs and large trees used as cover.

The status of golden eagle populations in the United States is not well known, although there are indications that populations may be in decline (USFWS 2009b, Kochert et al. 2002). Accidental death from collision with man-made structures, electrocution, gunshot, and poisoning are the leading causes of mortality for this species, and loss and degradation of habitat from agriculture, development, and wildfire continues to put pressure on golden eagle populations (Kochert et al. 2002; USFWS 2009b).

In spring 2010 golden eagle helicopter surveys were conducted to cover the area within a 10-mile radius from the PPSP boundaries as well as three other proposed solar projects (Solar Millennium 2010u, TTEC 2010a). The surveys covered eleven mountain ranges between and around Blythe and Desert Center (TTEC 2010a) and were conducted following the USFWS's February 2010 Interim Golden Eagle Inventory and Monitoring Protocols (Pagel et al. 2010). The surveys found two active golden eagle nests within one territory, approximately 7 miles southwest of the PSEGS project site in the Chuckwalla Mountains. Additionally, three inactive nests were located approximately six miles southwest of the site in the Chuckwalla Mountains; two of these nests were associated with the territory discussed above, the other is likely associated with a territory located further south of the PSEGS project site (Solar Millennium 2010u).

Surveys for golden eagle were also conducted for the Desert Harvest Solar Project, located roughly ten miles to the west of the PSEGS project. These surveys detected eight golden eagle nests, all located on power poles (Aspen 2012). Most of the nests were located south of the I-10 freeway. Based on personal conversations with the

USFWS (Dr. Joel Pagel), the BLM has additional information on known active and inactive nests in the area, and staff has requested that the project owner coordinate with the BLM to obtain this information. Staff will review BLM's data when available, and incorporate this information in the FSA. Based on ongoing discussions with the resource agencies, specific locations of active nest may not be published, to ensure the safety of the nests.

Additional survey efforts are ongoing for the PSEGS project. From January to February 2013, fresh carcasses and camera stations were placed on the site and within a ten mile buffer area surrounding the project site. A single subadult eagle made repeat visits to a bait station located northeast of the project site, in the Palen Mountains. Additionally, the project owner conducted ground and helicopter surveys for golden eagle in April, 2013 (Palen 2013x) and at the time of publication of this PSA, had provided a one-page summary report of the findings. Helicopter surveys for nests were performed within a 10-mile radius of the project, along the Palen Mountains, the Chuckwalla Mountains, and the Coxcomb Mountains were surveyed from the ground. Known locations of nests were surveyed, and three potential nests of golden eagles were noted in the Chuckwalla Mountains. Staff will review the full survey report when it becomes available. Staff's Data Request 3 provides the project owner further guidance in collecting data on eagle populations in the area, and that data will be presented in the FSA.

Loggerhead Shrike

Loggerhead shrikes are uncommon residents throughout most of the southern portion of their range, including southern California. In southern California they are generally much more common in interior desert regions than along the coast (Humple 2008). Loggerhead shrikes initiate their breeding season in February and may continue with raising a second brood as late as July; they often re-nest if their first nest fails or to raise a second brood (Yosef 1996).

This species can be found within lowland, open habitat types, including creosote scrub and other desert habitats, sage scrub, non-native grasslands, chaparral, riparian, croplands, and areas characterized by open scattered trees and shrubs. Fences, posts, or other potential perches are typically present. In general, loggerhead shrikes prey upon large insects, small birds, amphibians, reptiles, and small rodents over open ground within areas of short vegetation, usually impaling prey on thorns, wire barbs, or sharp twigs to cache for later feeding (Yosef 1996). Loss of habitat to agriculture, development, and invasive species is a major threat; this species has shown a significant decline in the Sonoran Desert (Humple 2008).

The entire Project Disturbance Area contains suitable habitat for loggerhead shrike. This species, including an adult with fledglings, was observed on the Project site during spring 2010 surveys (Solar Millennium 2010k), and also during golden eagle surveys in the winter of 2013 (Palen 2013x and 2013k).

Le Conte's Thrasher

In California, Le Conte's thrasher is a resident in the San Joaquin Valley and the Mojave and Colorado deserts. It occurs in desert flats, washes and alluvial fans with sandy and/or alkaline soil and scattered shrubs. It rarely occurs in monotypic creosote scrub habitat, because creosote bush is unable to support a nest, or in massive Sonoran Desert woodlands (Prescott 2005). Preferred nest substrate includes thorny shrubs and small desert trees. Breeding activity occurs from January to early June, with a peak from mid-March to mid-April (BLM CDD 2002). Le Conte's thrashers forage for food by digging and probing in the soil. They eat arthropods, small lizards and snakes, and seeds and fruit; the bulk of their diet consists of beetles, caterpillars, scorpions, and spiders.

This species was observed during Project surveys, including avian surveys conducted over a period of four weeks in the spring of 2009. Because the Sonoran creosote scrub bush in this area is fairly monotypic, suitable habitat for this species in the Project Disturbance Area is confined to of the 148 acres of desert dry wash woodland. The closest CNDDB record for this species is about 3 miles south of the Project site (CNDDB 2010).

California horned lark

The California horned lark is found throughout California except the north coast, and is less common in mountainous areas. This species prefers open areas that are barren or with short vegetation including deserts, brushy flats, and agricultural areas. Eggs are laid March to early June, and this species frequently lays a second clutch.

The Project site contains suitable habitat for this species, especially in creosote bush scrub. This species was observed frequently in the Project Disturbance Area during surveys conducted for the PSPP project, as well as during golden eagle surveys in the winter of 2013 (Palen 2013k). There are numerous CNDDB (2010) records for this species in western Riverside County.

Prairie Falcon

The prairie falcon inhabits dry environments in the North American west from southern Canada to central Mexico. It is found in open habitat from annual grasslands to alpine meadows at all elevations up to 10,990 feet, but is associated primarily with perennial grasslands, savannahs, rangeland, some agricultural fields, and desert scrub areas. They require cliffs or bluffs for nesting though will sometimes nest in trees, on power line structures, on buildings, or inside caves or stone quarries. Ground squirrels and horned larks are the primary food source, but prairie falcon will also prey on lizards, other small birds, and small rodents.

Prairie falcons were observed several times during project surveys both as flyovers and perched in the Project Disturbance Area. The entire Project Disturbance Area (4,024 acres) contains suitable foraging habitat for this species. The Project site does not contain suitable nesting habitat, although adjacent mountains may. There are numerous CNDDB (2010) records in the region for this species, including eight records from Little Maria Mountains to the northeast (1977) and the Chuckwalla Mountains to the southwest (1978). During golden eagle Phase 2 nest surveys performed jointly for neighboring proposed energy projects, a pair of prairie falcons was documented to be nesting on the same cliff on which the golden eagle nest was located in the Palen

Mountains (TTEC 2010a). Staff observed this species at the Palen Project site during site visits performed April 9 and 10, 2013.

American Badger

American badgers were once fairly widespread throughout open grassland habitats of California. Badgers are an uncommon permanent resident with a wide distribution across California, except from the North Coast area. American badger is a resident species and is most abundant in the drier open stages of most shrub, forest, and herbaceous habitats with friable soils. Badgers are generally associated with treeless regions, prairies, parklands, and cold desert areas (Zeiner et al. 1990). Badgers inhabit burrows and often predate and forage on other small mammal burrows as evidenced by claw marks along the edges of existing burrows. Most of the CNDDB records from the Palo Verde Valley area of Riverside County are prior to 1960 and the closest is located approximately 12 miles southeast of the Project site, northwest of Palo Verde (CNDDB 2010).

American badger sign was found during spring 2009 and spring 2010 field surveys for the PSPP; burrow predation evidence by badgers was found throughout the Project Disturbance Area habitats and Study area. Surveyors observed 5 badger dens and over 10 wildlife burrows showing evidence of predation by badgers (Solar Millennium 2009b). During spring 2010 surveys for the PSPP, one American badger den was found in the Project Disturbance Area and two were found in the buffer area (Solar Millennium 2010k, Table 3). In addition, a badger skull was observed within the Study area, south of I-10 (Solar Millennium 2009b). The PSEGS project footprint would impact fewer known American badger burrows detected in 2009-2010 however since badgers use multiple burrows within their home range impacts to this species would be similar to the PSPP. This species or its sign was not reported to be observed during spring 2013 surveys for the PSEGS along the proposed generation tie-line or the natural gasline route. However, staff is awaiting a final survey report including an inventory of all wildlife detected to supplement the summary submitted by the project owner on May 21, 2013 (Palen 2013s). The entire Project Disturbance Area is considered suitable habitat for badgers.

Desert Kit Fox

Desert kit fox is an uncommon to rare permanent resident of arid regions of the southern portion of California. Kit fox occur in annual grasslands, or grassy open, arid stages of vegetation dominated by scattered herbaceous species. Kit fox occur in association with their prey base which is primarily cottontail rabbits, ground squirrels, kangaroo rats and various species of insects, lizards, or birds (Zeiner et al. 1990). California Code of Regulations 14 CCR § 460 stipulates that desert kit fox may not be taken at any time. Protection provided by kit fox dens for use as shelter, escape, cover, and reproduction is vital to the survival of the species. Desert kit fox burrows, complexes and scat were observed throughout the Study area within desert wash and upland scrub habitats during spring 2009. Approximately 71 kit fox burrows and burrow complexes were recorded within the Study area during 2009 field surveys, most of which occur in the Project Disturbance Area (Solar Millennium 2009a). Kit fox scat was observed within the transmission line disturbance area in fall 2009 and a kit fox burrow was observed in spring 2009 (Solar Millennium 2009b). During spring 2010 field surveys, two kit fox complexes were found in the Project Disturbance Area and four burrow complexes were found in the buffer area (Solar Millennium 2010k). The PSEGS project footprint would impact fewer known desert kit fox burrows detected in 2009-2010 however since kit fox use multiple burrows within their home range impacts to this species would be similar to the PSPP. Sign of this species was reported to be observed during spring 2013 surveys for the PSEGS along the proposed generation tie-line or the natural gasline route. However, staff is awaiting a final survey report including a complete description of the location and type of sing detected to supplement the summary submitted by the project owner on May 21, 2013 (Palen 2013s). The entire Project Disturbance Area is suitable habitat for desert kit fox.

Nelson's Bighorn Sheep

Nelson's bighorn sheep includes bighorns from the Transverse Ranges through most of the desert mountain ranges of California, Nevada, and northern Arizona to Utah. Essential habitat for bighorn sheep includes steep, rocky slopes of desert mountains, termed "escape terrain." Their agility on steep rocky terrain is an adaptation used to escape predators such as coyotes, eagles, and cougars (Wehausen 1992). Surface water is another element of desert bighorn habitat considered essential to population health. Male and female bighorn sheep inhabiting desert ecosystems can survive without consuming surface water (Krausman et al. 1985) and males appear to drink infrequently in many situations; however, there are no known large populations of bighorn sheep in the desert region that lack access to surface water. In the spring, when annual plants are available, bighorn tend to disperse downhill to bajadas and alluvial fans to forage. Desert bighorn have a long lambing season that can begin in December and end in June in the Mojave Desert, and a small percentage of births commonly occur in summer, as well (Wehausen 1992).

Over the past 140 years, bighorn sheep have suffered considerable population declines throughout their range and metapopulations have been fragmented by roads and other barriers with a resulting decline in genetic diversity (Bleich et al. 1996, Epps et al. 2005). Disease, sometimes brought about by contacts with domestic sheep, drought and predation, interacting with other anthropogenic factors may also have contributed to declines in bighorn sheep populations (Wehausen 2005). Loss of surface water sources may also diminish the viability of existing populations (Wehausen 2005).

Two metapopulations of bighorn sheep occur within the NECO planning area, the Southern Mojave and Sonoran. Within these metapopulations, there are smaller, isolated subpopulations of bighorn sheep, known as demes, and there are nine demes occurring in the Sonoran metapopulation (BLM CDD 2002). Bighorn sheep metapopulations have been fragmented by highways, roads, railroads, and aqueducts primarily by the construction of Interstate 10 (I-10) and Interstate 40 which are major barriers to bighorn sheep movements. Transportation corridors of Highways 66, 62, 177, 95, and 78, the AT&SF Railroad (parallel to Old Highway 66) and the Eagle Mountain Railroad (scheduled for reactivation) inhibit bighorn sheep movements between demes. Nevertheless, bighorn sheep are known to cross these and other linear features such as transmission lines and fences.

The PSEGS site is located south of occupied range in Bighorn Sheep Wildlife Habitat Management Areas (WHMAs) in the Palen, Granite, and Coxcomb mountains (BLM

CDD 2002). Recent surveys also suggest bighorn sheep may occur in the Little Maria Mountains, farther northeast of the Project area (Wehausen 2009). CNDDB records for this species from the Project area indicate that bighorn sheep disperse through these mountain ranges typically whenever forage and water conditions permit.

No sign or evidence of Nelson's bighorn sheep were found during field surveys performed within the Study area; however, bighorn sheep have been documented in the Chuckwalla Mountains southwest of the Project site and the Palen, Granite, Coxcomb, Eagle mountain ranges among other ranges to the north, west, and east. Six rams were observed in the Coxcomb Mountains during Phase 2 golden eagle surveys performed jointly for various energy projects during 2010 (Tetra Tech 2010a). This species or its sign was not observed during spring 2013 surveys for the PSEGS along the proposed generation tie-line or the natural gasline route. However, staff is waiting for the final survey report, including an inventory of all wildlife detected, to supplement the summary submitted by the project owner on May 21, 2013 (Palen 2013s). The project area does not occur in a known movement corridor as identified in the NECO. All vegetation communities within the Study area are considered suitable for bighorn sheep.

Burro Deer

Burro deer is a subspecies of mule deer (*Odocoileus hemionus*) found in the Colorado Desert of southern California. This species is found in the Colorado region of the Sonoran Desert near the Colorado River and within desert dry wash woodland communities. Some burro deer are resident along the Colorado River, but a significant portion move into desert areas in response to water and forage. During the hot summers, water is critical, and burro deer concentrate along the Colorado River or the Coachella Canal where water developments have been installed and where microphyll woodland is dense and provides good forage and cover. With late summer thundershowers and cooler temperatures, deer move away from the Colorado River and Coachella Canal and then up the larger washes into mountains or wash complexes in the foothills (BLM CDD 2002).

During spring 2009 and December 2009 field surveys for the PSPP, deer scat and tracks were observed in rocky substrate and deep washes including the western, central, and eastern desert washes that transect the Project site. Deer sign was found within the washes and 150-foot-wide box culverts that convey the washes underneath I-10 via (Solar Millennium 2009a, AECOM 2009a). Burro deer use the culvert associated with the western-most Project area wash to access a water source at a nearby orchard. Other species sign observed in these washes include coyote, cottontail rabbit (*Sylvilagus audubonii*), bobcat, badger, and kit fox. During spring 2013 field surveys for the PSEGS, deer scat and tracks were observed in arboreal washes east of the modified gen-tie, both adjacent to the I-10 and one set of deer tracks was also observed in the buffer for the natural gas pipeline, south of the I-10. The entire Project site supports suitable habitat for burro deer.

SPECIAL STATUS INSECTS

Desert ecosystems are known to support a broad group of invertebrate life. As in all ecosystems, invertebrates play a crucial role in a number of biological processes. Insects serve as the primary or secondary food source for a variety of bird, reptile, and mammal predators; act as important pollination agents for plant species; they act as efficient components in controlling pest populations; and supporting the naturally occurring maintenance of an area by consuming detritus and contributing to necessary soil nutrients. The project site likely supports a wide variety of common and non-native invertebrates. Some of the orders identified in the project area included Hemiptera (true bugs), Coleoptera (beetles), and Diptera (flies). Various insects were observed on the project site by staff during surveys conducted to verify and document biological resources. A review of the CNDDB by staff resulted in a list of several special status insects known from the area, including the federally endangered Casey's June beetle.

Conservation Challenges California's Action Plan states that within the Mojave Desert Region, 29 invertebrate taxa are included on the CDFW's Special Animals List, including 19 arthropod taxa and 10 mollusk taxa. Of these, 22 are endemic to the Mojave Desert Region, and six other taxa found here are endemic to California but not restricted to this region (CDFW 2007a). Staff believes the adjacent agricultural operation and concomitant water supply likely attracts and supports a variety of insect species. Other species may migrate over the project site and general area at various times of the year, or stopover at the project site and general area during migration. Little data on migration routes is available, and staff is currently working to determine which, if any, special status species might be present at or over the project site and general vicinity during migratory movements. Any further data collected will be available in the FSA.

Biological Resources Table 4
Special-Status Species with Low to Moderate Potential to Occur at the Project Site

Species	Habitat Requirements and Geographic Range	Potential to Occur or Presence On Site
Plants		
Angel trumpets *Acleisanthes longiflora*	This species occurs in Sonoran desert scrub habitats on carbonate soils from approximately 200 to 300 feet above MSL. There are two records from the Consortium of California Herbaria from the Colorado Desert, Palo Verde area (CCH 2010).	This species has a low potential to occur since the elevation range of the Project site is appropriate for this species although the Study area does not support carbonate/limestone derived soils in mountainous areas.
Argus blazing star *Mentzelia puberula*	This plant species occurs in desert scrub and desert woodlands with limestone and granitic slopes above 2,000 feet in elevation. Based on 13 Consortium of California Herbaria database records for this species, this species has been collected from Riverside, San Bernardino, and Imperial Counties from the Little and Big Maria Mountains in Riverside County.	This species is not expected to occur in the study area due to lack of limestone and granitic slopes which are soil types preferred by this species that are absent from the study area. The Project site is located at approximately 130 to 200 feet above MSL which is well below the typical elevation where this species typically occurs.
Arizona spurge *Chamaesyce arizonica*	This species occupies sandy, Sonoran desert scrub habitat areas and has been reported from Imperial, Riverside, and San Diego Counties and portions of Arizona and Baja California (CNPS 2009) from approximately 150 feet to 1,200 feet above MSL. There are seven database records from the Consortium of California Herbaria primarily from San Diego County but also Riverside and Imperial counties often from sandy areas and transition areas between chaparral and desert habitats. The record from Riverside County is near Palm Springs from Andreas Canyon (CCH 2010).	Arizona spurge has a low potential to occur within the study area due to the presence of suitable habitat and appropriate elevation range of the Project site.
Bitter hymenoxys *Hymenoxys odorata*	Bitter hymenoxys grows riparian scrub and Sonoran desert scrub habitats from 150 feet to 500 feet above MSL. This plant species blooms from February through November (CNPS 2009). There are five CNDDB records for this species for the entire state of California, two of which occur in Riverside County; the nearest CNDDB occurrence is a historical record approximately 5 miles southeast of the Project area from sandy slope, low bottom lands and overflow flats (CNDDB 2010).	This species was not found during spring 2009-2010 or 2013 field surveys. This species has a potential to occur within desert dry wash woodland, unvegetated washes, and Sonoran creosote bush scrub habitats within the Project area.

Species	Habitat Requirements and Geographic Range	Potential to Occur or Presence On Site
Bitter snakeweed *Condalia globosa* var. *pubescens*	Also referred to by the common name, spiny abrojo. Bitter snakeweed occurs in Sonoran desert scrub from approximately 400 feet to 3,000 feet above MSL. Bitter snakeweed blooms from March through May (CNPS 2009). Based on 35 records from the Consortium of California Herbaria database, all records are from Imperial County except one from Riverside County, a record from 1,900 feet in elevation from a relatively flat alluvial fan from Chuckwalla Bench (CCH 2010). There are no CNDDB records for this species in California (CNDDB 2010).	This species was not observed during spring 2009-2010 or 2013 field surveys. The Project site occurs below the elevation where this species typically occurs.
California ayenia *Ayenia compacta*	This species occurs in Mojavean and Sonoran desert scrub habitats from approximately 500 to 3,300 feet above MSL. This species blooms from March through April. There are 29 records from the Consortium of California Herbaria database from the Anza-Borrego area alone, one from Riverside County from a sandy wash in the Santa Rosa Mountains off Martinez Canyon (CCH 2010). The nearest CNDDB occurrence is a historical record from 1776 approximately 30 miles southwest of the Project area in the Chuckwalla Mountains (CNDDB 2010).	This species was not observed during spring 2009-2010 or 2013 field surveys. This species has a potential to occur within Sonoran creosote bush scrub and desert wash habitats within the Project area.
California satintail *Imperata brevifolia*	This species occurs in grassy areas found near chaparral, desert scrub, riparian scrubs, coastal scrub, wet springs, meadows, stream sides, and floodplains from sea level to approximately 1,500 feet above MSL. There are 64 records from the Consortium of California Herbaria database from many northern and southern California Counties. Records from Riverside County are from the Palm Springs and San Jacinto Mountains area along irrigation ditches or streams.	California satintail has a low potential to occur within the study area due to the presence of suitable habitat although lack of occurrences from the Project area. This species was not observed during spring 2009-2010 or 2013 field surveys.
Chaparral sand verbena *Abronia villosa* var. *aurita*	This species occupies sandy soil areas of chaparral, coastal sage scrub, and sandy desert dune habitats (CNPS 2009) from approximately 240 feet to 4,800 feet above MSL. There are 147 records in the Consortium of California Herbaria database many from Riverside County in the San Jacinto Mountains area.	Chaparral sand verbena has a low potential to occur within the study area due to the presence of suitable habitat although lack of occurrences from the Project area. This species was not observed during spring 2009-2010 or 2013 field surveys.

Species	Habitat Requirements and Geographic Range	Potential to Occur or Presence On Site
Coachella Valley milk-vetch *Astragalus lentiginosus* var. *coachellae*	The Coachella Valley Multiple Species Habitat Conservation Plan states that this species occurs on "dunes and sandy flats, along the disturbed margins of sandy washes, and in sandy soils along roadsides and in areas formerly occupied by undisturbed sand dunes. Within the sand dunes and sand fields, this milk-vetch tends to occur in the coarser sands at the margins of dunes, not in the most active blowsand areas. As this species is strongly affiliated with sandy substrates, it may occur in localized pockets where sand has been deposited by wind or by active washes. It may also occur in sandy substrates in creosote bush scrub, not directly associated with sand dune habitat (CVAG 2007). This plant species blooms from February to May, producing pink to deep magenta-colored flowers. This species occurs on aeolian deposits with fewer than 25 occurrences in the Coachella Valley. Coachella Valley milk-vetch depends on natural disturbances from fluvial and aeolian processes for seedling establishment (BLM CDD 2002).	This species was not observed during spring 2009-2010 or 2013 surveys and does not have a potential to occur in the study area. This species is not expected to occur in the Project area. The distribution of Coachella Valley milk-vetch is restricted to the Coachella Valley in Riverside County, between Cabazon and Indio. CVAG (2007) identifies six outlying occurrences within a 5-mile area along Rice Road in the Chuckwalla Valley north of Desert Center, California (CVAG 2007); however, USFWS staff has indicated that these occurrences are not of the listed taxon (Engelhard, pers. comm.).
Cove's cassia *Senna covesii*	This species occurs on dry, sandy desert washes and slopes of the Sonoran Desert between 1,600 to 2,000 feet above MSL. This species occurs in sandy washes, roadsides, and alkaline flats in the Mojave and northern Sonoran deserts between 1,600 to 2,000 feet above MSL (CNPS 2009).	Cove's cassia has a low potential to occur within the study area due to the presence of suitable habitat and the Project site being located below the typical elevation range where this species is known from. This species was not observed during spring 2009-2010 or 2013 field surveys.
Crucifixion thorn *Castela emoryi*	This species occurs in Sonoran and Mojavean deserts in scrub habitats and playas with dry, gravelly washes, slopes, and plains from approximately 300 to 2,100 feet above MSL. There are 64 records in the Consortium of California Herbaria database from Riverside, San Bernardino, Imperial counties among others and often times prefers grassy or hayfield habitats. There is a record from a hayfield in Chuckwalla Valley.	This species has a low potential to occur within the study area due to the presence of suitable habitat and appropriate elevation range of the Project site. This species was not observed during spring 2009-2010 or 2013 field surveys.
Desert portulaca *Portulaca hamiloides*	This species occurs in Joshua tree woodlands and has been reported from Riverside and San Bernardino counties and portions of Arizona and Baja, California from 3,000 feet to 3,600 feet above MSL (CNPS 2009).	This species is not expected to occur within the study area due to lack of typical habitat associations and the Project site being located outside of the elevation range. This species was not observed during spring 2009-2010 or 2013 field surveys.

Species	Habitat Requirements and Geographic Range	Potential to Occur or Presence On Site
Desert sand parsley *Ammoselinum giganteum*	This species occupies Sonoran creosote bush scrub habitat and has been reported from Riverside County, California and portions of Arizona (CNPS 2009) at approximately 1,200 feet above MSL (There are two records from the Consortium of California Herbaria database from Riverside County from the Chuckwalla Valley where this species was observed growing in dry basins at 500 feet above MSL (CCH 2010).	Desert sand parsley has a low potential to occur within the study area due to presence of suitable habitat and reported occurrences from the Chuckwalla Valley. This species was not observed during spring 2009-2010 or 2013 field surveys.
Desert spike moss *Selaginella eremophila*	This is a dense, mat forming, non-flowering plant. This species occurs in Sonoran creosote scrub habitats in gravelly or rocky soils from approximately 600 to 2,700 feet above MSL. There are 56 records in the Consortium of California Herbaria database from Riverside and San Diego Counties with several records from Anza Borrego State Park, Palm Springs, Palm Canyon, and San Jacinto Mountain Range. One collection from Riverside County is from the vicinity of the Chocolate-Chuckwalla Mountain region near the north side of the Orocopia Mountains from sloped rocky, shady surfaces in gravelly soils (CCH 2010).	This species was not observed during spring 2009-2010 or 2013 field surveys. This species has a low potential to occur within the study area give the presence of suitable desert scrub habitat and historic collections from the Project area, although the Project site is located below the typical elevation range of this species.
Dwarf germander *Teucrium cubense* ssp. *depressum*	This species occurs in desert dune, playa margins, and Sonoran desert scrub habitats from approximately 100 feet to 1,200 feet above MSL. This species typically blooms from March to May but may also bloom from September through November. This species typically occurs in sandy soils and wash habitats and is known from fewer than 10 occurrences in California (CNPS 2009). There are 15 records from Consortium of California Herbaria database from Riverside and Imperial counties; there are records from the Chuckwalla Valley in the Hayfield area and Palo Verde Valley. There is a CNDDB record from Wiley's Well Road (400 feet elevation) from 1979 (CNDDB 2010). Another CNDDB occurrence is a historical record from 1912 located approximately 7 miles southeast of the Project area from the Palo Verde Valley (CNDDB 2010).	This species has a low potential to occur due to the presence of suitable habitat and appropriate elevation range of the site. This species was not observed during spring 2009-2010 or 2013 field surveys.

Species	Habitat Requirements and Geographic Range	Potential to Occur or Presence On Site
Foxtail cactus *Coryphantha alversonii*	This species occurs on rocky, granitic soils in Sonoran and Mojavean desert scrub habitats from 200 feet to 4,600 feet above MSL. Prior to conducting spring 2009 field surveys, a reference population was observed on April 9, 2009 at a gravel pit northwest of Blythe along State Route 95 and several individuals were observed in relatively undisturbed Sonoran creosote bush scrub on granitic rock, a preferred habitat type of this species (CNPS 2009). This species was not found during surveys performed in the Biological Resources Survey Area (BRSA). There are 25 records of this species from the Consortium of California Herbaria database from Riverside, Imperial, and San Bernardino Counties. There are records from the Chuckwalla Valley from rocky, granitic slopes (CCH 2010).	Foxtail cactus has a low potential to occur within the study area due to the presence of suitable desert scrub habitat and appropriate elevation of the site although lack of rocky, grantic soils. This species was not observed during spring 2009-2010 or 2013 field surveys.
Mesquite nest straw *Stylocline sonorensis*	This species occupies Sonoran desert scrub habitats around 1,300 feet elevation and has been reported from Riverside County and portions of Arizona and Sonora, Mexico (CNPS 2009). There are two records from the Consortium of California Herbaria database from Riverside County both from the Chuckwalla Mountains, Hayfields region from 1930 (CCH 2010).	This species was not observed during spring 2009-2010 or 2013 field surveys. Mesquite nest straw has a low potential to occur within the study area due to suitable habitat present within the site.
Orocopia sage *Salvia greatae*	This species occurs in the southeastern Sonoran Desert and is associated with the Orocopia and Chocolate Mountains on alluvial slopes between 100 and 800 feet above MSL. There are 49 records from the Consortium of California Herbaria database, several from the Chocolate, Chuckwalla, and Orocopia mountain areas (CCH 2010).	This species was not observed during spring 2009-2010 or 2013 field surveys. This species has a low potential to occur within the study area due to the presence of suitable habitat and appropriate elevation range of the site.
Pink fairyduster *Calliandra eriophylla*	This species occurs in the Sonoran Desert in sandy washes, slopes and mesas from 350 to 5,000 feet above MSL. There are 62 records from the Consortium of California Herbaria database, several from the Chocolate-Chuckwalla Mountains area in Imperial and San Diego counties (CCH 2010).	This species was not observed during spring 2009-2010 or 2013 field surveys. Pink fairy duster has a low potential to occur within the study area due to suitable habitats, appropriate elevation range of the site, and reported records from the Project area.

Species	Habitat Requirements and Geographic Range	Potential to Occur or Presence On Site
Pink velvet mallow *Horsfordia alata*	This species occurs in the Sonoran Desert in California, Arizona, and Mexico. It occurs in Sonoran desert scrub habitats from approximately 300 to 1,500 feet above MSL. There are no CNDDB records for this species for the entire state of California; the most recent collections have been from the Chocolate, Chuckwalla, and Cargo Muchacho Mountains approximately 50 miles south of the Study area and are believed to be extant.	This species was not observed during spring 2009-2010 or 2013 field surveys.
Sand evening-primrose *Camissonia arenaria*	This species occupies sandy and gravelly areas of Sonoran desert scrub habitat and has been reported from Imperial and Riverside counties and areas of Arizona and Mexico from 200 feet to 2,700 feet above MSL (CNPS 2009). There are 13 records of this species in the Consortium of California Herbaria database several from the Chocolate-Chuckwalla Mountains, Palo Verde Valley, and Ogilby Pass area (CCH 2010).	This species has a low potential to occur within the study area due to the presence of suitable habitat and appropriate elevation of the site. This species was not observed during spring 2009-2010 or 2013 field surveys.
Slender woolly-heads *Nemacaulis denudata* var. *gracilis*	This species occupies desert sand dunes, coastal dunes, and Sonoran desert scrub (CNPS 2009) from 150 to 1,200 feet above MSL. There are 45 records in the Consortium of California Herbaria database from the Palm Springs, Indian Wells area in Riverside County (CCH 2010).	Slender woolly-heads has a low potential to occur within the study area due to suitable habitat and appropriate elevation range of the site. This species was not observed during spring 2009-2010 or 2013 field surveys.
Small-flowered androstephium *Androstephium breviflorum*	This species occurs in desert dune and Mojavean desert scrub habitats from approximately 700 feet to 2,000 feet above MSL (CNPS 2009). This species blooms from March through April and often occurs on desert bajadas. The nearest CNDDB record for this species is from Cadiz Valley from Riverside and San Bernardino Counties approximately one mile north of Highway 62 during 1995 from a sandy, Mojavean Desert shrub-land bajada (CNDDB 2010). This	This species has a potential to occur within the site due to suitable sand dune habitat and appropriate elevation range of the site. Species was not observed during 2009-2010 or 2013 field surveys.
Spearleaf *Matelea parvifolia*	This species occurs in Mojavean and Sonoran desert scrub habitats from 1,320 feet to approximately 3,300 feet above MSL. This species blooms from March through May (CNPS 2009). The nearest CNDDB record for this species is from the Chuckwalla Bench area during 1986 from desert dry wash woodland and creosote scrub habitats (CNDDB 2010).	This species has a potential to occur within the Project Site although was not observed during spring 2009 field surveys. The Project site is located below the typical elevation range of this species. This species was not observed during spring 2009-2010 or 2013 field surveys.

Species	Habitat Requirements and Geographic Range	Potential to Occur or Presence On Site
Wiggins' cholla *Cylindropuntia wigginsii*	Wiggins' cholla is not recognized as a species, but is considered a hybrid of silver cholla (*C. echinocarpa*) and pencil cholla (*C. remosissima*). Wiggins' cholla is not found as a separate species in The Jepson Manual nor in A California Flora and Supplement (Munz and Keck 1959, Munz 1968); however, the BLM's Proposed NECO identifies Wiggins' cholla as a special-status species (BLM CDD 2002). CNPS considers this species a sporadic hybrid of the two Cylindropuntia species mentioned above (CNPS 2009).	Since this species is not a recognized subspecies, Wiggins' cholla is not expected to occur in the Project area.
Birds		
Bendire's thrasher *Toxostoma bendirei*	Bendire's thrashers are known in California from scattered locations in Kern, Inyo, San Bernardino, and Riverside counties. This species is a summer resident in southeastern California, and arrives at breeding grounds from mid-March through May, and departs by late August. It favors open grassland, shrubland, or woodland with scattered shrubs, primarily in areas that contain large cholla, Joshua tree, Spanish bayonet, Mojave yucca, palo verde, mesquite, catclaw, desert-thorn, or agave. The status of populations of this species is poorly understood, but threats are believed to be loss of habitat due to urbanization, harvesting of yucca and Joshua trees, overgrazing, and off-road vehicle activity. In parts of the range, grazing may increase habitat suitability by increasing scattered junipers within the area.	The desert dry wash natural community provides potential habitat for this species (148 acres), although this species was not observed during surveys. There are CNDDB (2010) records from near the Desert Center, approximately 8 miles west of the Project, from 2004.
Black-tailed gnatcatcher *Polioptila melanura*	A year round resident in southwestern United States and central and northern Mexico, in California the black-tailed gnatcatcher is found in the southeast desert wash habitat from Palm Springs and Joshua Tree National Monument south, and along the Colorado River. It is now rare in eastern Mojave Desert north to the Amargosa River, Inyo Co. This species nests primarily in wooded desert wash habitat, but also occurs in creosote scrub habitat during the non-breeding season.	Based on a review of the natural community descriptions provided by the Applicant, the Project site contains little, if any, of the dense scrub habitat preferred by this species. They are known from the area, including from McCoy Spring, Palen Valley, and Chuckwalla Well (Fitton 2008). The closet occurrence based on the CNDDB (2010) is from 1977 and is approximately 16.5 miles east of the Project site.

Species	Habitat Requirements and Geographic Range	Potential to Occur or Presence On Site
Crissal thrasher *Toxostoma crissale*	Crissal thrashers are non-migratory residents ranging from southern Nevada and southeastern California to western Texas and central Mexico. This species prefers habitats characterized by dense, low scrubby vegetation, which, at lower elevations, includes desert and foothill scrub and riparian brush. Nests of this species typically consist of an open cup of twigs, lined with finer vegetation, and are placed in the middle of a dense shrub.	Based on a review of the natural community descriptions provided by the Applicant, the Project site contains little, if any, of the dense scrub habitat preferred by this species. They are known from the area, including from McCoy Spring, Palen Valley, and Chuckwalla Well (Fitton 2008). The closet occurrence based on the CNDDB (2010) is from 1977 and is approximately 16.5 miles east of the Project site.
Ferruginous hawk *Buteo regalis*	Ferruginous hawks do not breed in California, but are winter residents and in California are most common in grassland and agricultural areas in the southwest. Ferruginous hawks are found in open terrain from grasslands to deserts, and are usually associated with concentrations of small mammals. Threats to this species include loss of wintering habitat from urbanization and cultivation.	The Project site contains suitable wintering habitat for this species. There are nine CNDDB (2010) records for this species in western Riverside County.
Gila woodpecker *Melanerpes uropygialis*	The Gila woodpecker's range is limited to a small area of southwestern United States and northwestern Mexico. In California, this species is found only along the Colorado River and in small numbers in Imperial County. In southeastern California, Gila woodpeckers were formerly associated with desert washes extending up to 1 mile from the Colorado River. Currently, they are found only in riparian areas along the Colorado River.	In California, this species is currently known only from the Colorado River; therefore this species is not expected in the Project site. The Project site does not contain suitable nesting habitat for this species. The closest CNDDB (2010) record for this species is a 1986 record east of the Project site at the Colorado River.
Gilded flicker *Colaptes chrysoides*	In California, the gilded flicker is known from the southeast; habitat includes stands of giant cactus, Joshua tree, and riparian groves of cottonwoods and tree willows in warm desert lowlands and foothills. Until the mid-1990's, this species was considered a subspecies of northern flicker (*C. atratus*). This species nests primarily in cactus, but also will use cottonwoods and willows of riparian woodlands. This species may be nearly extinct in California.	This species is not expected to regularly use the Project site due to lack of suitable habitat. The closest CNDDB (2010) records for this species are along the Colorado River.
Mountain plover Charadrius montanus	Mountain plovers do not breed in California, but are winter visitors primarily from September to mid-March. In California they are found in the Central Valley, Antelope Valley, San Jacinto Valley, Imperial Valley, and Palo Verde Valley. Mountain plover habitat includes short-grass prairie or their equivalents, and in southern California deserts are associated primarily with agricultural areas, though use of these areas is suspected to be because of loss of native grassland and playa habitats.	This species may use the dry lakebed and nearby agricultural areas as winter habitat. The closest CNDDB (2010) record for this species is in Imperial County at the southern end of the Salton Sea.

Species	Habitat Requirements and Geographic Range	Potential to Occur or Presence On Site
Northern harrier *Circus cyaneus*	In western North America, the northern harrier breeds from northern Alaska south to Baja California, Mexico. This species does not commonly breed in desert regions of California, where suitable habitat is limited, but winters broadly throughout California in areas with suitable habitat. Northern harriers forage in open habitats including deserts, pasturelands, grasslands, and old fields.	The Project site contains suitable wintering habitat for the northern harrier, and this species was observed during 2009 and 2010 Project site surveys (Solar Millennium 2009a). There are CNDDB (2010) nesting records for this species in eastern Riverside County.
Peregrine falcon *Falco peregrinus*	The Peregrine falcon's year-round range includes coastal and northwestern California and the Sierra Nevada and other California mountains. Additionally, this species winters inland throughout the Central Valley and in northeastern California. They are rare in the arid southeast, but they occur and are suspected to breed in the lower Colorado River Valley. Peregrine falcons require open habitat for foraging, and prefer breeding sites near water. Nesting habitat includes cliffs, steep banks, dunes, mounds, and some human-made structures.	This species may forage on the Project site and nest in nearby mountains, but was not observed in the Project site during Project surveys. There are no CNDDB (2010) records for Riverside County.
Purple martin *Progne subis*	The historical breeding range of the purple martin includes southern California, though populations have shrunk dramatically. Neither the historical or current breeding range, however, includes the Colorado Desert. Purple martins habitat requirements include adequate nest sites and availability of large aerial insects, and therefore are most abundant near wetlands and other water sources. Threats to this species include loss of large tree and snags and competition from European starlings.	This species was observed migrating through the Project site, but is not expected to extensively use the Project site. There are six CNDDB (2010) records for this species from western Riverside County, the most recent of which include nesting records from 1983 and 1993.
Short-eared owl *Asio flammeus*	Short-eared owls breed through much of northern North America, and are year-round residents in some areas of California. Historically, this species occurred throughout much of California, west of the southern deserts, in low numbers. Currently, small populations breed in regularly in the Great Basin and in the Sacramento/San Joaquin River Delta area, but sporadically in other parts of its former range. Short-eared owls require open country that supports small mammal populations, and that also provides adequate vegetation to provide cover for nests. This includes salt- and freshwater marshes, irrigated alfalfa or grain fields, and ungrazed grasslands and old pastures.	The Project site contains suitable wintering habitat for the short-eared owl. This species was not observed during surveys for this Project, it was observed during surveys for a nearby proposed energy facility site immediately west of the McCoy Mountains. There are no Riverside County CNDDB (2010) records for this species.

Species	Habitat Requirements and Geographic Range	Potential to Occur or Presence On Site
Swainson's hawk *Buteo swainsoni*	Swainson's hawks require large areas of open landscape for foraging, including grasslands and agricultural lands that provide low-growing vegetation for hunting and high rodent prey populations. Swainson's hawks typically nest in large native trees such as valley oak, cottonwood, walnut, and willow, and occasionally in nonnative trees, such as eucalyptus within riparian woodlands, roadside trees, trees along field borders, isolated trees, small groves, and on the edges of remnant oak woodlands. While there are historical breeding records of this species from the Colorado Desert, this species is now known from southern California only as a spring and fall migrant. This reduction in breeding range is believed to be from loss of nesting habitat.	The Project site may provide foraging habitat for migrating individuals, and this species was observed in the Project site during 2009 and 2010 surveys. There are no CNDDB (2010) records for this species in Riverside County.
Vaux's swift *Chaetura vauxi*	This species is not known to breed in Riverside County or elsewhere in southern California. Very few nests have been found so their breeding range has been inferred from sightings of birds flying over potential nesting areas during their nesting season, in June and July. Vaux's swifts prefer to nest in the hollows formed naturally inside of large old conifer trees, especially snags, which are entirely lacking from the Project site.	This species was observed during surveys, but occurrences are expected to be of migrants, only.
Vermilion flycatcher *Pyrocephalus rubinus*	Vermilion flycatchers are rare breeders or residents in localized areas of southern California, including along the Colorado River. They are usually found near water in arid scrub, farmlands, parks, golf courses, desert, savanna, cultivated lands, and riparian woodlands; nesting substrate includes cottonwood, willow, and mesquite.	Within the Project vicinity, occurrences of this species are limited to the Colorado River. This species is not expected in the Project site. The closest CNDDB (2010) records include a recent (1983) record from the Blythe golf course.
Yellow warbler *Dendroica petechia*	Yellow warblers historically bred throughout much of California except for high elevations, the Colorado Desert, and most of the Mojave Desert. Breeding abundance for this species has declined in much of California, as has the breeding range, especially in the Central Valley and parts of Owens Valley. In southeastern California, this species is known only from the lower Colorado River Valley from the middle of San Bernardino County through Riverside and Imperial Counties. Currently, this species no longer breeds in much of the Riverside County segment of the lower Colorado River Valley. This species commonly uses wet, deciduous thickets for breeding, and seeks a variety of wooded, scrubby habitats in winter.	This species was not observed during surveys, and is not expected to nest in the Project site due to lack of suitable habitat. The closest CNDDB (2010) records for this species are two 1986 records east of the Project site at the Colorado River.

Species	Habitat Requirements and Geographic Range	Potential to Occur or Presence On Site
Yellow-breasted chat *Icteria virens*	The yellow-breasted chat occurs as a summer resident and migrant in California. In the southeastern California, the yellow-breasted chat breeds primarily in scattered locations in Owen's Valley and the Mojave, from the Salton Sea, and from the lower Colorado River Valley. This species occupies shrubby riparian habitat with an open canopy, and will next in non-native species including tamarisk. Threats to this species include loss of riparian habitat, and, it is suspected, pressure from cowbird parasitism.	In this region, this species is associated with the Colorado River only. The Project site does not contain suitable habitat for this species. CNDDB (2010) records in the region are associated with the Salton Sea or the Colorado River. The closest CNDDB records for this species are two 1986 records east of the Project site at the Colorado River.
Mammals		
Colorado Valley woodrat *Neotoma albigula venusta*	Occurs from southern Nevada, southeastern California, northeastern Baja California, to western Arizona. Colorado Valley woodrats are found in a variety of habitats including low desert, pinyon-juniper woodlands, and desert-transition chaparral. Suitable habitat elements for this species include washes where organic debris gathers, areas of prickly pear cactus and mesquite, rocky areas, and crevices in boulders which are used for cover and nest sites.	This species is not expected to occur due to coarse soils and disturbance of the Project site from past agricultural activities. The nearest CNDDB record is from 1934 near Blythe (CNDDB 2010).
Arizona myotis *Myotis occultus*	This species has been found from southeastern California through Arizona, New Mexico, and south into Chihauhau, Mexico. Arizona myotis is most commonly known from conifer forests from 6,000 to 9,000 feet in elevation, although maternity roosts are known from much lower elevations including areas along the Colorado River in California.	This species is not expected to occur due to lack of coniferous forests and low elevation of the study area. The closest CNDDB (2010) record is a historical occurrence from 1945 approximately 10 miles south of the study area near the town of Ripley.
Big-free tailed bat *Nyctinomops macrotis*	This species ranges from most of South America northward to include Mexico, Arizona, New Mexico, southern and western Texas, southern California, southeastern Nevada, southern Utah, and north and western Colorado from generally sea level to 8,000 feet in elevation. This species occurs in desert shrub, woodlands, and coniferous forests. It roosts mostly in the crevices of rocks although big free-tailed bats may roosts in buildings, caves, and tree cavities	This species has the potential to roost and forage within the project area. The nearest occurrences for this species in Riverside County are from the vicinity of Palm Springs and Joshua Tree National Park (CNDDB 2010). A single bat of an unidentified species was observed roosting beneath a bridge near Corn Springs Road near the location of the proposed substation during December 2009 surveys (AECOM 2010a).

Species	Habitat Requirements and Geographic Range	Potential to Occur or Presence On Site
California leaf-nosed bat *Macrotus californicus*	California leaf-nosed bats occur in the deserts of California, southern Nevada, Arizona and south to northwestern Mexico. In California, they are now found primarily in the mountain ranges bordering the Colorado River Basin. In California, the two largest roosts (each sheltering 1,500 bats during winter months) are in mines in extreme southeastern California. This species depends on either caves or mines for roosting habitat. All major maternity, mating, and overwintering sites are in mines or caves (BLM CDD 2002). Radio-telemetry studies of *Macrotus* in the California desert show that the California leaf-nosed bat forages almost exclusively among desert wash vegetation within 6.2 miles of their roost (WBWG 2005-2009).	All habitats within the Project Disturbance Area are suitable habitats for this species. A single bat of an unidentified species was observed roosting beneath a bridge near Corn Springs Road near the location of the proposed substation during December 2009 surveys (AECOM 2010a). There are several CNDDB records in the vicinity of the study area. The nearest record is from 1993 near the McCoy Mountains area in creosote bush scrub habitat approximately where approximately 300 adults were observed roosting (CNDDB 2010).
Cave myotis *Myotis velifer*	The cave myotis occurs from western Texas, to southern Nevada, southeastern California (only along the Colorado River), southward into Mexico, and is also widely distributed in Arizona. This species is found primarily at lower elevations (the Sonoran and Transition life zones) of the arid southwest in areas dominated by creosote bush, palo verde, and cactus. This species is a “cave dweller” and caves are the main roosts although this species may also use mines, buildings, and bridges for roosts.	This species has a potential to occur within the study area, more likely as a foraging species than a roosting bat species. The nearest CNDDB record for this species is from 2002 near the I-15 bridge over the Colorado River in Blythe where individual bats of this species were detected acoustically during April 2002 (CNDDB 2010).
Hoary bat *Lasiurus cinereus*	Hoary bat is the most widespread of North American bats and are highly associated with forested habitats in the west. Hoary bat roosts are usually located at the edge of a clearing although more unusual roosting sites have been reported in caves, beneath rock ledges, woodpecker holes, squirrel nests, and building sides.	This species has a potential to roost and forage within the Project area. The closest CNDDB (2010) record is a historical occurrence approximately from the town of Neighbors during 1919. A single bat of an unidentified species was observed roosting beneath a bridge near Corn Springs Road near the location of the proposed substation during December 2009 surveys (AECOM 2010a).

Species	Habitat Requirements and Geographic Range	Potential to Occur or Presence On Site
Pallid bat *Antrozous pallidus*	Pallid bats inhabit low elevation (less than 6,000 feet) rocky, arid deserts and canyonlands, shrub/steppe grasslands, but also occur in higher elevation coniferous forests, greater than 7,000 feet in elevation. This species is most abundant in xeric landscapes including the Great Basin, Sonoran, and Mojave deserts (WBWG 2005-2009). Pallid bats are known from Cuba, Mexico, and throughout the southwestern and western United States. Population trends are not well known, but there are indications of decline. Pallid bats roost alone, in small groups (2 to 20 bats), or gregariously (100s of individuals). Day and night roosts include crevices in rocky outcrops and cliffs, caves, mines, trees with exfoliating bark, and various human structures such as bridges, barns, porches, bat boxes, and human-occupied as well as vacant buildings (WBWG 2005-2009).	This species has a potential to roost and forage within the Project area. A single bat of an unidentified species was observed roosting beneath a bridge near Corn Springs Road near the location of the proposed substation during December 2009 surveys (AECOM 2010a). Anabat/Sonobat surveys, which allows for more precise identification of bat species based on the recording of echolocation frequencies, were not conducted in conjunction with the December 2009 surveys. The nearest CNDDB record is approximately 5 miles southeast of the Project site (CNDDB 2010).
Pocketed free-tailed bat *Nyctinomops femorosaccus*	This species occurs in western North America, from southern California, central Arizona, southern New Mexico, western Texas, south into Mexico and Baja, California (WBWG 2005-2009). Despite only a limited number of records, pocketed free-tailed bats are known to occur in the desert from March through August, when they are migrating out of the area. In California, they are found primarily in creosote bush and chaparral habitats in proximity to granite boulders, cliffs, or rocky canyons.	This species has a potential to roost and forage within the Project site based on what is understood of its habitat requirements and roosting habits. The nearest CNDDB record for this species is from 2002 near the I-15 bridge over the Colorado River in Blythe. Individual bats of this species were detected acoustically during April 2002 (CNDDB 2010). A single bat of an unidentified species was observed roosting beneath a bridge near Corn Springs Road near the location of the proposed substation during December 2009 surveys (AECOM 2010a).
Spotted bat *Euderma maculatum*	This species is known from all the states west of and including Montana, Wyoming, Colorado, New Mexico and Texas. Although broadly distributed, this species is rarely common, but may occur locally from southern British Columbia, northern Arizona, Arizona/ Utah border, and western Texas from below sea level to 8,100 feet above MSL. Spotted bats occur in arid, low desert habitats to high elevation conifer forests and prominent rock features appear to be a necessary feature for roosting.	This species has a potential to roost and forage within the Project site based on what is understood of its habitat requirements and roosting habits. The nearest CNDDB record is a historical occurrence from 1907 in the Colorado Desert near Mecca (CNDDB 2010). A single bat of an unidentified species was observed roosting beneath a bridge near Corn Springs Road near the location of the proposed substation during December 2009 surveys (AECOM 2010a).

Species	Habitat Requirements and Geographic Range	Potential to Occur or Presence On Site
Townsend's big-eared bat *Corynorhinus townsendii*	This species has been reported in a wide variety of habitat types ranging from sea level to approximately 9,000 feet above MSL. Habitat associations include coniferous forests, deserts, native prairies, riparian communities, active agricultural areas, and coastal habitat types. Foraging associations include edge habitats along streams, adjacent to and within a variety of wooded habitats.	This species has a potential to forage within the Study although roosting is unlikely to occur since cave and abandoned buildings do not occur within the study area. A single bat of an unidentified species was observed roosting beneath a bridge near Corn Springs Road near the location of the proposed substation during December 2009 surveys (AECOM 2010a).
Western mastiff bat *Eumops perotis*	The subspecies that occurs in North America*, E. p. californicus*, ranges from central Mexico across the southwestern United States including parts of California, southern Nevada, Arizona, southern New Mexico and western Texas. Recent surveys have extended the previously known range to the north in both Arizona with several localities near the Utah border and California. It is found in a variety of habitats, from desert scrub to chaparral to oak woodland and into the ponderosa pine belt and high elevation meadows of mixed conifer forests. Surveys in northern Arizona have documented roosts at approximately 3,600 feet above MSL and foraging bat species at 7,500 feet above MSL (WBWG 2005-2009).	The Project site does not support suitable roosting habitat for western mastiff bat but this species may utilize the Study area for foraging. The nearest CNDDB record is approximately five miles southwest of the study area (CDFW 2010). A single bat of an unidentified species was observed roosting beneath a bridge near Corn Springs Road near the location of the proposed substation during December 2009 surveys (AECOM 2010a).
Yuma myotis *Myotis yumanensis*	This species ranges across the western third of North America from British Columbia, Canada, to Baja California and southern Mexico. Yuma myotis is usually associated with permanent sources of water, typically rivers and streams, feeding primarily on aquatic emergent insects, but Yuma myotis also use tinajas in the arid west. It occurs in a variety of habitats including riparian, arid scrublands and deserts, and forests. The species roosts in bridges, buildings, cliff crevices, caves, mines, and trees.	This species has a potential to roost and forage within the Project site. The nearest CNDDB record is from 2002 near the Blythe bridge over the Colorado River where individual bats of this species were detected acoustically during April 2002 (CNDDB 2010).

Species	Habitat Requirements and Geographic Range	Potential to Occur or Presence On Site
Yuma mountain lion *Puma concolor browni*	In the NECO planning area, mountain lions primarily inhabit the low mountains and extensive wash systems in and around Chuckwalla Bench, Chuckwalla Mountains, Chocolate Mountains, Picacho Mountains, Milpitas Wash, Vinagre Wash, and other washes in that area. Mountain lions typically occur in habitats with extensive, well-developed riparian or shrubby vegetation interspersed with irregular terrain, rocky outcrops, and community edges. Mountain lions are restricted to the southern Colorado Desert from Joshua Tree National Park south and east to the Colorado River. Burro deer, the primary prey item, are known to spend the hot summer and fall in riparian areas along the Colorado River and in dense microphyll woodlands near the Coachella Canal.	Mountain lion likely use the BRSA but no definitive sign for this species was observed during 2009 spring surveys. This species or its sign was not reported to be observed during spring 2013 surveys for the PSEGS along the proposed generation tie-line or the natural gasline route. However, staff is awaiting a final survey report inlcuding an inventory of all wildlife detected to supplement the summary submitted by the project owner on May 21, 2013 (Palen 2013X).

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

CONSTRUCTION AND OPERATION – DIRECT IMPACTS, INDIRECT IMPACTS, AND MITIGATION

Direct impacts are those resulting from a project and occurring at the same time and place. Indirect impacts are caused by a project, but can occur later in time or farther removed in distance while still reasonably foreseeable and related to the project. The potential impacts discussed in this analysis are those most likely to be associated with construction and operation of the Project.

Impact analyses typically characterize effects to plant communities as temporary or permanent, with a permanent impact referring to areas that are paved or otherwise precluded from restoration to a pre-project state. In the desert ecosystems the definition of permanent impacts needs to reflect the slow recovery rates of its plant communities. Natural recovery rates from disturbance in these systems depend on the nature and severity of the impact. For example, creosote bushes can resprout a full canopy within five years after damage from heavy vehicle traffic (Gibson et al. 2004), but more severe damage involving vegetation removal and soil disturbance can take from 50 to 300 years for partial recovery; complete ecosystem recovery may require over 3,000 years (Lovich and Bainbridge 1999). In this analysis, an impact is considered temporary only if there is evidence to indicate that pre-disturbance levels of biomass, cover, density, community structure, and soil characteristics could be achieved within five years.

Summary of Impacts

Biological Resources Table 5 summarizes the direct, indirect and cumulative impacts to biological resources and includes the proposed conditions of certification that would mitigate these impacts. **Biological Resources Table 6** provides a summary of acreage impacts and recommended mitigation.

Biological Resources Table 5
Summary of Impacts and Mitigation

Biological Resource	Impact/Mitigation
Sonoran Creosote Bush Scrub & Associated Wildlife Habitat	**Direct Impacts:** Permanent loss of 3,343[a] acres; fragmentation of adjacent wildlife habitat and native plant communities. Staff will provide a complete analysis of impacts to vegetation communities for all new areas of the PSEGS project upon receipt of the requested information included in Data Request Set 1 in the Final Staff Assessment **Indirect Impacts:** Disturbance (noise, lights, dust) to surrounding plant and animal communities; spread of non-native invasive plants; changes in drainage patterns downslope of Project; erosion and sedimentation of disturbed soils. **Cumulative Impacts:** Contributes to cumulatively considerable loss of habitat, fragmentation, and indirect effects from past, present, and foreseeable future projects in the California Desert region of the NECO planning area. **Mitigation:** Off-site habitat acquisition and enhancement (**BIO-12**); implement impact avoidance and minimization measures (**BIO-8)** and weed control plan (**BIO-14**).
Stabilized and Partially Stabilized Dunes	**Direct Impacts:** Permanent loss of 187 acres of stabilized and partially stabilized dune habitat; potential accidental direct impacts to adjacent preserved habitat during construction and operation. **Indirect Impacts:** Likely disruption of sand transport corridor resulting in downwind impacts Sand dune habitat; introduction and spread of non-native invasive plants; erosion and sedimentation of disturbed soils; fragmentation and degradation of remaining habitat. Staff will provide a complete analysis of indirect impacts for the PSEGS project upon receipt of the requested information included in Data Request Set 2 in the Final Staff Assessment. **Cumulative Impacts:** Contributes substantially~~100%~~ to cumulative impacts~~loss~~ from future projects within Chuckwalla Valley and NECO planning area. **Mitigation:** Implement **BIO-20,** Sand Dune Community Impact Mitigation.
Waters of the State/ Sensitive Plant Communities	**Direct Impacts:** Permanent loss biological functions and values of 359.1[a] acres of state waters, including: • 198 [a] acres desert dry wash woodland • 162 [a] acres of unvegetated ephemeral dry wash **Indirect Impacts:** Indirect impacts include colonization of invasive weeds and erosion/sedimentation to downstream areas. Staff will provide a complete analysis of impacts to waters of the State for all new areas of the PSEGS project upon receipt of the requested information included in Workshop Data Requests held in April 2013 in the Final Staff Assessment **Cumulative Impacts:** Contributes to cumulative loss of habitat from future projects within the Chuckwalla Valey and NECO planning area. Indirect effects cumulatively considerable. **Mitigation:** Acquisition and enhancement of 752 acres of ephemeral desert washes, implementation of avoidance and minimization measures to protect state waters (**BIO-21**); implement weed management plan (**BIO-14**).

Biological Resource	Impact/Mitigation
Groundwater-dependent Plant Communities	**Direct Impacts:** None. The effects of pumping may take several-to-many years to appear, depending on the degree of separation in the confining layers between the shallow aquifer (supporting plants) and deep aquifers (where pumping will occur); see below. **Indirect and Cumulative Impacts:** Potential for significant adverse effects to groundwater-dependent plant ecosystems (GDEs) near Palen Dry Lake, including loss of habitat function and value for wildlife, reduced plant cover which increases wind erosion and affects air quality, increase in weedy species, impacts to special-status species inhabiting the GDEs. Even minor individual impacts to GDEs are considered cumulatively considerable. **Mitigation:** Monitoring groundwater-dependent plant communities near the Project site (**BIO-23**) and implementation of remedial action and compensatory mitigation if adverse effects are detected (**BIO-24**). BIO-7 BRMIMP ensures enforcement of all conditions of certification.
Desert Tortoise	**Direct Impacts:** Potential take of individuals during operation and construction; permanent loss of 3,947[a] acres (including 229[a] acres of critical habitat) of low to moderate quality desert tortoise habitat and fragmentation of surrounding habitat. **Indirect Impacts:** Increased risk of predation from ravens, coyotes, feral dogs; disturbance from increased noise and lighting; introduction and spread of weeds; increased road kill hazard. **Cumulative Impacts:** Contributes to cumulative loss of low to moderate value desert tortoise habitat from future projects in NECO, based on USGS habitat model (Nussear et al. 2009). Impacts to higher quality habitat values less than cumulatively considerable. **Mitigation:** Implement avoidance and minimization measures (**BIO-6** through **BIO-11**) and acquire 4,861 acres of desert tortoise habitat (**BIO-12**).
Mojave Fringe-toed Lizard	**Direct Impacts:** Mortality to individuals during construction and permanent loss of 1,479 acres of Mojave fringe-toed lizard habitat; increased road kill hazard from construction traffic; potential accidental direct impacts to adjacent preserved habitat during construction and operation, increased risk of disturbance or mortality from vegetation management activities. **Indirect Impacts:** Disruption of sand transportion; introduction and spread of non-native invasive plants; erosion and sedimentation of disturbed soils; fragmentation and degradation of remaining habitat; increased road kill hazard from construction and operations traffic; harm from accidental spraying/drift of herbicides and dust suppression chemicals. Staff will provide a complete analysis of indirect impacts for the PSEGS project and from vegetation management upon receipt of the requested information included in Data Request Set 1, 2, and 3 in the Final Staff Assessment. **Cumulative Impacts:** Contributes substantially to cumulative loss of Mojave fringe-toed lizard habitat in the Chuckwalla Valley. Project's contribution to fragmentation and indirect impacts cumulatively considerable. **Mitigation:** Implement **BIO-20,** Mojave fringe-toed lizard compensation, and **BIO-8,** impact avoidance and minimization measures; **BIO-14** weed management plan.

Biological Resource	Impact/Mitigation
Western Burrowing Owl	**Direct Impacts:** Permanent loss of breeding and foraging habitat for at least two pairs of resident burrowing owls; potential loss of eggs and young; degradation and fragmentation of remaining adjacent habitat from edge effects; disturbance of nesting and foraging activities for nesting pairs near the plant site and linear facilities. Collisions with project features, glare, also collision, electrocution, glare, and exposure to elevated levels of solar flux. **Indirect Impacts:** Increased road kill hazard from operations traffic and collision with mirrors; increased predation from ravens; disturbance of nesting activities from operations. Staff will provide a complete analysis of impacts to burrowing owl for all new areas of the PSEGS project upon receipt of the requested information included in Data Request Set 1 in the Final Staff Assessment **Cumulative Impacts:** Contributes to cumulative loss of habitat from future projects in the Chuckwalla Valley and NECO planning area. Indirect impacts also cumulatively considerable. **Mitigation:** Implement burrowing owl impact avoidance and mitigation measures, including acquisition of 78 acres of burrowing owl habitat (**BIO 18**). Additionally, implement impact avoidance and minimization measures (**BIO-1** through **BIO-8**); pre-construction nest surveys (**BIO-15**); avian enhancement and conservation plan (**BIO-16a**), and avian and bat protection plans (**BIO-16b**).
Golden Eagle/Bald Eagle	**Direct/Indirect Impact**: Loss of foraging habitat, potential mortality or disturbance during construction and operation, loss or fragmentation of habitat, displacement, and disruption of movement. Collision, glare, electrocution, and death or injury from exposure to concentrated solar flux. Fragmentation of local population; introduction and spread of non-native invasive plants; increased risk of fire; and degradation of off-site springs or seeps. Weed abatement, mirror washing and maintenance. Glare or heat associated with the heliostats may also adversely affect bird's use of the site. **Cumulative Impacts:** The modified project would contribute to cumulative loss of foraging habitat (Sonoran creosote scrub and desert dry wash woodland) within a 140-mile radius of the project, and also would contribute to cumulatively considerable loss of habitat, fragmentation, and direct loss of these species from past, present, and foreseeable future projects within 140-mile radius of the modified project. Fragmentation and indirect impacts also would be cumulatively considerable. Mitigation: Off-site habitat acquisition and enhancement (**BIO-12** and **BIO-21**); pre-construction nest surveys (**BIO-15**); avian enhancement and conservation plan (**BIO-16a**), and avian and bat protection plans (**BIO-16b**).

Biological Resource	Impact/Mitigation
Special-status Birds & Migratory Birds	**Direct/Indirect Impacts:** Permanent loss of breeding and foraging habitat, Sonoran creosote bush scrub and desert dry wash woodland); potential loss of eggs and young; disturbance of nesting and foraging activities for populations on and near the plant site and linear facilities; degradation and fragmentation of remaining adjacent habitat from edge effects, increased predation from ravens; disturbance from operations. Increased road kill hazard from operations traffic, fragmentation of local population; introduction and spread of non-native invasive plants; increased risk of fire; and degradation of off-site springs or seeps. Weed abatement, mirror washing and maintenance. Glare or heat associated with the heliostats may also adversely affect bird's use of the site. **Cumulative Impacts:** Contributes cumulative loss of habitat from future projects within NECO planning area desert dry wash woodland. Project's cumulative contribution to fragmentation, indirect impacts, and direct loss of special status and migratory birds from collisions and exposure to solar flux would be considerable. **Mitigation:** Implement impact avoidance and minimization measures (**BIO-1** through **BIO-8**); pre-construction nest surveys (**BIO-15**); avian protection plan (**BIO-16**) off-site habitat acquisition and enhancement (**BIO-12**). Pre-construction nest surveys (**BIO-15**); avian enhancement and conservation plan (**BIO-16a**), and avian and bat protection plans (**BIO-16b**).
Special Status Bats (draft conclusions, pending results of onsite acoustic monitoring and offsite surveys for roosting habitat within 1 mile of the project site)	**Direct Impacts**: No anticipated direct loss of maternity, day roosts, or hibernacula. Loss of foraging habitat. Bats that forage near the ground, such as the pallid bat, would also be subject to crushing or disturbance by vehicles driving at dusk, dawn, or during the night. Collision with facility structures, exposure to concentrated solar flux **Indirect Impacts**: the loss of foraging habitat due to type conversion, night time lighting that exposes bats to predation, and alteration in prey base. Degradation to groundwater dependent communities in the vicinity of the project site. **Cumulative Impacts**: Contributes to cumulatively considerable loss of habitat, fragmentation, and direct loss of these species from past, present, and foreseeable future projects in the Pahrump Valley. Mitigation: **BIO-1** through **BIO-8** requires avoidance and minimization measures during life of project, construction monitoring, worker training, fugitive dust control, fire prevention and weed management. pre-construction nest surveys (**BIO-15**); avian enhancement and conservation plan (**BIO-16a**), and avian and bat protection plans (**BIO-16b**). **BIO-23** requires monitoring to track the impacts of pumping to groundwater levels as they develop during the life of the project, and defines triggers for adaptive management to be implemented if data indicate impending adverse effects.

Biological Resource	Impact/Mitigation
Desert Kit Fox & American Badger	**Direct Impacts:** Permanent loss of 3,901[a] acres of habitat; fragmentation and degradation of remaining habitat, loss of foraging grounds, crushing or entombing of animals during construction; increased risk of road kill hazard from construction traffic. **Indirect Impacts:** Disturbance from increased noise and lighting; introduction and spread of weeds; increased risk of road kill from operations traffic; increased risk of disturbance or mortality from vegetation management activities. Staff will provide a complete analysis of impacts to desert kit fox for all new areas of the PSEGS project and from vegetation management upon receipt of the requested information included in Data Request Set 1 and 3 in the Final Staff Assessment **Cumulative Impacts:** Contributes to cumulative loss of habitat from future projects within the NECO planning area. Project's contribution to fragmentation and indirect impacts also cumulatively considerable. **Mitigation:** Implementation of impact avoidance and minimization measures (**BIO-17**); off-site habitat acquisition and enhancement (**BIO-12**).
Special Wildlife Management Areas	**Desert Wildlife Management Areas:** A portion of the proposed generation tie-lin would be located in the Chuckwalla DWMA wouth of I-10. **Areas of Critical Environmental Concern:** None. **Wildlife Habitat Management Areas:** Contributes to the loss of Sonoran creosote scrub and desert dry wash woodland habitat from future projects within Palen-Ford WHMA. Project would not contribute to the loss of sand dune communities within the WHMA. Contributes to the loss to the DWMA Connectivity WHMA. No cumulative contribution to habitat loss in Big Maria Mountains WHMA. **Desert Tortoise Critical Habitat:** Approximately 229 acres of the southwestern corner of the Project overlaps the northern boundary of the Chuckwalla Desert Tortoise Critical Habitat Area. **Mitigation:** Mitigate loss of critical habitat with acquisition and preservation of suitable desert tortoise at a 5:1 ratio (**BIO-12**).

Biological Resource	Impact/Mitigation
Special-status Plants	**Direct Impacts:** – • Harwood's milk-vetch: Less-than-significant direct loss of approximatelythree in Project Disturbance Area; • Harwood's eriastrum: No direct impacts; • California ditaxis: Loss of 11 plants significant; • Ribbed cryptantha: abundant throughout the vicinity; less-than-significant direct effect; • New taxon of saltbush: No direct impacts. • Late-season plants: no direct impacts within approved project footprint. Potentially significant impacts to fall-blooming plantsnot detected during spring surveys along new PSEGS features, including modified generation tie-line corridor (Sonoran creosote bush scrub and dry desert wash woodland). **Indirect Impacts:** Minor to potentially significant indirect impacts to all plants in close proximity to site from introduction and spread of non-native invasive plants; increased risk of fire; altered drainage patterns downstream of site; erosion and sedimentation of disturbed soils; accidental chemical and herbicide drift; disruption of photosynthesis and other metabolic processes from dust; fragmentation of population and impaired gene flow and increased vulnerability to local extinctions, and accidental impacts to avoided plants during construction. **Cumulative Impacts:** Project's contribution to spread of weeds, fragmentation, altered hydrology, and risk of fire is cumulatively considerable, however these effects would be reduced through the implementation of staffs proposed conditions of certification. **Mitigation:** Implement impact avoidance and minimization measures (**BIO-8**); Avoidance and minimization measures (**subsection A, BIO-19**); conduct fall surveys (subs**ection B, BIO-19**) and mitigate according to thresholds in **BIO-19**); implement avoidance and compensation mitigation according to performance standards in subs**ection D, BIO-19**; implement weed management plan (**BIO-14**); implement worker training in fire prevention (**BIO-8**).

Sources for impact acreage:
a. Supplement No. 1 Petition to Amend (Palen 2013a).

Biological Resources Table 6
Acreage of Direct and Indirect Impacts to Biological Resources and Recommended Mitigation

Resource	Acres Impacted	Mitigation Ratio	Recommended Mitigation Acreage
Desert Tortoise Habitat[1]			
Within Critical Habitat	229	5:1	1,144
Outside Critical Habitat	3,718	1:1	3,719
Desert Tortoise Total	**3,947**	—	**4,864**
Mojave Fringe-toed Lizard (MFTL) – Direct Impacts[2]			
Stabilized and partially stabilized sand dunes – direct impacts	187	3:1	561
Non-dune habitats occupied by MTFL (sand fields vegetated with sparse creosote bush scrub)	1,293	1:1	1,293
Mojave Fringe-Toed Lizard – Indirect Impacts	TBD	0.5:1	
MTFL Total	**TBD**	—	**at least 1,854**
State Waters - Direct Impacts[3]			
Desert Dry Wash Woodland	197	3:1	592
Unvegetated Ephemeral Dry Wash	163	1:1	163
State Waters Subtotal	***360***	**—**	***755***
State Waters – Indirect Impacts from Changes in Hydrology[3]			
Desert Dry Wash Woodland	0.03	1.5:1	0
Unvegetated Ephemeral Dry Wash	0.51	0.5:1	0.235
State Waters Subtotal	***0.51***	**—**	0.235
State Waters Total	**360.51**	—	**756.235**
Burrowing Owl Habitat – two pairs, four individuals, 19.5 acres each (per 1993 CBOC guidelines)	**78**	**n/a**	**78**

1 – Desert tortoise calculations are from Table 5 in Applicant's Biological Resources Data Package Addendum (Solar Millennium 2010m).
2 –MFTL calculation are from Table 1 and Table 6 in Applicant's Biological Resources Data Package Addendum (Solar Millennium 2010m). 1,496 is the result of subtracting 285 acres of sand dune habitat (from Table 1) impacted by the Project from the total of 1,781 acres of suitable MFTL habitat (Table 6) identified by the Applicant.
3 –State waters calculations are from Table 1 in Applicant's Supplement NO.1 (Palen 2013a).

Waters of the State: Impacts and Mitigation

Biological Resources Table 6 summarizes the direct and indirect impacts to waters of the state as a result of Project construction, and includes recommendations from Energy Commission staff and CDFW for compensatory mitigation ratios for these impacts.

Construction of the PSEGS project would result in direct and indirect impacts to numerous ephemeral streams and washes that occur within the Project Disturbance Area. Construction and operation would alter the hydrological, biogeochemical, vegetation and wildlife functions of these drainages. This would result from the construction of evaporation ponds, roads, and placement of the power towers, heliostats, and ancillary facilities. Approximately 358.6 acres of jurisdictional Waters of the State were delineated by the project owner on the PSEGS project site and linear facilities (Palen 2013a). Waters of the United States do not occur on the project site or linear facilities (*Ibid*).

For the approved PSPP project all vegetation would be removed and the ephemeral drainages graded within the Project Disturbance Area. To control flooding an engineered channel would have been constructed to contain the 100 year storm event. For the PSEGS project impacts to desert washes would be minimized by allowing water to pass through the site, rather than diverting flows around the site in artificially constructed channels. This analysis recognizes that at least a portion of the hydrologic and geomorphic functions would be maintained. However, staff and the CDFW maintain that wildlife habitat functions and values of the streams would be eliminated or significantly diminished by a combination and operation of the facility. A review of Appendix A (Palen 2013a) identified that approximately 27 percent of the site would be developed by either dirt roads, heliostats, or other facilities. Activities including road construction and maintenance; the placement of perimeter exclusion fencing; dust and weed control; periodic vegetation removal; and mirror-washing would all contribute to the loss of functions within the site. Glint and glare, nighttime lighting, human disturbance, and potential erosion and sedimentation of streams during storm events would also diminish habitat values for plants and wildlife. The functions and values of the ephemeral washes associated with the natural gas pipeline and transmission line could also be adversely affected.

Direct impacts to State jurisdictional waters would include the removal of native vegetation including some areas characterized by microphyll woodland, the discharge of fill, degradation of water quality, and vegetation removal. Indirect impacts could include alterations to the existing topographical and hydrological conditions and the introduction of non-native, invasive plant species. As described previously the diversity and episodic nature of streams and streambed materials creates habitat niches within the floodplain for varying wildlife. Operational impacts would include routine mowing of vegetation, vehicle access, weed abatement, and facility maintenance. Desert washes downstream from the Project area, comprising approximately 32 acres of state waters, would also be indirectly impacted as a result of changes to upstream hydrology; however these effects would be minimal as flows would be allowed to pass through the site. Nonetheless, a small portion of these waters could be affected through the spread of weeds or disruption of flows.

Staff considers direct impacts of the Project to approximately 358.6 acres of state jurisdictional waters and indirect impacts to be significant. The extensive ephemeral drainage network at the Project site currently provides many functions and values, including landscape hydrologic connections, stream energy dissipation during high-water flows that reduces erosion and improves water quality, water supply and water-quality filtering functions, surface and subsurface water storage, groundwater recharge, sediment transport, storage, and deposition aiding in floodplain maintenance and development, nutrient cycling, wildlife habitat and movement/migration, and support for vegetation communities that help stabilize stream banks and provide wildlife habitat. The Project would eliminate most of these functions and values from mowing, weed abatement, and the operation and maintenance of the facility. Because the site would be fenced; remaining habitat features would not be available to many species of wildlife.

Staff and CDFW agree that acquisition and enhancement of off-site state waters would mitigate Project impacts. Staff and CDFW have proposed a 3:1 mitigation ratio for desert dry wash woodland as required by guidelines in the Northern and Eastern Colorado Desert Coordinated Management Plan (NECO) (BLM-CDD 2002) and in practice by CDFW under the authority of the California Fish and Game Code. Staff recommends a 1:1 mitigation ratio for the loss of ephemeral dry wash habitat.

Table 2 of the project owners Supplement No.1 (Palen 2013a) identify the expected direct and indirect impacts to State waters that would be impacted and provides mitigation ratios for off-site habitat compensation. Staff's proposed Condition of Certification **BIO-21** provides the specifics of impact avoidance and mitigation measures for impacts to ephemeral drainages of the Project Disturbance Area. Implementation of Condition of Certification **BIO-21** would reduce Project impacts to state waters to less-than-significant levels.

Impacts to Wildlife Connectivity

The entire valley floor in this region is an important corridor that links the mountain ranges together (Solar Millennium 2010a), and the culverts under I-10 are an important component of the corridor. The operation of the I-10 fragments the valley floor and makes it difficult for wildlife to disperse between mountain ranges. Wildlife likely relies on these culverts to cross the I-10 because high traffic volumes likely cause wildlife to avoid crossing over the I-10, which is raised well above existing grade.

Project impacts to the network of ephemeral drainages and the placement of perimeter fencing at the site would adversely affect wildlife connectivity, and would impede the ability of wildlife to move through washes and under I-10 in the Project area. Surveys conducted by the Solar Millenium (Solar Millennium 2010a) and field observations by staff indicate that the culverts and associated major washes are used by a variety of wildlife, including deer, coyote, roadrunner, black-tailed jackrabbit, gray fox, Gambel's quail, woodrat, and other small rodents. The project owner's biologists found both recent and old tracks indicating culverts are important crossing points for wildlife as they move between mountain ranges and along the valley floor. Partial fencing on the box culvert under I-10 at the central wash, and complete fencing on the eastern culvert impedes some wildlife from using the culverts. CDFW reports that numerous tracks have been noted around three bridges under I-10, close to the site. For the PSEGS project CDFW is concerned that connectivity in the area would be maintained (M. Rodriquez, pers comm.) and recommends putting in a camera at one or more of the bridges to better understand kit fox use. Staff plans to request that the project owner install cameras one or more of the bridges to better understand kit fox use in Data Request Set 4 and submit weekly reports at least up to the publication of the FSA.

After the SA/DEIS was published, the Applicant conducted additional surveys and provided the report *Wildlife Movement and Desert Tortoise Habitat Connectivity* (AECOM 2010f). This report includes the location and photographs of 24 underpasses under I-10 along a 32-mile stretch between Desert Center and Wileys Well Road and further details describing five underpasses closest to the PSEGS project. The majority of these underpasses are suitably open enough to allow wildlife movement, and many provide moderate cover as well. This includes the underpasses closest to the PSEGS project. In the SA/DEIS staff concluded that Project impacts to the Project area washes would be significant and unmitigable impact because it would have eliminated which provide a vital movement corridor for desert tortoise and other wildlife would be significant and unmitigable. With the new information provided by the Applicant (AECOM 2010f) staff has concluded that with implementation of proposed conditions of certification the PSEGS project would not result in significant unmitigated impacts to connectivity for desert tortoise and other wildlife. These conditions of certification include **BIO-8**, #1, which requires construction of desert tortoise exclusion fencing on both sides of I-10 to direct desert tortoise and other wildlife to safe passage under the freeway bridges.

Impacts to Sand Transport Corridor and Sand Dune Habitat

The northeastern portion of the Project lies within in the Palen Dry Lake–Chuckwalla sand transport corridor as mapped in the Preliminary Geomorphic Aeolian and Ancient Lake Shoreline Report (Geomorphic Report) (Solar Millennium 2010b). The Geomorphic Report (page 22, Solar Millennium 2010b) divides the sand transport corridor into different zones based on the amount of sand transported, noting that Zone 1 (off the Project site) transports “a minimum of 80 percent” of the total volume of sand within the corridor, sand migration within Zone 2 is described as “moderately strong”, and sand transport in Zone 3 is “relatively low.”

For the PSPP, staff concluded that the intrusion of the Project within an active sand transport corridor, Zone 2, and to a lesser extent Zone 3, would have significant on-site impacts and would interfere with the creation and maintenance of sand dunes off-site. The Palen Dry Lake–Chuckwalla sand corridor is a major source of sand that supports downwind sand dunes; because most sand transport takes place close the ground (a general rule of thumb is that 90 percent of sand transport occurs within 6 feet of the ground surface) wind fences and solar arrays would effectively at block sand transport. The PSEGS footprint still intrudes into Zone 2 and Zone 3 so impacts would be similar.

The PSPP would also have had offsite impacts, cutting off the supply of sand within the PSPP Project Disturbance Area that would otherwise have been transported downwind to other dune areas, and would deflate downwind sand dunes, gradually diminishing their depth and extent over time as sand output exceeds sand input. New sand that would have been transported across the project footprint from upwind would potentially be cut off by drainage ditches, wind fences and above ground infrastructure. Staff modeled the indirect impacts to these sand transport zones, including impacts by percent reduction in sand input to areas downwind of the PSPP project. The PSEGS Project has been designed to eliminate the PSPP Project’s 30 foot tall wind fences that contributed to disruption of the sand transport (Palen 2013a). The revised PSEGS project boundary is proposed to be defined by a chain-link fence, which will have a very different effect on wind flow and sand transport. Sand may pass through the fence and winds will be affected by the heliostat array (CEC 2013l). The project owner assumed 39.7 acres of indirect impacts for the private parcel adjacent to project site that would be surrounded on three sides by project fencing (Palen 2013a). The project owner assumed with removal of the 30 foot tall wind fence required for the PSPP that all sand would flow through site unrestricted and the heliostats would behave in a similar fashion to desert plants as it relates to blocking sand transport (April 17, 2013 workshop). However, indirect impacts are currently being independently assessed by staff using the model developed by staff for the PSPP project as appropriate applicable. The analysis of indirect impacts will include an assessment of the results of additional sand transport modeling for the PSEGS project components and site configuration and a full analysis of indirect impacts will be included in the Final Staff Assessment. Staff is revising the PWA model to take account of the new arrangement of the solar array and the heliostats and will provide a complete analysis of indirect impacts for the PSEGS project upon receipt of the requested information included in Data Request Set 2 in the Final Staff Assessment.

The PSPP also had an impact on sand transport by eliminating the network of desert washes throughout the site and replacing them with engineered channels (**Biological Resources Appendix A**). Part of the sediment-delivery system that contributes to active sand dunes northeast of the Project area consists of fluvial depositional areas fed episodically by ephemeral streams. Finer fluvial sediments (typically sand size and finer) are mobilized in the sand transport corridor, which may be recharged with fine-grained sediment during large flood events. Project construction on the alluvial fans and alteration of stream channels by channelization may have reduced the amount of fluvial sediment reaching the depositional areas upwind of sand dunes. The proposed PSEGS eliminates the large drainage control channels and the majority of the project site would maintain the original grades and natural drainage features (Palen 2012a). Therefore impacts to sand transport would be reduced for the PSEGS. Staff is revising the PWA model and will provide a complete analysis of indirect impacts for the PSEGS project upon receipt of the requested information included in Data Request Set 2 in the Final Staff Assessment

The approved PSPP, Reconfigured Alternatives 2 and 3, shifted the Project footprint out of the sand transport corridor, and thus avoided substantial interference with the sand transport corridor and reduced impacts to sand dune dependent species such as Mojave fringe-toed lizards. The PSEGS project footprint is still within the sand transport corridor. The direct and indirect impacts of the PSEGS on sand dunes and the processes that support them would significantly affect sand dune-dependent species such as Mojave fringe-toed lizards, and could also impact Harwood's woolly-star, Harwood's milk-vetch and sand dune-dependent insect species. The direct, indirect and cumulative impacts of PSEGS to sand dune habitat would still be considered significant but can likely be mitigated to less-than-significant levels with implementation of staff's proposed Condition of Certification **BIO-20** (Sand Dune Community/Mojave Fringe-Toed Lizard Mitigation). Staff will provide a complete analysis of indirect impacts for the PSEGS project upon receipt of the requested information included in Data Request Set 2 in the Final Staff Assessment.

Impacts to Groundwater-Dependent Vegetation from Groundwater Pumping and Project Groundwater Use

The modified project would use less groundwater during both construction and operation than the originally approved PSPP project. Construction groundwater use is stated to be 1,130 acre-feet per year (AFY), a reduction from the original permitted project groundwater consumption of 1,917 AFY. Operational groundwater use is stated as 201

AFY, a reduction of nearly 100 AFY. No further analysis has been conducted for the modified project, as the original analysis is considered conservative, tailored to mitigate for greater impacts, and therefore is still fully protective of groundwater dependant resources. The following analysis is predominately taken from the PSPP RSA.

Groundwater levels near the Project's water supply wells will decline during the Project pumping (Galati & Blek 2010i, Soil and Water Figures 2 and 3). During the operation phase only 300 acre feet per year (afy) would be required for this dry-cooled project. However, to supply the needed quantity of water during construction, and because of the uncertainty in well yield due to the limited number of well tests, the project proposes to install and operate *up to* 10 wells on site, or as needed to yield 5,750 afy for the 39-month duration of construction.

Groundwater pumping could have significant impacts to biological resources if it lowers the alluvial (shallow) aquifer water table in areas where groundwater-dependent ecosystems occur. Based on a worst-case analysis that assumes no groundwater recharge during the 30-yr life of the Project, groundwater in the deep fossil aquifers where water would be extracted[5] is predicted to drawdown between approximately 0.1 feet and 5 feet within a 2-mile (approximate) radius centered on each Project well (Galati & Blek 2010i, Soil and Water Figures 2 and 3).

The present-day shoreline of Palen Dry Lake ("Palen Lake") is located approximately 2 miles from the nearest Project pumping well; the northeastern-most well. The area between this well and Palen Lake supports habitats associated with shallow groundwater, including alkali sink scrubs of iodine bush (a facultative wetland[6] species) and bush seep-weed (facultative), and scattered stands of honey mesquite (Solar Millennium 2009a; Evens & Hartman 2007; Sawyer et al. 2009; Silverman pers. comm.).

The extent to which this drawdown will also occur in the alluvial (shallow) aquifer that supports groundwater-dependent ecosystems is dependent on the extent to which the confining or separating layers of impermeable clays (the "aquitard") have been fractured by faulting (Worley-Parsons 2010). Worley-Parsons (2009) contend that the two aquifers are fully contained and separated by confining layers of low permeability sediments, citing the *Geologic Map of the Blythe Quadrangle* (Stone 2006) and the *Chuckwalla Valley Groundwater Basin Description* (DWR, 2004) as evidence that faults are not known to extend upward into the basin fill materials. In Data Response S&W #197 (AECOM 2010a), the Applicant states: "*The results of the aquifer testing on the PSEGS site suggest there is interconnectivity between shallow and deeper aquifer units below the site*..... *Draw downs of up to 10 feet were observed during the constant-rate discharge test, suggesting a component of vertical flow and connectivity to the overlying sediments. While it is not certain whether the former water supply well tested was gravel packed and if the gravel pack extended to the surface, it is probable that there was some measure of vertical influence*."

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[5] Water would be pumped from the "Bouse Formation" deep aquifer; see Section C.9 Soil & Water Resources for a detailed discussion of the groundwater analysis.

[6] Facultative Wetland = Usually occurs in wetlands (estimated probability 67%-99%), but occasionally found in non-wetlands; Facultative = Equally likely to occur in wetlands or non-wetlands (estimated probability 34%-66%). The wetland indicator categories should not be equated to degrees of wetness (USFWS 1993).

Staff concurs that the position of the site near the playa, where finer sediments predominate, combined with a history of relatively little faulting, suggest that the confining layers are more likely to be intact and with less vertical movement of groundwater between the shallow and deep aquifers than areas with more faulting and coarser-grained fills. However, the evidence does not preclude the possibility for fracturing and vertical hydraulic conductivity and the potential for drawdown in the shallow aquifer to lower the groundwater below the effective rooting level for some species, particularly the shallower-rooted sink scrubs. Further, the resources at risk are rare and sensitive habitats that support a wide variety of special-status plant and animal species. Staff is particularly concerned about those that occur in close proximity to the proposed pumping wells because: 1) the significance of the drawdown (5 to 10 ft in some areas just off the northeastern boundary 2) because the drawdown will occur quickly (within a few years), and 3) the effects of pumping are greatest near the well.

Because the evidence is not conclusive, staff supports a more conservative approach and recommends long-term monitoring and adaptive management in the event that adverse effects are detected. This adaptive approach is discussed in more detail under “Mitigation”, below, and in Condition of Certification **BIO-23** and **BIO-24**.

Groundwater-Dependent Ecosystems and Phreatophytes in the Project Area

The groundwater-dependent ecosystems and other habitats at risk are documented as rare natural communities by the California Department of Fish and Game Vegetation Program (CDFG 2003). Some are also BLM NECO Sensitive communities. Groundwater-dependent ecosystems documented in the area of predicted drawdown (Solar Millennium 2009a; Evens & Hartman 2007; Sawyer et al. 2009; Silverman pers. comm.) include:

- Honey mesquite woodlands (mostly small groves);
- Alkali sink scrubs (dominated or co-dominated by bush seep-weed, iodine bush, fourwing saltbush, spinescale, and allscale);
- Sparsely vegetated playa lake beds;
- Jackass clover unique stands (a special-status plant);
- Stabilized and partially stabilized dunes (mesic dune swales), and
- Microphyll woodlands (ironwood and palo verde desert wash woodlands)

Groundwater-dependent ecosystems are an important component of biological diversity in the California Desert region. Because they are rare or limited in distribution, they often support rare or special-status plants and animals, and the Project area is no exception: in the area predicted to incur the greatest drawdown, *i.e.*, surrounding the northeastern well, special-status species documented include Mojave fringe-toed lizard, American badger, desert kit fox, Harwood’s woolly-star, Harwood’s milk-vetch, jackass clover, ribbed cryptantha, a newly discovered species (or taxon) of saltbush, and a historic occurrence of a species presumed extinct in California: mesquite nest straw (AECOM 2010v, CNDDB 2010, CCH 2010).

Ground waters are important to sustain vegetation for wildlife habitat in areas where surface waters are not present (RWQCB 2006). Common mammals observed and/or associated with the habitats in the area where drawdowns are predicted include: black-tailed jackrabbits, round-tailed ground squirrels, white-tailed antelope ground squirrels, kangaroo rats, kit foxes, and coyotes. The most common birds include: horned larks, loggerhead shrikes, lesser nighthawks, ravens, black-throated sparrows, and white-crowned sparrows. Reptiles observed or expected to occur include: zebra tail lizards, desert horned lizards, desert iguanas, Mojave fringe-toed lizards, western whiptail lizards, coachwhips. Other important species observed in this area include these special-status birds: ferruginous hawk, northern harrier, and Swainson's hawk (AECOM 2010d).

Use of Groundwater by Phreatophytes

Within the 2- to 3-mile radius drawdown zone, the GDEs are dominated or defined by "phreatophytes". Phreatophytes have deep roots that extend down to, and extract water from a periodically stable water supply, including the capillary fringe, *i.e.*, the zone just above the water table that is not completely saturated, where water is lifted up by capillary action, or surface tension (Brown et al 2007). Even though the groundwater may never be visible at the ground surface, as it is in a wetland or spring, phreatophytic ecosystems can still be groundwater-dependent (Naumberg et al 2005).

The use of groundwater may not be year-round by phreatophytes. In these instances, other water sources are used during the rainy season but groundwater is used in the dry season (Froend & Loomes 2004). In the Project vicinity, for example, phreatophytes may utilize precipitation, stormwater runoff, or temporary ponding on the playas during the rainy season, and use groundwater during the dry season. There is also growing evidence that the dimorphic shallow and deep root systems of some phreatophytes (*e.g.*, honey mesquite) that alternately act as conduits that potentially redistribute water from moist layers to dry layers, a phenomenon termed "hydraulic redistribution" (Hultine et al 2003) that may play an important role during summer drought for surrounding shallow-rooted species and perhaps for the larger ecosystem (Brown et al 2007; Caldwell et al. 1998).

Obligate versus Facultative Phreatophytes

Desert phreatophytes are a complex group of species with varied adaptive mechanisms to tolerate or avoid drought. They should not be considered simply as a group of species that avoid desert water stress by utilizing deep ground water unavailable to other desert species (Nilsen et al 1984). There are two types of phreatophytes:

1) Obligate phreatophytes, which are deep rooted plants that only inhabit areas where they can access groundwater, via the capillary fringe, to satisfy at least some proportion of their environmental water requirement. Access to groundwater is a critically important to their presence in a landscape; and

2) Facultative phreatophytes, which are deep rooted plant species that tap into groundwater, via the capillary fringe, to satisfy at least some portion of their environmental water requirement, but will also inhabit areas where their water requirements can be met by soil moisture reserves alone. That is, the species will be groundwater dependent in some environments, but not in others.

Determination of Groundwater-Dependency

The dependence of these species on groundwater is a function of the hydrogeologic setting of the ecosystem, which governs whether a shallow water table exists that the species can use. 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 (1989) as being 20 to 30 feet below ground level. With capillary rise, this would be well within the reach of many or most of the phreatophytes known to occur here.

The identification of phreatophytic ecosystems can be challenging because there is no comprehensive list, but the following are general guidelines for deciding if an ecosystem or species is phreatophytic (Brown et al 2007; LeMaite et al 1999; Froend & Loomes 2004):

- It is known or documented to depend on groundwater, expert opinion or local knowledge can be useful in making a determination as some species' dependence varies by setting;
- A species known to have roots extending over a meter in depth;
- The community occurs in areas where the water table is known to be 'near' the surface;
- In arid regions, the herbaceous or shrub vegetation is still green or has a high leaf area late in the season (compared to other dry areas in the same watershed that do not have access to groundwater).

Additionally, stable isotope analysis can be used to identify whether groundwater is supplying the species' or ecosystem water needs (Froend & Loomes 2004).

The key ecosystem attributes of phreatophytic ecosystems include one or more of the following attributes (Brown et al 2007):

- The depth below surface of the water table;
- The chemical quality of the groundwater or soil, as expressed in terms of pH, salinity, or other nutrients (or contaminants).

Response to Water Stress

The response of these ecosystems to change in these attributes is variable (SKM 2001). The phreatophytes known to occur in the Project area are mostly facultative phreatophytes (Steinberg 2001; USFWS 1993; and others). Phreatophyte trees and shrubs have a range of strategies for dealing with water stress and some species are better adapted to deal with water stress than others, whether they are obligate or facultative phreatophytes. There is insufficient information available to assess whether facultative phreatophytes have a greater resistance to change in groundwater condition than obligate phreatophytes. However, obligate phreatophytes are less resilient than facultative phreatophytes and will only grow in areas where specific groundwater conditions exist, and require uninterrupted access to the water table; all of these species are groundwater-*dependent*. "Facultative" phreatophytes, however, can use groundwater if it is available but they can also occur in settings where groundwater is not available (Naiman et al 2005).

A plant affected by competition for water displays signs of stress (e.g. Manning and Barbour 1988), and stress can be manifested as anything from diminished physiological processes to plant death. Lowering the local water table from groundwater pumping has been demonstrated to cause habitat conversions and reduce plant cover where pumping causes water levels to drop below the effective plant rooting depths, increasing wind erosion of the soil and affecting air quality, and native habitats converted to invasive exotic communities (Patten et al 2007; Lovich 1999; Manning 2006).

Secondly, declining water tables may *reduce* the amounts of salts and water wicked to the surface by capillary action, potentially altering the chemistry of surface soils (Patten et al. 2007) around the playa (Palen Lake) margins. If the surface salinity decreases, it could render the habitat unsuitable for the halophytes (salt-adapted plants) that make up these ecosystems, which includes several rare or special-status plants, and cause a habitat conversion to non-halophytes (Dodd & Donovan 1999). Reduced surface salinity may be an expected response of regional groundwater withdrawal for urban expansion and other uses in the Great Basin and Mojave Deserts (Patten et al. 2007), and now also in the Sonoran Desert of California for solar thermal development and other groundwater uses.

As Elmore et al. (2006) and Manning (2007) showed, as water table is lowered by pumping, total live plant abundance (plant cover) on a site decreases correspondingly. Shallower rooted herbs are the first affected and least adapted; deep-rooted woody phreatophytes can take many years longer to die, but the effects of stress may be evident in indicators of plant vigor that would not be visible in an aerial photo. Non-native opportunistic “weed” species (e.g., Russian thistle) are better adapted to nutrient-poor soils and wider variety of soil moisture regimes or conditions, and may demonstrate a competitive edge. Lower plant cover can also lead to increased soil erosion, due to wind or water, leading to loss of nutrients, minerals, and structure necessary for seed germination of plants adapted to prior groundwater conditions on the site. The complex below-ground systems of bacteria, algae, and fungi, which provide many valuable ecosystems services (e.g. breakdown of organic matter, nitrogen fixation, carbon storage, and recycling of nutrients) are also disrupted when water tables are lowered. Ultimately, if pumping lowers the water table below the effective rooting depth of the predominant species, a decline in plant cover and change in species abundance due to groundwater withdrawal from groundwater-dependent ecosystems may result in severe consequences, depending on the organism(s) involved or the prevailing ecosystem processes (Manning 2009).

Animals, including mammals, reptiles, birds, and invertebrates, who may require certain plant species or a certain vegetation structure, may no longer find suitable food or living space. Local extirpations are compounded if the displaced animal is an important food source for another animal. If the vegetation is dependent on the groundwater aquifer, but the decline in water table depth is minor and/or temporary (i.e., a minor drawdown and restored to spring baseline levels following construction), the ecosystem effects may be correspondingly minor or temporary, depending on the time required to refill the impacted aquifer.

Impacts to Springs

According to the Applicant's analysis of the potential impacts of the Project pumping to area springs (AECOM 2010a, DR 181-233):

> *"Corn Spring appears to derive its water from precipitation falling onto the Chuckwalla Mountains, and movement of groundwater under pressure along an historic fault that bisects the mountains. Groundwater extraction from the PSEGS site will not affect Corn Spring. According to the NWIS database, seeps and surface discharge/outfall (along with streams, lakes, wetlands, and diversions) are categorized as "surface water sites" and four sites are located in the Chuckwalla Valley Groundwater Basin. One of the four locations is the aforementioned Corn Spring Wash, while two other sites are located near the northern edge of the Chuckwalla Mountains approximately eight and 13 miles west of the PSEGS site. Water in these three sites appear to originate from infiltration of precipitation that falls on the Chuckwalla Mountains as all three sites are located either within the Chuckwalla Mountains or are less than one mile downslope from the Chuckwalla Mountains. At this great distance and given the source of water to the sites, groundwater extracted from the PSEGS site will not affect these three sites. The fourth "surface water site" listed in the NWIS database for the Chuckwalla Valley Groundwater Basin is Coxcomb Wash, located approximately eight miles northwest of the PSEGS site. Coxcomb Wash is an ephemeral dry wash that flows southeastward from the Coxcomb Mountains. As a result, groundwater extracted from the PSEGS site will not affect the flow of water in Coxcomb Wash. The locations of Corn Spring and other "surface water sites" identified in the NWIS database and through the several other data sources are shown on Figure DR-S&W-193. The sites are listed on Table DR-S&W-193-1."*

McCoy Spring is located at an elevation of 889 feet at the outlet of a bedrock canyon near the toe of the western slope of the McCoy Mountains, approximately 15 miles to the northeast of the Project. According to the groundwater investigation conducted by Worley-Parsons (2009):

> *"Springs may be considered surface extensions of the local groundwater system; however, springs and seeps that occur near the interface between bedrock mountains are often associated with base flow discharge or perched aquifers that are part of a separate groundwater flow system that originates in the surrounding mountains and do not have direct hydraulic connection to the adjacent basin aquifer system. Based on the close proximity of bedrock outcrops to the spring, it likely represents baseflow discharge from the McCoy Mountains. As such, it does not appear to have a direct hydraulic connection to groundwater levels in the Chuckwalla Valley Groundwater Basin, which occurs in the basin fill materials to the west of McCoy Spring. They concluded that a groundwater level drawdown of many feet would be required to cause a change in the baseflow discharge from the McCoy Mountains."*

Section C.9, the **SOIL AND WATER RESOURCES** section, provides a discussion of potential Project impacts to springs. Biological Resources staff agrees with the conclusion's in Section C.9 that springs would not be affected by Project groundwater pumping. This conclusion is based on the distance of the Project from these features, as well as the bedrock geology and physiographic setting.

Impacts to Non-Phreatophytes

The proposed groundwater pumping could also potentially cause some loss of habitat function or value for drought-tolerant, upland species that occur in close proximity to a pumping well. Creosote bush are not characteristically dependent on groundwater but could be affected if a significant drawdown were to occur quickly and in an area where this shallow-rooted species is accustomed to the regular availability of soil moisture. The permanent diversion of surface flows north of I-10 after construction of the freeway and diversion dikes has had a marked adverse effect on the vigor of the creosote scrub community, apparent in the stunted, depauperate shrubs, low cover density and low species diversity. These drought-adapted and shallow-rooted species are typically supported by precipitation (or, in the I-10 example, by sheet flow). It is unclear if a drawdown in the groundwater would significantly affect the creosote bush scrub close to the wells but staff remains cautious and recommends sampling the creosote bush scrub habitats in the long-term monitoring program (see "Mitigation for Impacts to Groundwater Dependent Plant Communities", below).

Monitoring for Early Detection of Potential Impacts

In general, the hydrologic threshold for vegetation change is not well understood (Patten et al. 2007) but is expected to occur as tolerance levels, along a gradient from wetland to upland, or beginning with the obligate or least resilient species, depending on the depth, timing and duration of the drawdown, and where tolerances are exceeded for the dominant plant taxa.

Patten, Rouse & Stromberg (2007) suggest that on-site monitoring is critical for detecting impacts, and, in addition to monitoring groundwater responses, emphasize direct monitoring of ecosystem function (Eamus et al 2006; Lake & Bond 2007; Stromberg et al 2006). Long-term vegetation data are capable of providing early warning signs of impending changes in ecosystem processes (Patten et al. 2007). Combined with the data on groundwater and climate, sampling of plant communities can provide sensitive metrics for assessing ecological changes over time. However, to ensure that the information is appropriate for management, it is important that monitoring and analysis be designed to test for magnitudes of changes rather than just existence of change, a phenomenon which can occur under disturbance or non-disturbance conditions.

Mitigation for Impacts to Groundwater Dependent Plant Communities–

Two conditions, **BIO-23** and **BIO-24** were required for the PSEGS project. No new or additional impacts were identified in conjunction with the modified project, and therefore no new conditions, or edits to the existing Conditions of Certification **BIO-23** or **BIO-24** (described further below) are necessary. Staff's Condition of Certification **BIO-23** provides specifications and performance standards for the development of a detailed, peer-reviewed Vegetation Monitoring Plan (Plan). Monitoring would occur for the life of the Project. In addition to monitoring indicators of plant vigor, water table monitoring and soil core sampling will also be used to provide additional warning signs of impending changes and ensure that remedial action is taken before effects reach a level of plant mortality or significant impairment of the habitat function and values.

Staff's proposed Condition of Certification **BIO-24** requires the Project owner to take remedial action if the monitoring described in **BIO-23** detects declining spring and post-monsoon water tables in the alluvial (shallow) aquifer—in any amount greater than the baseline seasonal variability— in combination with a decline in plant vigor of greater than 20 percent when compared to the same plots pre-disturbance. Remedial measures described in **BIO-24** establish a performance standard of restoring the groundwater tables to baseline levels by: 1) relocating the Project pumping well to another location where the groundwater-dependent vegetation is no longer within the area of groundwater drawdown, or 2) reducing the Project water usage through water conservation methods or new technologies to a level required to restore groundwater levels in the shallow aquifer to pre-impact levels.

One of the possible remedial actions proposed in Condition of Certification **BIO-24** is installation of a new well in a location that avoids impacts to phreatophytic plants or plant community. Because the location of the new well cannot be within an area that supports phreatophytic species or communities, staff has provided the following criteria for deciding if an ecosystem (or species) is phreatophytic (Brown et al 2007; LeMaite et al 1999; Froend & Loomes 2004):

- It is not known or documented to depend on groundwater, based on scientific literature or expert opinion (local knowledge can be useful in making a determination as some species' dependence varies by setting);
- The species are not known to have roots extending over a meter in depth;
- The community does not occur in an area where the water table is known to be 'near' the surface (relative to the documented rooting depths of the species);
- The herbaceous or shrub vegetation is not still green and/or does not have a high leaf area late in the dry season (compared to other dry areas in the same watershed that do not have access to groundwater).

Special-status Species: Impacts and Mitigation

Desert Tortoise

Direct Impacts

Protocol-level surveys for desert tortoise were conducted for the PSPP project site and linear facilities between March 17 and May 22, 2009 (Study area except substation) and October 24 to 25, 2009 (substation site and buffer). Clearance surveys were conducted on portions of the PSPP project site in 2010. Surveys conducted in 2009 detected 17 burrows (Class 3–5), 15 tortoise pallets (Class 4 or 5), and 19 tortoise shell remains (Class 5) in the project area (AECOM 2010a). Surveys conducted in 2010 identified seven tortoises (adult and juvenile) in the Project area including four along the generation tie line and three tortoises south of I-10, the latter being outside of the Project Disturbance Area and buffer area. Only one tortoise was detected in the Project Disturbance Area along the gen-tie line for the PSPP project (Solar Millennium 2010k, Table 1 and Figure 1). Desert tortoises were not detected on the PSPP solar field.

Protocol surveys for desert tortoise were conducted for the PSEGS project from 7 to 30 April 2013. These surveys were limited to areas not previously surveyed for the PSPP project and included portions of the generation tie-in and the new natural gas pipeline alignment. Desert tortoises were not detected during these surveys (Palen 2013m). Two desert tortoise burrows showing sign of recent occupation were detected on the generation tie-in south of I-10 and a possible burrow was noted in a survey buffer north of the freeway (Palen 2013m). Supplemental surveys for desert tortoise were not conducted in the Project Disturbance Area of the solar field for the PSEGS project.

Although desert tortoises were not detected on the project site this species is known to occur in the project region. Desert tortoise sign is present on the project site and the species has been periodically detected in adjacent habitat. In addition, for the PSPP project resource agency staff located a possible desert tortoise burrow near the bridge associated with the large wash that flows into the center of the Project Disturbance Area (LaPre, pers. comm.). Potential desert tortoise burrows were noted by staff during reconnaissance level surveys of the project area during April 2010 and 2013. Additional observations of desert tortoise from Project buffers for the PSPP project are included in the Revised Desert Tortoise Technical Report (Galati & Blek 2010b, Revised Desert Tortoise Technical Report). **Biological Resources Figure 7** identifies desert tortoise sign detected by the project owner during surveys of the PSPP and PSEGS project site.

Although desert tortoise were not detected on the solar field and only a small number of desert tortoises were detected in the buffer area it is likely that the project area supports desert tortoise that were not observed by the surveyors. Desert tortoises are frequently unavailable to be sampled by field crews because they make extensive use of underground shelters (Nussear 2004). Similarly, desert tortoises spend much of the year in burrows even during the active season (Woodbury and Hardy 1948; Marlow 1979; Nagy and Medica 1986; Bulova 1994), and only the proportion of the tortoise population that is above ground is usually sampled (Nussear 2004). In a study conducted at Marine Corps Air Ground Combat Center Twentynine Palms, Duda et al (1999) found that during the spring, desert tortoises were located above-ground 45 percent of the time in a productive year, compared with only 20 percent in a drought year. They further noted that surface activity declined from spring levels in the summer of both years, yet the difference between years was still significant. Desert tortoises were located on the surface 26 percent in the productive year and 11 percent in the drought year. Even when desert tortoise are active and above ground during the surveys only a subset of these animals are usually detected. This can lead to a violation of a critical assumption of the line distance sampling technique, namely, that all animals on the line are found (Anderson et al. 2001; Buckland et al. 2001).

In order to account for observer bias, weather conditions, and desert tortoise behavior the USFWS developed a predictive model (USFWS 2010) for estimating the expected range of desert tortoise that may be present based on the limited ability to detect animals during the surveys. The USFWS 2010 survey protocol takes into account the probability that tortoises would be present above ground based on the previous winter's rainfall and the fact that not all tortoises within the survey area are seen by surveyors. The model then provides a mathematical formula that is used to estimate the number of adult and subadult tortoises that are actually present. Statistical techniques can provide further estimates of minimum and maximum numbers of tortoises expected, within a 95 percent confidence interval. In addition, most juvenile tortoises and tortoise eggs are not detected during field surveys. The use of this model requires the detection of live adult or subadult desert tortoise; neither of which was detected on the proposed solar field. The absence of live tortoise data limits the ability of the model to provide statistically defensible estimates of desert tortoise density. Similarly, the fact that living desert tortoises were not detected during surveys does not suggest that desert tortoises are not present on the project site. Review of range wide data, existing site conditions and historic disturbance, and the results of the surveys completed to date suggest the site is expected to support a relatively low number of desert tortoise.

To support the preparation of the Biological Opinion (BO) for the Approved PSPP project the FWS used desert tortoises found in the buffer transects of the generation tie-in and regional estimates to estimate tortoise density for the Project (Palen 2013m). Based on this information the FWS concluded that two subadult or adult tortoises occupy the Project site (USFWS 2011b). In addition to adult and subadult desert tortoises, the proposed project site is expected to support a population of juvenile tortoises that are not considered in the USFWS formula.

Juvenile tortoises are extremely difficult to detect because of their small size and cryptic nature. In many instances juveniles are overlooked during surveys. However, estimates of juvenile tortoise populations can be extrapolated using information based on a four-year study of tortoise population ecology conducted by Turner et al. (1987). This study determined that juveniles accounted for approximately 31.1 to 51.1 percent of the overall tortoise population. Using this range and the USFWS estimated between four and six juvenile desert tortoises may occur on the project site. The project site may also support the eggs of desert tortoise. The number of tortoise eggs that could be present on the project site was estimated by the USFWS based on the assumption of a 1:1 sex ratio and that all females present would lay eggs (clutch) in a given year. Applying the 1:1 sex ratio six out of the 12 desert tortoises could be reproductive females. Given one clutch per reproductive female in a given year multiplied by the average number of eggs found in a clutch (i.e., 5.8; see USFWS 1994b); approximately 35 eggs would be expected to occur in a given year (USFWS 2011b). However, fewer eggs are likely to be onsite at any given time because not all females are expected to be of reproductive age or elected to produce eggs during any given year.

Biological Resources Table 7a
Estimated Number of Desert Tortoise on the Project Site and Linear Facilities

Adult and Sub-adults*		**Juvenile Estimates***		**Eggs***	**Total Adult/Sub-adult and Juvenile**	
Lower	Upper	Lower	Upper		Lower	Upper
2	12	3	6	35	**5**	**18**

*All estimates of desert tortoise abundance are based on values identified in the 2011 Biological Opinion for the Approved PSPP (USFWS 2011b).

As part of its authority granted by the Warren-Alquist Act, the Energy Commission has in-lieu permitting authority for local and state agencies; therefore the State Incidental Take Permit (2081) for desert tortoise would be subsumed in the Commission Final Decision. For the purposes of this analysis staff considers the USFWS 2011 Biological Opinion for the approved PSPP project to provide a reasonable estimate of the expected number of desert tortoise that may occur on the PSEGS project. Because live desert tortoises were not detected during the surveys staff acknowledges that this data is based on the extrapolation of existing information. The actual number of desert tortoises that may occur in the project Disturbance Area is likely much lower. The actual number of desert tortoise encountered on the site, if any, will be quantified during pre-construction clearance surveys and monitoring during construction of the facility.

During construction of the Project desert tortoises may be harmed during clearing, grading, and trenching activities or may become entrapped within open trenches and pipes. Construction activities could also result in direct mortality, injury, or harassment of individuals as a result of encounters with vehicles or heavy equipment. Other direct effects could include individual tortoises being crushed or entombed in their burrows, collection or vandalism, disruption of tortoise behavior during construction or operation of facilities, disturbance by noise or vibrations from the heavy equipment, and injury or mortality from encounters with workers' or visitors' pets. Desert tortoises may also be attracted to the construction area by application of water to control dust, placing them at higher risk of injury or mortality. Increased human activity and vehicle travel would occur from the construction and improvement of access roads, which could disturb, injure, or kill individual tortoises. Also, tortoises may seek shade and thermal cover by taking shelter under parked vehicles and can be killed, injured, or harassed when the vehicle is moved.

Use of paved roads, including I-10, and dirt access roads could result in mortality of desert tortoises by vehicle strikes. The potential for increased traffic-related tortoise mortality is greatest along paved roads where vehicle frequency and speed is greatest. Desert tortoises on dirt roads may be affected depending on vehicle frequency and speed. Data indicate that desert tortoise numbers decline as vehicle use increases (Bury et al. 1977) and that tortoise sign increases with increased distance from roads (Nicholson 1978; Karl 1989; von Seckendorf & Marlow 1997, 2002).

Construction activities that result in accidental fires can directly affect desert tortoise and their habitat. Because of the abundance of weeds in the region wildfires that result from welding, vehicles carelessly parked on vegetation, smoking, or other ignition sources pose a potential direct impact to desert tortoise and can quickly spread to off-site areas. Direct effects of fire on desert tortoise include mortality by incineration, elevating body temperature, poisoning by smoke, and asphyxiation (Whelan 1995). Small individuals such as hatchlings are more at risk from lethal heating than large ones because they have a higher surface to volume ratio that allows heat to penetrate their vital organs relatively quickly (Brooks and Esque 2002).

The former project owner (Solar Millenium) recommended impact avoidance and minimization measures to reduce these impacts to desert tortoise, including installation of exclusion fencing to keep desert tortoise out of construction areas, translocating the resident desert tortoise from the Project site, controlling construction traffic, reducing speed limits to decrease the incidence of road kills, and worker environmental awareness training programs.

Staff incorporated these recommendations into conditions of certification. Staff's proposed Conditions of Certification **BIO-1** through **BIO-5,** requires qualified biologists with authority to implement mitigation measures be on site during all construction activities. Staff's proposed Condition of Certification **BIO-6** requires the development and implementation of a Worker Environmental Awareness Program to train all workers to minimize impacts to sensitive species and their habitats. Staff's proposed Condition of Certification **BIO-7** requires the project owner to prepare and implement a Biological Resources Mitigation Implementation and Monitoring Plan that incorporates the mitigation and compliance measures required by local, state, and federal LORS regarding biological resources. Staff’s proposed Condition of Certification **BIO-8** describes Best Management Practices requirements and other impact avoidance and minimization measures.

Staff’s proposed Conditions of Certification **BIO-9** through **BIO-11** are specific to desert tortoise. Condition of Certification **BIO-9** requires installation of security and desert tortoise exclusionary fencing around the entire Project Disturbance Area and on portions of I-10 south of the Project area. **BIO-10** recommends the development and implementation of a desert tortoise relocation/translocation plan to move any desert tortoises found in the Project Disturbance Area to identified relocation or translocation sites. Staff’s proposed Condition of Certification **BIO-11** requires verification that all desert tortoise impact avoidance, minimization, and compensation measures have been implemented.

Implementation of staff’s proposed Conditions of Certification **BIO-9** and **BIO-10** have inherent risks and could themselves result in effects such as mortality, injury, or harassment of desert tortoises due to equipment operation, fence installation activities, removal of tortoise burrows, and tortoise relocation/translocation. These impacts are described in more detail below.

Impacts to Critical Habitat

The Project area overlaps a portion of the Chuckwalla Desert Tortoise Critical Habitat Unit (Chuckwalla CHU). The Chuckwalla CHU is 1,020,600 acres (USFWS 1994b) and 229 acres would be directly impacted by the PSEGS project (Palen 2013m). The functions and values of desert tortoise critical habitat north of I-10 are relatively low; however the presence of desert tortoise in this area has been detected. Habitat south of I-10 is better for desert tortoise and generally increases with proximity to the Chuckwalla Mountains. Both proposed substation sites are south of I-10, and are located in desert tortoise critical habitat. Southern California Edison (SCE) is currently building the Red Bluff substation and has provided mitigation for that project.

The critical habitat area overlapping with the Project site contains at least three sizeable washes with major bridges that provide for dispersal and long term gene flow across I-10 which is needed to achieve population connectivity between the Chuckwalla and Chemehuevi critical habitat units. Although I-10 has disrupted the hydrology and associated microphyll woodland components of the lesser washes, the shrub and herbaceous annual vegetative components between the washes remain hydrologically unaffected and support comparable community characteristics with areas south of I-10. Since desert tortoise forage predominantly on annual plants, the hydrologic effects on the tree canopy do not affect foraging habitat characteristics. Therefore, while the habitat in this area may be considered low quality, the area is occupied (based on the presence of sign) and provides a vital role and function of the critical habitat designation for maintaining inter-DWMA population connectivity espoused in the species' recovery plan (USFWS 1994a).

Although the three major culverts under I-10 would remain open to desert tortoise movement, the Project would disrupt local movement patterns by forcing tortoises to walk around the Project site. Thus, tortoises north of the Project site attempting to move in a southward direction would be diverted to the east or west, and the perimeter fencing around the Project site would direct tortoises towards I-10 on the traffic surface (AECOM 2010b. Tortoise-proof fencing has not been installed along this segment of I-10, so desert tortoises moving around the Project site rather than moving through washes would potentially experience increased rates of vehicular-related mortality. Increased mortality would further reduce local population levels and increase the adverse effects of habitat fragmentation by preventing dispersal between the Chuckwalla Mountains to the southwest and Palen Mountains to the northeast. Staff considers the potential increase in desert tortoise road fatalities to be a significant impact of the Project. This impact would be reduced to less-than-significant levels with installation of desert tortoise exclusion fencing along I-10 south of the Project site, as described in staff's proposed Condition of Certification **BIO-9** (Desert Tortoise Clearance Surveys and Fencing). This proposed fencing is consistent with guidance in the NECO, which specifies that: "Interstate Highways 40 and 10 would be fenced by Caltrans along their common boundaries with DWMAs to preclude tortoise mortality and limit other wildlife mortality" (BLM-CDD 2002, page 2-29).

Impacts of Relocation/Translocation

For many projects the regulatory agencies require that desert tortoises be captured and relocated from the development site. This relocation is defined as "translocation" if a desert tortoises is moved more than a certain distance from their current location (i.e., typically greater than 500 meters/1642 feet). Although desert tortoises were not found on the proposed solar field it is likely that a low number of desert tortoises are present. If detected during clearance surveys, desert tortoises will require translocation to off-site locations.

Large scale land acquisition to support military training, residential and commercial development, and the construction of industrial level solar infrastructure projects has necessitated the use of translocation as a tool to minimize direct losses to desert tortoise and other sensitive wildlife. Construction of the proposed project would require the translocation or removal of all desert tortoises, including adults, subadults, and any juveniles that are found on the site during clearance surveys. An important consideration in assessing potential impacts from the translocation effort is establishing the proposed translocation sites. Translocation and control sites should occur on lands that can be managed for the protection of this species. The translocation of animals to privately held lands is not recommended by FWS and CDFW, given the threat of future development and other inherent risks to desert tortoise associated with private land. The primary and secondary recipient sites identified for the approved PSPP project were located on roughly 11,129 ha (27,500 ac) of BLM lands in the Chuckwalla DWMA along the upper bajadas on the north side of the Chuckwalla and Little Chuckwalla Mountains (USFWS 2011b). Staff expects that additional information on the proposed translocation sites will be developed prior to the FSA.

The distance of the translocation site from the project site also affects the methods used during the implementation of the plan. USFWS may require disease testing and quarantine for any tortoise translocated more than 500 meters (1642 feet). This requirement is intended to limit the potential exposure risk to healthy tortoises adjacent the project site. However, for each desert tortoise translocated to a long distance sites, two other tortoises must be handled, disease tested, and radio tagged. Therefore, a total of three tortoises are handled for each translocation event. Desert tortoises at the recipient site and control site are diseased tested and radio tagged in order to ensure that healthy animals are not being introduced into a diseased population and to track the animals post-release. In addition disease testing and radio tagging allows the agencies to track the mortality of translocated versus host or control populations; provides long term monitoring of the populations; and provides a mechanism for evaluating whether mortality occurs uniformly across the three groups. These requirements may not be enacted in the event that only short distance translocation occurs and if the number of desert tortoises is determined to be low (i.e., usually less than five animals).

The USFWS may limit the maximum number of desert tortoises that may be relocated to a particular area to minimize potential effects to the host population from resource competition. In order to assess this impact, additional information is required of the applicant, specifically the density of desert tortoises inhabiting proposed translocation sites.

Translocation activities require the implementation of a series of actions. Some of the proposed activities include but are not limited to:

- The identification of the proposed translocation and control sites;
- The evaluation of the habitat quality on the translocation and control sites;
- A determination of existing tortoise density and an assessment of the sites ability to accommodate additional tortoises above baseline conditions;
- Pre-construction fencing and clearance surveys of the project site;
- The construction of holding pens for quarantined translocated tortoises prior to their release into host populations;
- Pre-construction surveys of the proposed translocation sites;
- The placement of tracking units (GPS) on tortoises from the project site, translocation site, and control site;
- Possible disease testing for long distance translocated tortoises, host, and control sites;
- Long term monitoring and reporting of control and translocated and host populations; and
- The implementation of remedial actions should excessive predation or mortality be observed.

Translocation of desert tortoise has inherent risks that must be considered when implementing this activity. Capturing, handling, and relocating desert tortoises could result in harassment, injury, or mortality of desert tortoises. Impacts of translocation may include elevated stress hormone levels, changes in behavior and social structure dynamics, genetic mixing, increased movement (caused by antagonistic behavior with other tortoises, avoidance of predators or anthropogenic influence, homing, or seeking out of preferred habitat), spread of disease, and increased predation. Handling, holding, and transport protocols may also compound with abiotic factors to affect the outcome for translocated individuals (Bertolero et al. 2007; Field et al. 2007; Rittenhouse et al.

2007; Teixeira et al. 2007), particularly during extreme temperatures, or if they void their bladders. Averill-Murray (2001) determined that tortoises that voided their bladders during handling had significantly lower overall survival rates (0.81-0.88) than those that did not void (0.96). Desert tortoises that are improperly handled by biologists without the use of appropriate protective measures may be exposed to pathogens that spread among tortoises in both resident and translocated animals. The introduction of diseased tortoises to a recipient site or holding pen may result in the spread of upper respiratory tract disease (URTD). The USFWS consider URTD to be one of the most serious infectious disease affecting desert tortoises.

Translocation may be a useful tool in the conservation of some species, yet well designed studies are necessary to properly evaluate its efficacy (Field et al 2007). As of 2013 there are a number of ongoing translocation actions that are underway. Most of these translocation events are related to military land expansion and solar energy development although a large scale translocation event is planned to occur on BLM lands near Pahrump Nevada. Definitions of success are variable and determining ultimate success can require lengthy studies (Fischer and Lindenmayer 2000, Seigel and Dodd 2002). For the PSEGS project translocation is considered a mechanism to salvage existing animals and place them in an area where they have the potential to survive post construction.

Success rates of herpetofauna translocations range from 14 percent to 42 percent, suggesting that improved efforts are essential for the future recovery of many reptiles and amphibians (Dodd and Seigel 1991; Germano and Bishop 2009). Existing studies suggest that animals move away from the translocation site and move through the landscape at a higher rate than control animals (Sullivan et al. 2004; Bertolero et al. 2007; Field et al. 2007). More specifically, a review of 91 herpetofauna translocation projects reported the primary causes of translocation failure were homing response by translocated individuals and poor habitat in translocated areas, followed by human collection, predation, food and nutrient limitation, and disease (Germano and Bishop 2009). The risks and uncertainties of translocation to desert tortoises are well recognized in the desert tortoise scientific community. The Desert Tortoise Recovery Office (DTRO) Science Advisory Committee (SAC) has made the following observation regarding desert tortoise translocations (DTRO 2009, p. 2):

> *As such, consensus (if not unanimity) exists among the SAC and other meeting participants that translocation is fraught with long-term uncertainties, notwithstanding recent research showing short-term successes, and should not be considered lightly as a management option. When considered, translocation should be part of a strategic population augmentation program, targeted toward depleted Populations in areas containing “good” habitat. The SAC recognizes that quantitative measures of habitat quality relative to desert tortoise demographics or population status currently do not exist, and a specific measure of “depleted” (e.g., ratio of dead to live tortoises in surveys of the potential translocation area) was not identified. Augmentations may also be useful to increase less depleted populations if the goal is to obtain a better demographic structure for long-term population persistence. Therefore, any translocations should be accompanied by specific monitoring or research to study the effectiveness or*

success of the translocation relative to changes in land use, management, or environmental condition.

However, many translocations of desert tortoises have been limited in scope and applicability; shortcomings have included small sample size, loss of tortoises by death, poaching, transmitter failure, limited sampling period, inadequate information on resident tortoises; variation in release techniques or timing of releases, and use of captive or penned tortoises (Walde et al. 2011). In a study conducted over that last four years at Fort Irwin the USGS observed highly variable mortality rates ranging from 34 percent in 2009 to 1.5 percent in 2011(Drake et al. 2011). Tortoise mortality rate for 2011 continued to decrease from previous years despite an increase in the number of tortoises being monitored (*ibid.*). **Biological Resource Table 7b** provides a summary of the data taken from the 2011 USGS study at Fort Irwin California.

Biological Resource Table 7b
Desert tortoise mortality from 2008-2011 at the Ft. Irwin Study Site.*

Study Year	Number Dead	Number Monitored	Percent Mortality
2008	39	121	32.2
2009	31	90	34.4
2010	11	82	13.4
2011	8	525	1.5

*Drake et al 2011.

This study suggested that the majority of desert tortoise mortality could be attributed indirectly to predation. In times of drought when predators (e.g. coyotes, kit foxes, and bobcats) have fewer mammalian prey items available, they increase take of less preferred prey including desert tortoises (Woodbury and Hardy 1948, Berry 1974). During droughts, coyotes apparently killed most of the tortoises in one study at the Desert Tortoise Natural Area (Peterson 1994) and 21 to 28 percent of the marked wild population in a study near Ridgecrest, California were killed by canids. Longshore et al. (2003) found that periods of drought may directly influence tortoise survivorship leading to regional population declines. Turner et al. (1984) also reported unpublished materials from K.H. Berry indicating that a site in the west Mojave had less than five percent mortality during five previous years (estimated from carcass remains), followed by a year when she observed 27 percent mortality among 48 marked tortoises over 12.5 km^2. Esque et al. (2010) found mortality rates at sites spanning the Mojave Desert ranged from zero to 43.5 percent, where two of the sites had no mortality observed and seven sites had some mortality in at least one of three years reported here.

Mortality data compiled from the ISEGS Monthly Compliance Report - July 2012 identified that of approximately 504 animals tracked (i.e., hatchlings, resident, control, and translocated animals) 32 were deceased and 21 have been identified as missing. The breakdown of mortalities included four hatchlings (born in the holding pens), six control animals, six resident animals, eight animals identified for translocation but held in pens, and seven animals that were subject to short distance translocation efforts. Excluding hatchlings and missing animals' mortality rates (i.e., 28/ 447 animals) for all desert tortoise including resident, control, and translocatee's is approximately six percent at this time. However, this is preliminary data and the long term effects of translocation for this population are not yet known.

While data suggests that translocation may be an effective tool for salvaging desert tortoise from large scale land use projects; the implementation of translocation activities must be completed in a thorough and well-coordinated manner. To provide guidance for these actions the USFWS prepared specific draft guidelines for clearance and translocation of desert tortoises from the project sites. This included the *Translocation of Desert Tortoises (Mojave Population) From Project Sites: Plan Development Guidance* (USFWS 2010b). This document provides guidance including the timing of relocation/translocation, disease testing requirements, and other actions intended to minimize impacts to desert tortoise. The plan will be revised for the PSEGS project to include changes to the project footprint and reviewed and approved by CDFW, USFWS, BLM and Energy Commission. The Desert Tortoise Relocation/Translocation Plan includes the identification and prioritization of potentially suitable locations for translocation; desert tortoise handling and transport considerations (including temperature); animal health considerations; a description of translocation scheduling, site preparation, and management; and specification of monitoring and reporting activities for evaluating success of translocation. With implementation of staff's proposed Condition of Certification **BIO-10,** adverse impacts associated with desert tortoise relocation/translocation would be minimized.

Biological Resources Table 7c (Desert Tortoise Density Estimates and Impact Summary) estimates of the numbers of tortoises that may be translocated from the project site; numbers of tortoises that may be handled at the translocation and control sites; and numbers of undetected juveniles and eggs that may occur at the project site. These figures are based on the values provided in the on the 2011 USFWS BO for the approved PSPP project (USFWS 2011b). Because no living desert tortoises were identified on the proposed solar field the actual number of desert tortoises that require translocation from the Project Disturbance Area is expected to be lower than the values identified in **Biological Resources Table 7c**.

Biological Resources Table 7c
Desert Tortoise Density Estimates and Impact Summary

	Estimated Number of Tortoises Subject to Direct Project Effects*						
Project Feature	**Adult and Sub-adults**		**Juvenile Estimates**		**Eggs**	**Total Adult/Sub-adult and Juvenile**	
	Lower	Upper	Lower	Upper		Lower	Upper
Project Site	2	12	3	6	35	5	18
Translocation Area²	2	12	3	6	N/A	5	18
Control Area³	2	12	3	6	N/A	5	18
Subtotal	6	36	9	18	N/A	15	54

**All estimates of desert tortoise abundance are based on values identified in the 2011 Biological Opinion for the Approved PSPP (USFWS 2011b).

As described in **Biological Resources Table 7c** (Desert Tortoise Density Estimates and Impact Summary) approximately two to 12 adult or subadult desert tortoises, three to six juvenile tortoises, and 35 eggs have the potential to occur on the proposed project site. The actual number of animals that may be subject to translocation is expected to be a subset of this value. It is estimated that only 15 percent of juvenile tortoises (0.15 multiplied by the number of juveniles) on the site would be located during clearance surveys.

There are inherent risks to any action that requires the handling, disease testing, and translocation of desert tortoise. For the proposed project these risks could occur in the translocated, host, and the control population. Although desert tortoises will not be translocated into the control population some mortality may occur from handling or if used, from the placement of GPS tracking devices. For example, mortality at control populations is expected to be approximately five percent based on a review of scientific studies of tortoise mortalities associated with routine handling (Moore pers. comm. 2010).

For this project translocation mortality rates are assumed to range up to 45 percent. This value represents the high end of documented translocation mortality for desert tortoise at this time. Using the five percent mortality rate for the control population (adult and juvenile tortoises multiplied by 0.05) and the 45 percent mortality rate for the translocated and host populations (adults and juveniles multiplied by 0.45) this would result in the potential loss of between five and 20 tortoises from translocation mortality. All of the 35 eggs would be lost. If fewer desert tortoises are discovered or mortality rates are lower there would be a corresponding reduction in desert tortoise deaths from translocation activities.

The project owner prepared a draft Desert Tortoise Relocation/Translocation Plan as part of the Incidental Take Permit application (AECOM 2010a, Attachment DR-BIO-47) for the approved PSPP project which includes measures to avoid and minimize adverse impacts to resident and translocated desert tortoise. Condition of certification **BIO-10** requires development of a Desert Tortoise Translocation Plan in consultation with CDFW, BLM, and USFWS. The Desert Tortoise Translocation Plan will include the identification and prioritization of potentially suitable locations for translocation; desert tortoise handling and transport considerations (including temperature); animal health considerations; a description of translocation scheduling, site preparation, and management; and specification of monitoring and reporting activities for evaluating success of translocation. With implementation of proposed Condition of Certification **BIO-10**, adverse impacts associated with desert tortoise translocation would be minimized.

Mitigation for Desert Tortoise Habitat Loss

The PSEGS project would result in the loss of approximately 3,947 acres of desert tortoise habitat. Construction would also result in the fragmentation and disturbance to adjacent habitat. These impacts are significant and require compensatory mitigation. With the exception of the dune areas desert tortoise habitat is present across most of the PSEGS project site. Habitat conditions vary on the site and generally consist of low to moderate quality habitat. Historic military training, agriculture, the spread of exotic plants, construction of I-10 and the large wing-dykes near the foothills of the Chuckwalla Mountains have contributed to the decline of habitat conditions on the project site. Staff agrees that little of the habitat quality within the Project Disturbance Area could be described as high quality, but all of it is suitable for desert tortoise and all could be potentially occupied.

For the approved PSPP project staff, FWS, CDFW, and BLM recommended compensatory mitigation ratio of 5:1 for disturbance to critical habitat and at a 1:1 ratio for areas outside of critical habitat. Staff from BLM, Energy Commission, USFWS, and

CDFW agrees that compensatory mitigation at these ratios is appropriate for the PSEGS Project because the Project would eliminate desert tortoise habitat, fragment adjacent habitat, and adversely affect connectivity for desert tortoise and other wildlife. The compensation ratio for the BLM is determined by its bioregional land use plan rather than the specific effects of the PSEGS Project on desert tortoise. The NECO specifies the following desert tortoise compensation requirements are applicable for the PSEGS project (from page D-2, Appendix D, BLM-CCD 2002):

> "*A mitigation fee based on the amount of acreage disturbed shall be required of proponents of new development. Within Desert Wildlife Management Areas (DWMAs) (Category I) the lands delivered or equivalent fee shall be an amount that achieves a ratio of 5 acres of compensation land for every 1 acre disturbed. Outside DWMAs (Category III) the lands delivered or equivalent fee shall be an amount that achieves a ratio of one 1 acre of compensation land for every 1 acre disturbed. Funds may be expended as approved by the Management Oversight Group in 1991. Lands will be acquired or enhanced within the same recovery unit as the disturbance. CDFW may require additional fees for management of lands and for rehabilitation of lands.*"

Integrating State and Federal Desert Tortoise Mitigation

Compensatory mitigation for desert tortoise typically involves balancing the acreage of habitat loss with acquisition of lands that would be permanently protected and enhanced to support healthy populations of desert tortoise. The compensation comes about by removing threats to desert tortoise and by improving the carrying capacity of the acquired property so that more desert tortoises will survive and reproduce on these lands.

While staff from BLM, Energy Commission, USFWS, and CDFW agree that these ratios for compensatory mitigation are appropriate for Project impacts to desert tortoise habitat, some differences remain between the federal and state approach to desert tortoise mitigation that currently preclude a complete integration of desert tortoise mitigation requirements. One difference is the state requirement for permanent protection of acquired mitigation lands. Energy Commission staff and CDFW require that mitigation lands acquired for endangered species be maintained and protected in perpetuity for the benefit of those species. The BLM cannot always make the same commitment to protecting acquired mitigation lands because their multiple use mandate restricts their ability to designate lands solely for conservation purposes and to exclude potentially incompatible development and activities.

For the acquisition of mitigation lands to truly compensate for the habitat loss and to make up for the numbers of desert tortoise that would otherwise have been supported by that habitat, the acquisition must be accompanied by: (1) permanent protection and management of the lands for desert tortoise, and (2) enhancement actions. The permanent protection is essential because it would allow the lands to be managed in a way that excludes multiple threats and incompatible uses (grazing, off-highway vehicle use, roads and trails, utility corridors, military operations, construction, mining, grazing by livestock and burros, invasive species, fire, and environmental contaminants). Without this protection and management desert tortoise populations on the acquired lands would be subject to the same threats that led to its population declines and threatened status. This level of protection would be necessary to meet the mitigation requirements for loss of desert tortoise habitat under CESA. An equally important component of mitigation is the implementation of enhancement actions to improve desert tortoise survival and reproduction. These actions might include habitat restoration, invasive plant control, road closures or road fencing, reducing livestock and burro grazing, reduce the risk of wildfires, and by controlling ravens and other predators. Without permanent protection and enhancement actions on lands acquired for mitigation, the project's impacts would result in a net loss of desert tortoises and their habitat.

The REAT Agencies agree that to address the in-perpetuity protection requirement for any lands acquired and subsequently donated to BLM will have either a deed restriction or conservation easement in title that will preclude future development of the land (Fesnock pers. comm., Flint pers. comm.). The REAT Agencies also note that protection could be achieved by buying private in-holdings within designated wilderness or wilderness study areas, being that these areas are congressionally designated and as such preclude any development within them, thus meeting the requirement for in-perpetuity protection. The BLM has an established process for accepting lands with deed restrictions or conservation easements and is working on streamlined version of this process. The BLM has also indicated that for any land enhancement actions or recovery actions implemented on existing BLM-owned lands, BLM would develop a Memorandum of Understanding (MOU) with CDFW containing provisions for notification of any proposed projects affecting those lands (BLM 2009a). The BLM agreed that future projects authorized on these mitigation lands that might degrade or diminish the desert tortoise recovery value would be compensated at a higher rate (BLM 2009a).

Calculation of Security for Desert Tortoise Compensatory Mitigation

To satisfy CDFW's full mitigation standard the proposed mitigation must meet criteria described in Title 14 CCR, Sections 783.4(a) and (b). These criteria include requirements that the proposed mitigation would be capable of successful implementation, and that adequate funding is provided to implement the required mitigation measures and to monitor compliance effectiveness of the measures. These financial assurances are generally provided in the form of an irrevocable letter of credit, a pledged savings account or another form of security prior to initiating ground-disturbing project activities. Staff's proposed conditions of certification typically specify the dollar amount of the security, and include a provision for adjusting that security amount when parcel-specific information is available.

This financial security amount is calculated by multiplying the acreage of the impact area by the total per-acre costs, a figure which represents the sum of the costs required for: (1) land acquisition, (2) initial habitat improvements, and (3) a fund to support long-term management of the acquired lands. The latter cost for the long-term management fund is typically the largest component of the mitigation fee. Interest from the fund provides enough income to cover annual stewardship costs on the acquired lands and includes a buffer to offset inflation.

The REAT agencies have developed a total cost accounting method for calculating acquisition or conservation easement costs for mitigation lands, as shown in **Biological Resources Table 8** below. This method provides an estimate of security costs for mitigation and includes the costs associated with the purchase transactions, appraisal, escrow, and title insurance including mineral, oil, and gas rights. The estimate also addresses costs of initial enhancement (e.g., signs, fencing, and boundary/property line surveys; or restoration actions such as removal of exotic species, roads), management for ongoing activities such as public access and enforcement; and monitoring the implementation, effectiveness, and compliance of conservation measures with the goals and objectives of the mitigation. For those projects using the REAT-National Fish and Wildlife Foundation (NFWF) Mitigation Account for implementing mitigation actions, the budget includes administration of contracts and reporting.

Biological Resources Table 8
REAT Biological Resources Mitigation/Compensation Cost Estimate Calculation Table - July 23, 2010 (REAT 2010)[1]

	Desert Tortoise Compensation	Sand Dune Habitat	Burrowing Owl	Streambed Compensation
Number of Acres	4863	1854	78	757
Estimated number of parcels to be acquired, at 160 acres per parcel[2]	30	12	1	5
Land cost at $1000/acre[3]	$ 4,863,000	$1,854,000.00	$78,000	$757,000.00
Level 1 Environmental Site Assessment at $3000/parcel	$91,181.25	$34,762.50	$3,000	$14,193.75
Appraisal at no less than $5,000/parcel	$151,968.25	$57,937.50	$5,000	$23,656.25
Initial site work - clean-up, restoration or enhancement, at $250/acre[4]	$1,215,750	$463,500.00	$19,500	$189,250.00
Closing and Escrow Cost at $5000 for 2 transactions[5]	$151,968.25	$57,937.50	$5,000	$23,656.25
Biological survey for determining mitigation value of land (habitat based with species specific augmentation) at $5000/parcel	$151,968.25	$57,937.50	$5,000	$23,656.25
3rd Party Administrative Costs (Land Cost x 10%)[6]	$486,300	$185,400.00	$7,800	$75,700.00
Agency cost to accept land donation[7] (Land Cost x 15%) x 1.17 (17% of the 15% for overhead)	$853,456.50	$325,377.00	$13,689	$132,853.50
Subtotal of Acquisition and Initial Site Work	$ $7,965,594.00	$3,036,852.00	$136,989	$1,239,966.00
Long-term Management and Maintenance (LTMM) fee at $1450/acre [8]	$7,051,350	$2,688,300.00	$113,100	$1,097,650.00
NFWF Fees				

Establish Project Specific Account[9]	$12,000			
Call for and Process Pre-Proposal Modified RFP or RPF [10]	$30,000			
NFWF Management fee for Acquisition and Enhancement Actions (Subtotal x 3%)	$238,967.82	$91,105.56	$4,109	$37,198.98
NFWF Management Fee for LTMM account (LTMM x 1%)	$70,513.50	$26,883.00	$1,131	$10,976.50
Subtotal of NFWF Fees	$393,481.32	$117,988.56	$5,240	$48,175.48
TOTAL Estimated cost for deposit in project specific sub-account	$ 15,368,425.32	$5,843,140.56	$255,330	$2,385,791.48

1. All costs are best estimates as of summer 2010. Actual costs will be determined at the time of the transactions and may change the funding needed to implement the required mitigation obligation. Note: regardless of the estimates, the developer is responsible for providing adequate funding to implement the required mitigation.
2. For the purposes of determining costs, a parcel is defined at 160 acres, recognizing that some will be larger and some will be smaller, but that 160 acres provides a good estimate for the number of transactions anticipated (based on input from CDD).
3. Generalized estimate taking into consideration a likely jump in land costs due to demand, and an 18-24 month window to acquire the land after agency decisions are made. If the agencies, developer, or 3rd party has better, credible information on land costs in the specific area where project-specific mitigation lands are likely to be purchased, that data overrides this general estimate. Note: regardless of the estimates, the developer is responsible for providing adequate funding to implement the required mitigation.
4. Based on information from CDFW.
5. Two transactions at $2500 each: landowner to 3rd party; 3rd party to agency. The transactions will likely be separated in time.
6. Includes staff time to work with agencies and landowners; develop management plan; oversee land transaction; organizational reporting and due diligence; review of acquisition documents; assembling acres to acquire….)
7. Includes agency costs to accept the land into the public management system and costs associated with tracking/managing the costs associated with the donation acceptance, including 2 physical inspections; review and approval of the Level 1 ESA assessment; review of all title documents; drafting deed and deed restrictions; issue escrow instructions; mapping the parcels….
8. Estimate for purposes of calculating general costs. The actual long term management costs will be determined using a Property Assessment Report (PAR) tailored to the specific acquisition. Includes land management; enforcement and defense of easement or title [short and long term]; monitoring….
9. Each renewable energy project will be a separate sub-account within the REAT-NFWF account, regardless of the number of required mitigation actions per project.
10. If determined necessary by the REAT agencies if multiple 3rd parties have expressed interest; for transparency and objective selection of 3rd party to carryout acquisition.

The cost for the long-term maintenance and management is typically the largest component of the mitigation fee. Interest from the long-term maintenance and management fee creates a funding source that provides enough income to cover annual stewardship costs on the acquired lands and includes a buffer to offset inflation. The amount for the long-term maintenance and management fee is established by a Property Analysis Record (PAR), a computerized database methodology developed by the Center for Natural Lands Management (<www.cnlm.org/cms>) which calculates the costs of land management activities for a particular parcel. These activities include development of a desert tortoise management plan tailored for each parcel of mitigation land to assess habitat status, identify desired conditions, and develop plans to achieve conditions that would best support desert tortoise. Once the management plan is developed and approved by the appropriate resource agencies, implementation of enhancement actions such as fencing, road closure, weed control, habitat restoration as well as monitoring can begin. The goal of these activities is to increase the carrying capacity of the acquired lands for desert tortoise and increase their population numbers by enhancing survivorship and reproduction.

Funding for the initial habitat improvements supports those actions needed immediately upon acquisition of the property to secure it and remove hazards. These activities might include fencing or debris clean-up, or other urgent remedial action identified prior to when the parcels were acquired. When the management plan is completed for the acquired parcel activities like these are thereafter funded from the interest produced by the long-term maintenance and management fee described above.

Condition of Certification **BIO-12** specifies acquisition of 4,863 acres to mitigate for impacts to desert tortoise habitat. Based on the calculations summarized in Biological Resources Table 6a, the estimated security with NFWF fees would be $15,277,027. The security amount without NFWF fees would be $14,927,392. The estimated composite mitigation cost for establishing the financial security would be $3,506 per acre (see **Biological Resources Table 8** for a breakdown of expected costs). This security amount may change when an updated appraisal is made and a PAR is prepared for the parcels that have been selected for acquisition. These are estimates based on current costs and the current REAT compensation table; the requirement is defined in6 terms of acres, not dollars per acre, and actual costs may vary. If the security proves to be inadequate to secure the necessary acreage because of increases in land costs, the Project owner would need to make up the difference. Similarly, if the security was an overestimate the Project owner would be refunded the excess.

The applicant may elect to purchase and permanently protect compensation lands itself; to fund the acquisition and initial improvement of compensation lands through National Fish and Wildlife Foundation (NFWF) by depositing funds for that purpose into NFWF's Renewable Energy Action Team (REAT) Account; or to fund the acquisition of compensation lands through a third party other than NFWF, as outlined in **BIO-12**. REAT options are described below. Further, **BIO-12** would require that the project owner provide financial assurances to guarantee an adequate level of funding to implement the compensation measures described above. Because there are several suitable options available to the applicant to satisfy the compensation requirement, and because mitigation requirements must satisfy the requirements of both state and federal Endangered Species acts, the calculation of the security amount includes estimates of all transaction and management fees described above. These calculations are presented in **Biological Resources Table 8**.

Indirect and Operational Impacts

Indirect effects to desert tortoises could include soil compaction, fugitive dust, the introduction of non-native and invasive plant species, and increased human presence along access roads. Indirect effects may also include habitat fragmentation, the disruption of existing home ranges, and barriers to dispersal. Increased human presence from new access roads or interest in the facility could lead to increased road kill, illegal collecting and the spread of disease due to abandonment of captive tortoises infected with upper respiratory tract disease. Operational impacts to desert tortoise include both direct and indirect effects including those described above. Typically, these effects are similar in type but smaller in magnitude when compared to construction related effects. These effects may include the risk of mortality from vehicle traffic, crushing of burrows by routine maintenance activities on access roads or if any desert tortoises remain in the facility area post construction, vegetation management activities, and washing of the heliostats. Other operational effects include fires, habitat degradation, and the spread of invasive plant species. Increased road traffic on roads in the region either from facility staff or sightseers increases the risk of road kill to both tortoises and common wildlife. This not only results in the loss of desert tortoise but increases the risk for subsidized predators such as ravens and coyotes.

Ravens and Other Predators

Construction and operation of the project has the potential to increase raven and coyote presence in the project area. Ravens depend on human encroachment to expand into areas where they were previously absent or in low abundance. Common ravens were rarely observed within the Project Disturbance Area during surveys in 2009, although one pair was observed nesting in a desert ironwood tree in the north central portion of the Project Disturbance Area (Solar Millennium 2009a, Volume II, Appendix F). Staff noted ravens at the site during surveys in 2013 and this species is known from the region. Ravens habituate to human activities and are subsidized by the food and water, as well as roosting and nesting resources that are introduced or augmented by human encroachment. Common raven populations in some areas of the Mojave Desert increased 1,500 percent from 1968 to 1988 in response to expanding human use of the desert (Boarman 2002). Since ravens were scarce in this area prior to 1940, the current level of raven predation on juvenile desert tortoises is considered to be an unnatural occurrence (BLM 1990; USFWS 2008a). Multiple coyotes were also observed by staff foraging in the adjacent date farm during surveys of the site in May 2013. In addition to ravens and coyotes, feral dogs have emerged as major predators of the tortoise. Dogs may range several miles into the desert and have been found digging up and killing desert tortoises (USFWS 2011a; Evans 2001). However the site is located in a rural area with only sparse residential development.

Ravens may use the perimeter fence as potential perch sites and new transmission line structures as nest and perch sites increasing the potential for loss of tortoises from raven predation. Several raven subsidies occur in the region including the existing date farm, a small reservoir located adjacent to the project fence line, and other agricultural activities located northwest of the site. Periodic roadkill on I-10 also provides subsidies for opportunistic predators/scavengers such as ravens. Road kills would mount with increased Project construction and operations traffic, further exacerbating the raven/predator attractions and increasing desert tortoise predation levels. Bird collisions with facility structures or transmission lines may attract ravens. As the project area is already subject to elevated raven predation pressure the loss of juvenile tortoise in an area supporting limited tortoise densities could have a long-term effect on the tortoise population by reducing the recruitment of juvenile tortoises into the adult life stages (Boarman 2003). The effects of reduced recruitment may not be apparent for years because tortoises do not typically reach sexual maturity until approximately 15 to 20 years of age, and are therefore considered indirect impacts of project operation. Subsidies

Implementation of condition of certification (**BIO-6**) worker environmental awareness training; (**BIO-8**) restrictions on pets being brought to the site required of all personnel, and the collection of road kill would reduce or eliminate the potential for these impacts. The project owner would also implement staffs recommended Condition of Certification **BIO-13 (Raven management Fee)** to further reduce impacts to desert tortoise from the projects contribution to raven subsidies in the region.

Regional Approach to Raven Control

The USFWS, in cooperation with CDFG and BLM, has developed a comprehensive regional raven management and monitoring program in the California Desert Conservation Area to address the regional, significant cumulative threat that increased numbers of common ravens pose to desert tortoise recovery efforts (USFWS 2010b). The Regional Raven Management Program will implement recommendations in the USFWS E*nvironmental Assessment to Implement a Desert Tortoise Recovery Plan Task: Reduce Common Raven Predation on the Desert Tortoise* (USFWS 2008). To mitigate the Palen Project's contribution to cumulative and indirect impacts on desert tortoise from raven predation, staff proposes that the applicant contribute toward implementation of the USFWS Regional Raven Management Program (USFWS 2010) as described in Condition of Certification **BIO-13**. The Applicant's payment would support the regional raven management plan activities focused within the Colorado Desert Recovery Unit, which would be adversely affected by increases in raven subsidies attributable to the PSEGS project. The fees contributed by the Applicant would fund implementation of the raven removal actions, education and outreach efforts, and surveying and monitoring activities identified in the Environmental Assessment (USFWS 2008). Staff has concluded that that implementation of these actions would be an effective means of reducing the Project's cumulative contributions to desert tortoise predation from increased raven numbers.

The project owner prepared a draft Raven Monitoring and Control Plan (AECOM 2010a DR-BIO-57) in response to staff's request to develop methods and best management practices to avoid and minimize raven attractants and subsidies for the approved PSPP project site. Staff has integrated this draft raven plan into proposed Condition of Certification **BIO-13.** The project owners Common Raven Monitoring, Management and Control Plan would involve identifying and preventing conditions that might attract or support ravens (for example, eliminating food sources such as garbage or roadkill, minimizing creation of structures that could provide ravens perches, nests or roosts), monitoring the effectiveness of raven management and control measures, and then implementing additional adaptive management measures to make sure that the Project does not result in an increase in raven numbers. Implementation of measures in **BIO-13** would avoid or minimize the contributions of the Project to increased desert tortoise predation from ravens to less than significant levels.

Increased Risk from Roads/Traffic

Vehicle traffic would increase as a result of construction and improvement of access roads, increasing the risk of injuring or killing desert tortoise. The potential for increased traffic-related tortoise mortality is greatest along paved roads where vehicle frequency and speed is greatest though tortoises on dirt roads may also be affected depending on vehicle frequency and speed. Census data indicate that desert tortoise numbers decline as vehicle use increases and that tortoise sign increases with increased distance from roads (Nicholson 1978; Hoff and Marlow 2002). Additional unauthorized impacts that may occur from casual use of the access roads in the Project area include unauthorized trail creation.

To minimize the risks of increased traffic fatality and other hazards associated with roads at the Project site, the Applicant has proposed a variety of minimization measures which staff has incorporated into Condition of Certification **BIO-8.** These measures include confining vehicular traffic to and from the Project site to existing routes of travel, prohibiting cross country vehicle and equipment use outside designated work areas, and imposing a speed limit of 25 miles per hour.

As discussed above, local movement patterns of desert tortoise would be disrupted by the Project, and tortoises north of the Project site attempting to move in a southward direction would be diverted to the east or west, and the perimeter fencing around the Project site would direct tortoises towards I-10 on the traffic surface (AECOM 2010b. Tortoise-proof fencing has not been installed along this segment of I-10, so desert tortoises moving around the Project site would potentially experience increased rates of vehicular-related mortality. Staff considers the potential increase in desert tortoise road fatalities to be a significant impact of the Project. To reduce this impact to less-than-significant levels, staff's proposed Condition of Certification **BIO-9** (Desert Tortoise Clearance Surveys and Fencing) requires installation of desert tortoise exclusion fencing along both sides of I-10 south of the Project area, and maintenance of the bridge undercrossings of I-10 as safe and accessible passage for desert tortoise.

Impacts from Noxious Weeds

Many invasive non-native species are adapted to and promoted by soil disturbance (Lathrop & Archibald 1980). Once introduced, they can out-compete native species because of minimal water requirements, high germination potential and high seed production (Beatley 1996). Weeds can outcompete native annuals where nitrogen deposition (near highways such as I-10) and precipitation rates are higher, leading to higher risk of wildfire (Allen et al. 2010), and can become locally dominant, representing a serious threat to native desert ecosystems (Abella et al. 2008). Sahara mustard (*Brassica tournefortii*) is regarded as one of the most invasive wildland pest plants in the Colorado and Mojave deserts, one of the most common invasive plants in desert tortoise habitat, and capable of dominating entire desert landscapes if no control actions are taken. Sahara mustard spreads explosively during wet years but even during a 12-

year drought in Riverside County (1989-1991), the population of Sahara mustard increased by nearly 35 times. Densities equivalent to as high as three million plants per acre have been recorded at Lake Mead National Recreation Area (Graham et al. 2002).

Left uncontrolled, Sahara mustard out-competes and ultimately replaces native wildflowers that provide valuable forage for the desert tortoise. It forms dense thickets that can increase the frequency, intensity, and size of desert fires, increasing the threat to native plant communities, the desert tortoise, and other wildlife (Brooks 2010). In areas where Sahara mustard is particularly dense it may also impede desert tortoise movement (Berry pers. comm.). In the Colorado and Mojave Deserts, a single tortoise was necropsied that had died from renal failure, related to renal oxalosis, and the crystals present in the kidneys were identified as oxalates (Jacobson et al. 2009). One additional tortoise was later necropsied that died of oxalosis in the same region (Berry pers. comm. 2010). Although many native plants in the Mojave and Colorado deserts contain oxalates, however, the oxalate-containing weed Sahara mustard is one of the most common invasives in desert tortoise habitat and is a suspected cause of the renal failure (Berry pers. comm.). See Indirect Impacts to Special-Status Plants for additional information on the risk invasive weeds pose to desert ecosystems. Staff's proposed Condition of Certification **BIO-14** (Weed Management Plan) includes monitoring and control measures that would reduce impacts to desert tortoise from increases in Sahara mustard and other weeds to less than significant levels.

Staff has requested the project owner supply further data relative to onsite vegetation management regimes, and specifically, to provide data reqarding the long-term effects of mowing native vegetation (CEC 2013h). Upon receipt of the requested data from the project owner, staff will provide final analysis and recommend any necessary changes to Condition of Certification **BIO-14** in the FSA.

Other Indirect Impacts

Indirect effects to desert tortoise may occur from wildfires. Desert tortoises that escape direct mortality from wildfires may be affected by fire-induced habitat alteration. Alterations to habitat can result in mortality, decreased fecundity, increased predation, starvation, and dehydration; all resulting in reduced viability of this species (USFWS 2011a). Reduction in plant cover also reduces available shelter as perennial plants, especially woody shrubs, provide protection for desert tortoises from mortality due to predators and overheating from the sun (Woodbury and Hardy 1948; Burge 1978; Mushinsky and Gibson 1991). Although single fires may not produce long-term reduction in the cover of perennial plants or biomass of native annual plants (O'Leary and Minnich 1981), recurrent fire can convert native desert scrub to alien annual grasslands (Brown and Minnich 1986; Duck et al. 1997; Esque et al 2003). Indirect effects can also increase the risk of predation by predators attracted to the area by increased human activity, water or food subsidies. Clearing and grading activities would result in the exposure of large numbers of fossorial species such as small rodents and reptiles. Many of these species are killed or injured during these activities and attract ravens and other opportunistic predators. Potential deposition of sediment loads as a result of construction-related sediment mobilization during heavy rain events and flooding downstream would impact existing desert tortoise burrows outside of the Project Disturbance Area.

Connectivity

The PSEGS project is located within designated Wildlife Habitat Management Areas (WHMAs). These include the Palen-Ford WHMA and DWMA Continuity WHMA (USFWS 2011b). Management emphasis for the Palen-Ford WHMA is on the management of the dunes and playas within the Palen-Ford dune system. Management emphasis for the DWMA Continuity WHMA is providing connectivity of tortoises between conservation areas north and south of I–10 (i.e., the Chuckwalla DWMA and Chemehuevi DWMA). The PSEGS project (solar field) is located north of I-10. Adjacent land uses include date farms, a small development and natural lands including the Palen Dunes.

The RSA for the approved project indicated that the Project area may be important for desert tortoise movements between higher quality habitats available in the Palen Mountains to the northeast and the Chuckwalla Mountains to the south; the location of the Project area connects these higher quality habitats (Galati & Blek 2010b). Similarly, desert tortoise are known to use low-quality intermountain habitat, such as that present across most of the Project area, as dispersal routes over time, providing connectivity between high-quality habitat areas in the surrounding mountains (Averill-Murray and Averill-Murray 2005). Currently, three large culverts under I-10, occurring along the existing washes in the Project area, provide desert tortoise and other wildlife a safe passage under I-10 in a north-south direction across the Project area (Galati & Blek 2010b). The box culverts, range in width from 90 to 150 feet and provide an outlet for Corn Springs Wash and other drainages that flow beneath I-10.

Recent studies indicate that habitat fragmentation and isolation of natural areas ultimately results in the loss of native species within those communities (Soulé et al. 1988). Populations of animals that are isolated from other populations are at higher risk of extirpation both from sources such as drought, disease, or wildlife. In the Colorado Desert large areas have been subject to habitat fragmentation from development (i.e., Desert Center, Blythe, State Prisons), agricultural practices, and off highway vehicle use. On a local scale, large solar infrastructure projects have been permitted and several are currently under construction in the Chuckwalla Valley. All of these features fragment habitat and reduce connectivity for some species of wildlife. The amount and distribution of suitable habitat is an essential element to consider for the management of wildlife. For example, some species require, and are often limited to, unique vegetation or terrain features for breeding or foraging such as desert tortoise.

Construction of the PSEGS project would result in a barrier to desert tortoise in the region. The placement of perimeter fencing will exclude desert tortoise from the site and remove approximately 3,947 acres of habitat for this species. Similarly, the facility will eliminate the large washes and other ephemeral drainages within the Project Disturbance Area and would impair local wildlife movement and reduce habitat connectivity for desert tortoise. Although desert tortoise is not a migratory species, opportunities for local movements within its home range and dispersal are important for maintaining viable populations (Galati and Blek 2010b). Impairment to connectivity through the Project vicinity could disrupt desert tortoise population dispersal from the Chuckwalla Mountains to the southwest connecting to the Palen Mountains in the northeast and vice versa (Galati and Blek 2010b); this impact to connectivity was identified as significant and unmitigable in the Staff Assessment/Draft Environmental Impact Statement (SA/DEIS).

After the SA/DEIS was published, the Applicant conducted a survey of the Project-vicinity undercrossings and prepared a report of the findings (*Wildlife Movement and Desert Tortoise Habitat*, AECOM 2010f). The results of this report show that there are numerous Project-vicinity undercrossings that provide wildlife movement corridors and provide the opportunity for desert tortoise connectivity. In addition, sand dune habitat and Palen Dry Lake are to the north of the Project site; washes associated with the Project lead directly into this sand dune and dry lake habitat. While desert tortoises will cross desert pavement and dunes, areas of heavy dune concentration and areas consisting purely of dunes offer little in the way forage and make burrowing difficult, and Palen Dry Lake is also inhospitable to desert tortoise (Galati and Blek 2010j). Staff agrees that these areas are not likely to be a regular part of tortoise home ranges, and with or without the Project desert tortoises moving through the area would be forced either to the east or west. Desert tortoise would maintain access through the three large culverts which would remain open after Project construction, but their utility as a wildlife movement corridor would be significantly impaired because of the loss of downstream washes that connect to the culverts.

Desert tortoise traveling around the Project from the north may attempt to cross I-10 at grade rather than use the underpass, increasing risk of mortality. Fencing on the west side of the Project could guide desert tortoise directly onto I-10. In addition to the three underpasses that occur adjacent to the project site, an additional 21 underpasses occur along the existing washes in the 36-mile-long stretch on either side of the proposed project, between Wiley Wells Road and Desert Center (see Figure 8 in AECOM 2010a). The 2011 BO for the approved PSPP project indicated AECOM surveyed these underpasses and determined that all are suitable for tortoise use and provide passage under I–10 in a north–south direction to allow tortoise passage. Therefore, although the proposed project would reduce the amount of available tortoise habitat and result in reduced habitat connectivity; habitat would remain to the west and east of the proposed project to provide connectivity of tortoises in the long term (2011b).

To facilitate desert tortoise movement and to connect the undercrossings south of the Project with open areas to the west, the Applicant has proposed installation of a large box culvert under the proposed access road leading to the Project site from I-10. This, along with desert tortoise fencing along both sides of I-10 to direct desert tortoise to nearby undercrossings, would mitigate impacts to connectivity below a level of significant. Staff has incorporated these measures into staff's proposed conditions of certification **BIO-8** and **BIO-9**.

Staff considers this loss of connectivity for local wildlife movement and for desert tortoise to be a significant impact of the PSEGS project. Staff's proposed Condition of Certification **BIO-12** requires land acquisitions of parcels that contribute to desert tortoise habitat connectivity and build linkages between desert tortoise populations and designated critical habitat. Implementation of this condition of certification would offset impacts to desert tortoise. These targeted areas are consistent with those described in the California Desert Connectivity Project (Science and Collaboration for Connected Wildlands Desert Linkages Habitat Connectivity Study <www.scwildlands.org>)

(Spencer et al. 2010). With implementation of staff's proposed conditions of certification **BIO-8**, **BIO-9**, and **BIO-12**, Project impacts to desert tortoise connectivity would be reduced to less-than-significant levels.

Conclusion – Impacts and Mitigation for Desert Tortoise

Staff's proposed Conditions of Certification **BIO-9** through **BIO-11** describe measures that would avoid and minimize direct impacts to desert tortoise, and staff has concluded that implementation of these measures would reduce potential direct impacts to less-than-significant levels. To address the loss of 3,947 acres of desert tortoise habitat, and associated fragmentation and loss of connectivity, staff's proposed Condition of Certification **BIO-12** requires acquisition and enhancement of 4,863 acres of desert tortoise habitat within the Colorado Desert Recovery Unit in areas that have potential to contribute to desert tortoise habitat connectivity and build linkages between desert tortoise populations. Staff has determined that sufficient compensatory mitigation lands are available in the Colorado Desert Recovery Unit to fulfill this acquisition requirement. Staff has concluded that implementation of proposed Conditions of Certification **BIO-9** through **BIO-12** would reduce impacts to desert tortoise to less-than-significant levels.

Mojave Fringe-toed Lizard

The Project would directly impact 1,479 acres of Mojave fringe-toed lizard habitat in the northeastern portion of the Project Disturbance Area, an area of active wind-blown sand with relatively shallow sand deposits, as well as areas of deeper and more active vegetated sand dunes. In addition to this direct and immediate loss of habitat, the project would significantly affect downwind Mojave fringe-toed lizard habitat The northeastern portion of the Project as originally configured would interrupt the regional wind-borne sand transport corridor that moves sand southeast and east along the Chuckwalla Valley and toward the Colorado River (**Biological Resources APPENDIX A**).

The Mojave fringe-toed lizard relies on vegetated sand dunes and a regular supply of fine wind-blown sand for its habitat. Active sand dunes (i.e., dunes that have an active layer of mobile sand) exist in a state of dynamic equilibrium, continuously losing sand downwind due to erosion and transport and gaining new supplies from upwind. If the upwind sand supply is cut off the dunes deflate, losing sand downwind and shrinking in size and depth. 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 lag does not support Mojave fringe-toed lizard habitat.

The PSPP would have affected sand transport because it included a perimeter sand fence that is 30 feet high designed to stop sand from entering the solar array. Most sand transport occurs close to the ground through the processes of rolling and saltation (bouncing of sand particles) with approximately 90 percent of sand transport occurs within six feet of the ground surface (see **Biological Resources APPENDIX A**). Staff concluded that wind fence would pose an effective barrier to sand transport, and create a "sand shadow" downwind. A sand shadow is defined as an area downwind of a sand barrier where the wind is able to remove sand but there is no supply of new sand upwind. Over time existing sand dunes in a shadow area will be deflated because they will shrink and become coarser as the fine sand is blown away by the wind.

As described earlier in the subsection on impacts to the sand transport corridor, the PSPP would have had an impact on sand transport and Mojave fringe-toed lizard habitat by eliminating the network of desert washes throughout the site and replacing them with engineered channels (**Biological Resources APPENDIX A**). Project construction on the alluvial fans and alteration of stream channels by channelization may have reduced the amount of fluvial sediment reaching the depositional areas upwind of sand dunes and Mojave fringe-toed lizard habitat. Similar effects have been observed in the Coachella Valley, with adverse consequences for Coachella Valley fringe-toed lizard habitat (Griffiths et al. 2002). The direct impacts for the PSEGS project on the sand transport corridor have been reduced to 1,129 acres from the PSPP (1,503 acres for Reconfigured Alternative 3 and 1,542 acres for Reconfigured Alternative 3). The proposed PSEGS eliminates the large drainage control channels and the majority of the project site would maintain the original grades and natural drainage features (Palen 2012a). The PSEGS Project has also been designed to eliminate the PSPP Project's 30 foot tall wind fences that contributed to disruption of the sand transport (Palen 2013a). The revised PSEGS project boundary is proposed to be defined by a chain--link fence, which will have a very different effect on wind flow and sand transport. Sand may pass through the fence and winds will be affected by the heliostat array (CEC 2013l). The project owner assumed 39.7 acres of indirect impacts for the private parcel adjacent to project site that would be surrounded on three sides by project fencing (Palen 2013a). Staff is revising the PWA model to take account of the new arrangement of the solar array and the heliostats and will provide a complete analysis of indirect impacts for the PSEGS project upon receipt of the requested information included in Data Request Set 2 in the FSA.

Other potential indirect and operational impacts of the PSEGS Project include: mortality from vehicle strikes; introduction and spread of non-native invasive plants; erosion and sedimentation of disturbed soils; edge effects including fragmentation and degradation of remaining habitat; increased road kill hazard from operations traffic; harm from vegetation management activities including mowing, trimming, and other vegetation removal methods, harm from accidental spraying or drift of dust suppression chemicals; and, an increase in access for avian predators (such as loggerhead shrikes) due to new perching structures. Sahara mustard, in particular, is a noxious weed of high concern in the Colorado Desert. Sahara mustard may affect wildlife by altering the availability of forage plants and characteristics of their habitat structure. Vehicle strikes have been a reported cause of mortality to Mojave fringe toed lizard on project access roads in the region. At least 118 Mojave fringe-toed lizards had been killed by vehicle strikes on the Colorado River Substation access road as of January 2013 (BLM EA). In addition, at least two Couch's spadefoot toads have been killed on the Colorado River Substation access road (SCE FRED 2013).

Staff has requested the project owner supply further data relative to onsite vegetation management regimes, and specifically, providing a draft vegetation management plan that describes the mowing plan for the site (CEC 2013h). Pending receipt of data from the project owner, staff will provide a final analysis, and any necessary changes to recommended conditions of certification in the FSA.

Barrows et al. (2009) found the Coachella Valley fringe-toed lizard to be the only animal species of five vertebrates evaluated to demonstrate a negative response to Sahara mustard abundance. Lizard abundance was monitored in undisturbed, weedy habitat and compared abundance in weeded control sites. The author noted that Coachella Valley fringe-toed lizard abundance on weeded plots showed a decrease (Barrows et al 2009). This negative impact was short-lived and declined no more than a year after the mustard's dominance waned. This indicates that Sahara mustard removal would improve habitat quality for fringe-toed lizards. An indirect effect of Sahara mustard on fringe-toed lizard is that it may increase sand compaction within aeolian sand (active dune) communities (Barrows et al 2009). Over time sand compaction could lead to a change in habitat from an aeolian sand community to a stabilized sand community.

The distribution of Mojave fringe-toed lizards is naturally fragmented because of its obligate habitat specificity to a patchy habitat type, and many local populations of this species are quite small, with small patches of sand supporting small populations of lizards. This fragmented pattern of distribution leaves the species vulnerable to local extirpations from additional habitat disturbance and fragmentation (Murphy et al. 2007). The Mojave fringe-toed lizard population in the Chuckwalla Valley, along with a very small population in Joshua Tree National Park's Pinto Basin, represents the southernmost distribution of this species (Barrows, pers. comm.). This southern population may represent an important gene pool in light of the likely warming and drying that will occur in this region as a result of climate change; these southernmost lizards that may be already adapted to hotter and drier conditions than those further north could represent a source of genetic variation that could stave off extinction of this species in selected refugia (Barrows, pers. comm.). The cumulative impact of all the PSEGS projects would be to increase the already fragmented distribution of the Mojave fringe-toed lizards, and to increase the risk of extirpation of isolated populations within the Chuckwalla Valley.

As described in the RSA, PSPP Reconfigured Alternatives 2 and 3 shifted the footprint of the Project out of the sand transport corridor. This change substantially reduced direct, indirect and cumulative impacts to Mojave fringe-toed lizard habitat of the PSPP however both alternatives would still have had significant impacts to Mojave fringe-toed lizards. Staff concluded that impacts to Mojave fringe-toed lizard habitat could be mitigated to less-than-significant levels with implementation of proposed Condition of Certification **BIO-20.** This condition recommends acquisition and protection of core populations of Mojave fringe-toed lizard habitat elsewhere in the Chuckwalla Valley. **BIO-20** requires that impacts to stabilized and partially stabilized sand dunes from the Project or any of its alternatives be mitigated at a 3:1, consistent with recommendations in the NECO plan. For impacts to non-dune habitats occupied by Mojave fringe-toed lizards (sand fields vegetated with sparse creosote bush scrub) the mitigation ratio would be 1:1, with the requirement that acquired mitigation lands be within the Chuckwalla or Palen sand transport corridor. Any indirect “sand shadow” impacts would be mitigated at a 0.5:1 ratio. Indirect impacts for the PSEGS have not yet been determined. Implementation of **BIO-20** would likely still mitigate direct impacts to Mojave fringe-toed lizard habitat to less-than-significant levels. Any modifications to **BIO-20** or additional proposed conditions of certification will be included in the Final Staff Assessment as appropriate.

In addition, staff recommends incorporating maintain speed limits, posting additional speed limit signs, and providing additional worker training related to Mojave fringe-toed lizard, and increase monitoring and reporting of species and vehicle strikes along project access roads into existing conditions of certification. Impacts to Mojave fringe-toed lizard habitat could be mitigated to less-than-significant levels with implementation of proposed Condition of Certification in **BIO-6** and **BIO-8.** Impacts from vegetation management will be addressed and analyzed pending receipt of a draft vegetation management plan from the project owner prior to publication of the Final Staff Assessment.

Couch's Spadefoot Toad

If Couch's spadefoot toads are present in the Project Disturbance Area, impacts from construction would include loss of habitat and direct mortality during grading and construction. Construction activities that create pits or depressions during the summer rains could provide breeding habitat, which could either be vulnerable to additional construction impacts or be in substrate that is incapable of sustaining ponded water for the necessary time. During project construction and operation Couch's spadefoot toads could be crushed on access roads, and it is possible for construction disturbance to cause toads to surface, regardless of whether the season is suitable for emergence. In light of this new information, staff suggests a conservative approach in considering the potential of Couch's spadefoot toad to occur on or adjacent the project site, and have encouraged the project owner to survey low areas and surficial depressions where ponding may occur, as well as washes, after rain events during spring and summer of 2013, to detect toad emergence. To finish the FSA, staff is awaiting the results of spadefoot toad microhabitat mapping performed in spring of 2013 (TN: 70096). Pending receipt of that data, staff may recommend additional protective measures in the FSA.

Western Burrowing Owl

Burrowing owl and their sign (feathers, whitewash, and/or pellets) was detected on the project site during protocol surveys conducted for the approved PSPP project. No burrowing owls or active owl burrows were documented within the ¾-mile and 1-mile buffer transects performed during spring 2009 surveys for this species (AECOM 2010a, Draft PSEGS Burrowing Owl Relocation/Translocation Plan). Surveys conducted for the natural gas pipeline alignment in 2013 detected one burrowing owl however an active burrow was not detected in the proposed disturbance area. As of 2010 at least five potentially active owl burrows occurred within the Project Disturbance Area. At that time staff determined that at least four owls (two adults and two juvenile/fledglings) were present on the Project site. During avian surveys conducted in 2013 the project owner documented ten burrowing owl observations across the project site. These surveys are not intended to document nesting and these may be resident or transient birds.

Direct impacts to burrowing owl includes the loss of nest sites, eggs, and/or young; permanent loss of breeding and foraging habitat; and disturbance of nesting and foraging activities for burrowing owl pairs within the Project site, buffer, or immediately surrounding area. This includes crushing burrows, increased noise levels from heavy equipment, disturbance from human presence, and exposure to fugitive dust. Because burrowing owls are cavity dwellers that are primarily active during crepuscular periods (i.e., dawn and dusk) or at night, birds flushed from burrows during the day would be exposed to elevated predation risk from raptors. Burrowing owls also exhibit site fidelity and owls displaced from a burrow during construction or from passive relocation activities have an increased risk of mortality from predation if they lack access to adequate burrows.

Indirect impacts to burrowing owls during construction and from operation of the facility can include increased road kill hazards, modifications to foraging and breeding activities, and loss of prey items and food sources due to a decreased number of fossorial mammals. Indirect and operational impacts to nesting birds may also include the loss of habitat due to the colonization of invasive plants and the disruption of breeding or foraging activity due to facility maintenance. Weed abatement, mirror washing, and maintenance activities would likely limit the use of some areas as foraging or nesting habitat. Burrowing owls may also be at risk from collision or electrocution with facility structures and from exposure to elevated levels of solar flux (see Impacts to Migratory/Special-status Bird Species).

Implementation of the PSEGS project would destroy occupied burrows or cause owls to abandon burrows. Construction during the breeding season could result in the incidental loss of fertile eggs or nestlings or otherwise lead to nest abandonment. The loss of occupied burrowing owl habitat (habitat known to have been occupied by owls during the nesting season within the past three years) or reductions in the number of this rare species, either directly or indirectly through nest abandonment or reproductive suppression, would constitute a significant impact absent mitigation. Furthermore, burrowing owls and their nests are protected under both federal and State laws and regulations, including the Migratory Bird Treaty Act and California Fish and Game Code Section 3503.5.

There is much debate among state, federal, local, and private entities over the most practicable and successful relocation/translocation methods for burrowing owl. When passive relocation is used solely as an impact avoidance measure, it is generally only effective when burrowing owl nesting territories are directly adjacent to permanently protected lands (i.e. military reservation, airport, wildlife reserve, agricultural reserve with appropriate crop type such as alfalfa) (Bloom 2003). Passive relocation has been criticized as a relocation method because relocated or displaced owls are tenacious about returning to their familiar burrows and are inclined to move back to the impact site if the impact site is still visible to the owl and/or if the impact site is not completely graded (Bloom, pers. comm.). Because project construction would be phased and occur over multiple years passive relocation may result in the repeated harassment of resident owls should they try to re-establish territories within the projects footprint. While construction of replacement burrows in off-site areas and the acquisition of mitigation lands would reduce impacts to the species, it is likely that owls would attempt to occupy areas close to known territories. This could require multiple passive relocation events for the same owls. Each of these events stresses the bird and exposes the owls to predation, lost breeding opportunities, thermal stress, and potential territorial disputes. Burrowing owls are put at increased risk when they are introduced to a new environment. The owls are naturally preyed upon by numerous diurnal and nocturnal avian and mammalian species and evicting owls from their familiar burrow, territory, and home range without a safe opportunity to become familiar with their new habitat increases the potential for predation (Pagel pers. com.). Thus, many burrowing owls likely die during passive relocations used for permanent owl eviction.

For successful active or passive relocation, breaking the owl's site fidelity is of utmost importance (Bloom 2003). The off-site location for the relocated owls should ideally have an existing burrowing owl colony and a large ground squirrel colony. Should neither colony already exist at the translocation site, artificial burrows should be installed if significant grassland or appropriate agricultural crop type is present (Bloom 2003). Active translocation of owls involves trapping owls, temporarily holding them in enclosures with supplemental feeding, and releasing at a suitable off-site location with existing or artificial burrows prior to breeding.

While active translocation might be a better solution than passive relocation for moving owls from large sites like the Project site, California Fish and Game Code 3503.3 prohibits the active relocation of burrowing owls unless the effort is designed as a research project. Therefore, staff can only recommend the implementation of passive relocation techniques. Although passive relocation would be conducted to avoid direct mortality of owls within the proposed project area, previously occupied burrow(s) would be destroyed and foraging habitat would be degraded. Due to the loss of habitat compensatory mitigation is required to reduce these impacts to less than significant levels. The location and amount of compensatory habitat required to mitigate impacts to burrowing owl is often based on the number of impacted owls and assumes that currently occupied habitat will be replaced with nearby occupied habitat.

Compensatory mitigation for burrowing owls identified for the approved PSPP project was based on guidelines recommended in the CDFG Staff Report on Burrowing Owl Mitigation (CDFG, 1995) and by the California Burrowing Owl Consortium (CBOC 1993). When published these guidance documents used the best information available and provided strategies for reducing impacts to burrowing owls and recommended mitigation acreages for off-site replacement habitat. For example the California Burrowing Owl Consortium (CBOC 1993) guidelines for off-site replacement habitat included the following recommendations:

- Replacement of occupied habitat with occupied habitat at 9.75 acres (6.5 acres times 1.5 acres) per pair or single bird;
- Replacement of occupied habitat with habitat contiguous to currently occupied habitat at 13.0 (6.5 acres times 2) acres per single pair or single bird, or;
- Replacement of occupied habitat with suitable unoccupied habitat at 19.5 (6.5 acres times 3) acres per pair or single bird.

For the approved PSPP project the USFWS noted that the above guidelines were developed for owls nesting in coastal habitats, and their efficacy in desert environments has not been ascertained (Sorenson, pers. comm.). No documentation is available to statistically evaluate the success of passive relocation in southern California. Passive relocations in western Riverside County have not involved banded birds, so information on rates of success and direct/indirect mortality are not available. Reports elsewhere (Trulio 1995, 1997) do not provide long term analyses associated with passive relocation efforts to determine if passively relocated burrowing owls are present in the area after one or more years. The lack of documented success of passive translocations raises concerns regarding the fate of evicted owls.

In 2012 the CDFW (formerly CDFG) published The Staff Report on Burrowing Owl Mitigation (CDFG 2012). This document indicated that “reversing declining population and range trends for burrowing owls will require implementation of more effective conservation actions, and evaluating the efficacy of the Departments’ existing recommended avoidance, minimization and mitigation approaches for burrowing owls”. The new guidelines provide revised methods for surveying; reflect new data on the species; and recommend an ecological approach to establishing mitigation for this species. The 2012 guidance departs from the standardized approach to determining off-site habitat compensation because the acreages are often implemented as the “default” mitigation and may not reflect the actual habitat requirements of the species in a given location (CDFG 2012).

Acquisition of the appropriate amount of offsite habitat for burrowing owl should take into consideration the foraging distance and average home range of breeding and non-breeding owls. Diurnal home range for owls can be 150 feet on both sides of a burrow. Nocturnal home range is much larger, 1 square mile per owl pair, and several owls can overlap in that 1 square mile (Bloom, pers. comm.). The mean home range for 11 male burrowing owls in 1998 and 22 males in 1999 was 177 hectares (437 acres) and 189 hectares (467 acres), respectively, at naval air station in Lemoore, California located south of Fresno (Bloom 2003). Male burrowing owls often move greater than 1,000 meters when foraging in the breeding season and home ranges can often times overlap (Bloom 2003).

For the approved PSPP project staff recommended a minimum of 78 acres (19.5 acres each) of suitable, offsite (preferably occupied) burrowing owl habitat be acquired to offset the loss of foraging and nesting habitat for owls that occur in the Project Disturbance Area. This mitigation was based on the 1993 burrowing owl guidelines which the CDFW suggests may not adequately compensate for burrowing owls in arid ecosystems. Staff agrees that the compensatory mitigation approach would likely be different based on the 2012 guidelines and acknowledges that the mitigation acreages alone would not likely be effective in reducing impacts to the species from the loss of over 3946 acres of foraging habitat. However, for the approved PSPP project and the PSEGS project the compensatory mitigation requirements for land acquisition would be “nested” within desert tortoise mitigation (See **BIO-12**). Under this condition the project owner would acquire approximately 4,863 acres of desert tortoise habitat. Provided the lands meet the requirements for burrowing owls staff considers this approach a viable mitigation option. The land acquisition identified under **BIO-12** would far exceed the recommendations for off-site compensatory burrowing owl mitigation identified in the 2012 guidelines.

To avoid potential impacts to burrowing owls in the Project Disturbance Area, staff is recommending that proposed conditions of certification (described below) include the completion of pre-construction surveys of the site using established protocols. If present, the project owner would establish a buffer and avoid active nests during the breeding season. If owls are detected using a burrow outside the breeding season the owls may be passively displaced pending the establishment of artificial burrows and the acquisition of adequate mitigation lands.

Staff's proposed Condition of Certification **BIO-18** (Burrowing Owl Impact Avoidance, Minimization and Compensation Measures) would require the Applicant to prepare and implement a Burrowing Owl Mitigation Plan that would include the following elements: a description of suitable burrowing owl relocation/translocation sites; guidelines for creation or enhancement of at least two natural or artificial burrows per relocated owl if an existing burrowing owl and/or ground squirrel colony does not occur outside the Project Disturbance Area; detailed methods and guidance for passive relocation of burrowing owls; and a description of proposed maintenance monitoring, reporting, and management of the relocated burrowing owls. This condition also requires acquisition and enhancement of a minimum of 78 acres of off-site suitable nesting and foraging burrowing owl habitat to mitigation for displacement of at least four owls. The Applicant has submitted a draft Burrowing Owl Relocation/Translocation Plan (AECOM 2010a, DR-BIO-51) which could serve as the basis for the Burrowing Owl Mitigation Plan. With implementation of staff's Condition of Certification **BIO-18**, and **BIO-12** impacts to burrowing owls would be reduced to less-than-significant levels.

Golden Eagle

Golden eagles can be extremely susceptible to disturbance during the breeding season (Anderson et al. 1990; USFWS 2009b), and adverse effects are possible from various human activities up to (and in some cases exceeding) one mile from a nest site (Whitfield et al. 2008). Surveys documented two active nest approximately seven miles southwest of the PSEGS project site in the Chuckwalla Mountains, three inactive nests approximately 6 miles southwest of the site in the Chuckwalla Mountains, one inactive golden eagle nest just over ten miles southeast of the site in the Chuckwalla Mountains, and two active golden eagle nests just over 10 miles northeast of the site in the Palen Mountains (Solar Millennium 2010u), nests just over 10 miles northeast of the site in the Palen Mountains (Solar Millennium 2010u), and preliminary results of spring 2013 helicopter surveys have indicated detection of three active nests in the Chuckwalla Mountains (Palen 2013x). Based on guidance provided by the USFWS (72 FR 31132, June 5, 2007) staff defined disturbance as an activity that would result in injury to an eagle or which would substantially interfere with normal breeding, feeding, or sheltering behavior. For example, a nestling being knocked from the nest by a startled adult would be considered an injury. A nestling fed inadequately because adults were agitated in the vicinity of the nest due to construction-related noise and activity would also be considered substantial interference, as would a situation in which nestlings starve because the adults were excluded from their familiar foraging grounds and could not provide adequate food to their young.

Staff concluded that Project construction activities could potentially injure or disturb golden eagles if nests were established sufficiently close to Project boundaries to be affected by the sights and sounds of construction. Staff considers these potential impacts unlikely, however, because suitable nesting substrate (i.e., cliff ledges, rocky outcrops, or large trees) does not occur within one mile of the PSEGS project area. The only potential nesting substrate within one mile of Project boundaries would be transmission line towers. If such nesting occurs on T-lines disturbance to golden eagle nests would be avoided with implementation of Condition of Certification **BIO-16b**. This condition recommends that during construction, golden eagle nest surveys be conducted in accordance with USFWS guidelines to verify the status of golden eagle nesting territories within one mile of the project boundaries. Implementation of **BIO-16b** would reduce potential impacts of Project construction on nesting golden eagles to less-than-significant levels.

Staff also assessed the impacts of the Project to golden eagle foraging habitat, and concluded that the Project would contribute to the cumulative loss of golden eagle foraging habitat within the NECO planning area. The Project would reduce the availability of eagle foraging habitat and could degrade nearby foraging habitat by the introduction and spread of noxious weeds. As discussed in the cumulative impact subsection, the Project contributes to cumulative loss of foraging habitat from future projects within the NECO planning area (see **Biological Resources Table 15**). The potential for impacts to golden eagle foraging habitat can be reduced to less-than-significant levels by implementation of staff's proposed Conditions of Certification **BIO-12** (acquisition of desert tortoise compensatory mitigation lands), **BIO-21** (acquisition of state waters compensatory mitigation lands), and **BIO-14** (implementation of weed management plan). As described in **BIO-12**, the acquisition of desert tortoise mitigation lands would be targeted for areas within and near the Chuckwalla Bench and the Chuckwalla DWMA. Because these targeted areas are also within 10 miles of potential nesting sites for golden eagles, acquisition of these desert tortoise mitigation lands would also provide protected golden eagle foraging grounds. Potential golden eagle impacts attributable to concentration of solar flux during operation of the project are discussed below for all avian species, in the following section titled "**OPERATIONAL IMPACTS TO FLIGHTED SPECIES**".

Migratory/Special-status Bird Species

Birds are the most conspicuous vertebrate found in the California Deserts (Latting and Rowlands 1995). Records exist for at least 425 species (Garrett and Dunn 1961) from 18 orders and 55 families. These approximately 350 species are characterized as Neotropical migrants who pass through the region during spring and fall migrations. These birds include various raptors including Swainson's hawks; turkey vultures; and numerous passerines some of which include least Bell's vireo, southwestern willow flycatchers, many hummingbirds, and various warblers. Shorebirds and other waterfowl are other common migrants that have the potential to occur in the project area.

The project site and Chuckwalla Valley provide foraging, cover, and/or breeding habitat for a wide variety of resident and migratory birds. Localized water sources such as Lake Tamarisk are known to attract birds as are irrigated agricultural areas including the palm groves that abut the PSEGS project site. Ponds, including the small cement lined reservoir located at the northwest corner of the site are also expected to attract a variety of birds. Both the project site and adjacent habitat support microphyll woodlands that have been recognized as important habitat for resident and migratory birds.

How a given species is affected by project construction or operation is a function of the species ecology and behavior. Although the Project area does not provide breeding habitat for many species (i.e., Swainson's hawks, northern harriers, peregrine falcons, or yellow warblers) these species are known from the region and have been documented overflying the site during migration or in the winter. These species may forage or rest on the project site. Similarly, many species of raptors winter in desert regions and become seasonal long term winter residents. Resident species are also affected by how they use the site. Some species of birds may be semi-permanent dwellers while nesting exhibiting strong site fidelity and territorial behavior; however these species may have much broader ranges during the winter.

Direct impacts to nesting and migratory birds would include the loss of foraging and nesting habitat and disturbance from construction activities. Construction during the breeding season could also result in displacement of breeding birds and abandonment of active nests. Small well hidden nests could be subject to loss during construction. Similarly, increased noise levels from heavy equipment, human presence, and exposure to fugitive dust could displace native birds or interfere with breeding. Habitat fragmentation, degradation and shifts in vegetative structure can affect nesting birds. In addition, noise and lighting effects have been demonstrated to adversely affect behavior, reproduction, and increase the risk of predation for some species.

Indirect impacts to nesting birds could include the loss of habitat due to the colonization of invasive plants and a disruption of breeding or foraging activity due to facility maintenance. Weed abatement, mirror washing, and maintenance activities would disrupt use of the area as foraging or nesting habitat.

During project construction birds may nest on construction equipment, office trailers, and vehicles. Birds may also become trapped in any narrow vertical pipes left uncovered. Birds have been documented to descend into pipes either in search of nest cavities or food and become trapped in the pipes. Once inside the cavity, the birds cannot climb the slick interior or spread their wings to fly (Brean 2011). Vertical pipes have been found to be a significant threat to bird mortality in Nevada, where the wide-spread use of vertical PVC pipes for mining claims markers has led to the widespread mortality of thousands of birds that had become entrapped in them (American Bird Conservancy 2011). To date, the Nevada Department of Wildlife (NDOW) has found over 3,000 fatalities in 10,000 removed pipes (Brean 2011). California Audubon also indicated that open pipes kill birds indiscriminately and that both common birds and protected species have been found among the layers of dead birds in open pipes (http://ca.audubon.org/workinglands-pipes.php). A single pipe on a preserve in Kern County contained the remains of numerous birds (http://kern.audubon.org/Audubon_Kern_River_Preserve_death_pipes.pdf).

Implementation of the PSEGS project would result in the direct loss of habitat that supports breeding and foraging for a variety of resident and migratory birds. This includes the functional loss of approximately 3,946 acres of habitat including Sonoran creosote bush scrub; desert dry wash woodland; dunes; and ephemeral drainages. Although nesting habitat for most migratory birds would not be loss the removal of foraging habitat, cover and roost sites for these species would be substantial. The project would have more substantial adverse effects to resident breeding birds, some of which include loggerhead shrike, California horned lark, and Le Conte’s thrasher. For the PSEGS the applicant has proposed to mow vegetation and allow some plants to persist within the heliostat field; however habitat remaining would be degraded and nesting birds would be subject to ongoing maintenance activities. Le Conte’s thrasher, loggerhead shrike and other wash-dependent species would in particular be affected by the loss of the cover, foraging and nesting opportunities provided by the structurally diverse and relatively lush desert dry wash woodland. Dry washes contain less than 5 percent of the Sonoran Desert's area, but are estimated to support 90 percent of Sonoran Desert birdlife (CalPIF 2006). The loss of habitat from the proposed project would be significant absent mitigation.

Staff's proposed Condition of Certification **BIO-12,** the desert tortoise compensatory mitigation plan, BIO-16a, which would annually fund habitat enhancement and restoration, and **BIO-21,** mitigation for impacts to state waters, would offset the cumulative loss of habitat for these species.

Implementation of the PSEGS project would result in direct, indirect and operational effects to nesting birds. During construction it is expected that most birds would disperse to adjacent habitat during initial vegetation clearance. However, if site grading, brush removal, or construction occurs during the nesting season bird nests may be destroyed, including eggs or nestling birds. Ground nesting species such as night hawks, poorwills, roadrunners, and horned lark, and various shrub nesters may disproportionally affected.

Noise during construction may adversely affect bird nesting success. For most common species, staff concludes that this impact would be less than significant, but staff believes that it could significantly affect breeding habitat suitability for native birds, including special-status species. The loss of active bird nests or young is regulated by the federal Migratory Bird Treaty Act and Fish and Game Code section 3503, which protects active nests or eggs of California birds. The project owner has proposed mitigation measures to avoid and minimize impacts to nesting birds that have been incorporated into staff's proposed Conditions of Certification including: **BIO-8** (Impact Avoidance and Minimization Measures); **BIO-15** (Pre-construction Nest Surveys); which describes guidelines for performing pre-construction surveys and **BIO-16a,** Avian Enhancement and Conservation Plan**,** which would implement funding toward habitat restoration and enhancement, and **BIO-16b** (Avian Avian and Bat Protection Plan) which provides a mechanism to monitor for bird collisions and implement adaptive management measures to minimize impacts. Implementation of staff's proposed conditions of certification would avoid direct impacts to nests, eggs, or young of migratory birds, and would minimize the impacts to less than significant levels per California Environmental Quality Act (CEQA) for construction disturbance to resident and migratory birds. Potential special status and migratory bird impacts attributable to operation of the project are discussed below for all avian species, in the section entitled "**OPERATIONAL IMPACTS TO FLIGHTED SPECIES**".

Bats

The project would adversely affect bats through the removal of foraging habitat. The entire project site is expected to support bat foraging, in particular desert dry washes, where increased presence of vegetation, especially microphyll woodland, would support a broad variety of insects prey items. Approximately 850 acres of agricultural development (jojoba and palm farms) occur immediately adjacent the project. Associated with these farms are two private pools, approximately two acres or less in size. Agriculture may support foraging by the species if they support appropriate insect fauna, because the plantation is irrigated and it is expected to support a host of unexpected insect species. Staff has requested the project owner perform additional surveys for bats within one mile of the project site, as per the NECO plan, Data Request

Set 3 (CEC 2013i). The results of these surveys will be presented in the FSA. The presence of an evaporation pond within the project may similarly serve as an attractant for insects, and therefore may attract bats for foraging.

Loss of roosting habitat is another impact of the PSEGS project. Suitable roosting habitat for bats within the modified project and linear features includes washes with large trees within the southern portions of the modified project in the central wash, and around the transmission line and substation. Large washes with riparian vegetation meander through the southern portion of the buffer around the transmission line and substation south of I-10. Some large trees are located within the southern portion of the central wash in the modified project. Large trees with exfoliating bark, tree cavities, rock crevices, bridges, and other locations may provide suitable roosting habitat for a variety of bat species within the modified project and buffer. Bat roosts are known to occur in the Project area. Bat roosts are also known to occur in Eagles Nest Mine (Little Maria Mountains) and Paymaster Mine in the project vicinity (LaPre pers. comm.). Additionally, the taller ornamental palm trees within the plantation may be utilized for roosting by bats including Western yellow bats.

The majority of adverse impacts to bat populations in the region result from disturbance of roosting or hibernation sites, especially where large numbers of bats congregate; physical closures of old mine shafts, which eliminates roosting habitat; elimination of riparian or desert wash microphyll vegetation which is often productive foraging habitat; more general habitat loss or land use conversion; and agricultural pesticide use which may poison bats or eliminate their prey-base (Pierson & Rainey 1998; Gannon 2003).

The applicant has suggested that impacts to bats will be limited to loss of forage. However, staff believes that impacts to bats may be caused by collisions with stationary project features such as the tower and heliostats, as well as moving objects such as construction equipment and other moving vehicles, particularly during periods of night time construction. Other onsite practices that increase available water, such as mirror washing, dust control, and leaks/spills when filling water trucks may attract insects, in turn attracting bats to the site. Increased vehicle presence on access roads and the I-10 freeway may also adversely impact bats. Bats are known to collide with stationary objects, such as windows and television towers; and of these collisions, many involved illuminated objects that should have been detected by vision, if not certainly by echolocation (Orbach and Fenton, 2010). Bats do not maneuver solely using echolocation, in fact, some bats have very good eyesight, such as *Macrotus californicus*, a species that feeds by gleaning insects, and therefore would need to clearly see them against foliage in order to eat them. There are several species of bats likely foraging at the site that also feed by gleaning, such as the pallid bat. While bat vision is adapted for long-distance use, and even exceeds echolocation ranges (Suthers 1970), the short-range visual capability of bats is poorly understood (Orbach and Fenton, 2010).

While much documentation of road-kill mortality has focused on terrestrial mammals, birds, reptiles and amphibians, the impact of highways on bat populations has only recently been identified (Kiefer et al. 1995, Wray et al. 2006, Lesinski 2007, López et al. 2007). During studies along a highway conducted in 2009 (Russell et al. 2009) found carcasses of *Myotis lucifugus* and *Myotis sodalis* that were killed by vehicles, and the authors concluded that “most likely does not reflect the true impact of highway traffic on these bat colonies.” During telemetry studies in 2000 (Butchkoski & Hassinger 2002), bats were observed crossing US Route 22 as they emerged from the roosts at dusk, and noted road-killed bats.

A year’s worth of data was collected along a section of road, revealing 61 road-killed bats belonging to seven species (Lesinski et al 2009). The frequency of detection of carcasses varied both seasonally and by the type of habitat surrounding the roadside. Interestingly, species that were struck ranged in typical flight elevations, and the authors’ hypothesis that low-flying species would be killed more frequently was not confirmed.

Staff’s recommended Conditions of Certification **BIO-1** through **BIO-8** would minimize overall project impacts to habitat, require worker training to minimize disturbances, biological monitoring and reporting of project disturbances, and compensate for habitat loss through the acquisition and management of offsite lands, including offset for dry desert wash habitat at a 3:1 ratio. Staff concludes that these measures would effectively mitigate foraging habitat impacts for special-status bats.

As discussed in the cumulative impact subsection, staff considers the Project to be a substantial contributor to the cumulative loss habitat for the NECO planning area biological resources, including habitat for these special-status bats. Staff’s proposed Condition of Certification **BIO-12,** the desert tortoise compensatory mitigation plan and **BIO-21,** mitigation for impacts to state waters, would offset the cumulative loss of habitat for these species. For a discussion of potential bat impacts attributable to operation of the project, as well as a discussion of mitigation, refer to the following section titled “**OPERATIONAL IMPACTS TO FLIGHTED SPECIES**”.

American Badger and Desert Kit Fox

Construction of the Project could kill or injure American badgers by crushing individuals with heavy equipment or could entomb them within a den. Construction activities could also result in disturbance or harassment of individuals. In 2011, an outbreak of canine distemper was identified in the a desert kit fox population within or adjacent to the Genesis Solar project site, located approximately 10 miles east of the PSEGS site. As of December 2011, at least 9 deaths of desert kit fox were reported at the Genesis site. This disense had not been reported previously and it was hypothesized that the stress from animals being passively relocated from the Genesis site for development of the solar project may have put the animals at greater risk of contracting the disease. CDFW Wildlife Investigations Laboratory Nogmae Wildlife Veternarian trapped and collared desert kit fox in the PSEGS vicinity in 2012 (M Rodriquez, pers comm.). Animals were also tested for canine distemper virus and also vaccinated part of the population. Canine distemper was not detected in the Palen population however the disease could still spread from other populations as animals move around the region. In order to address the concern of increasing the risk of spreading canine distemper within the Palen desert kit fox population, CDFW and BLM coordinated with staff to revise **BIO-17** based on measures developed for the Genesis project. Staff has deleted the PSPP Condition of Certification **BIO-17** which required that concurrent with the desert tortoise clearance survey, a qualified biologist perform a pre-construction survey for badger dens in the Project area, including areas within 20 feet of all Project facilities, utility corridors, and access roads. Staff has replaced it with staff's proposed Condition of Certification **BIO-17** which would require development of an American Badger and Kit Fox Management Plan that includes, but is not limited to, conducting pre-construction surveys and avoidance measures to protect badgers and kit fox during construction and operation.

The desert kit fox is not a special-status species, but it is protected under Title 14, California Code of Regulations (Section 460), and potential impacts to individuals of this species must be avoided. Desert kit fox sign was detected on the Project site, and the site includes marginally suitable foraging and denning habitat for this species. Construction of the Project could kill or injure desert kit fox by crushing individuals with heavy equipment, or could entomb them within a den if avoidance measures are not implemented. Construction activities could also result in disturbance or harassment of individuals. Staff's proposed Condition of Certification **BIO-17**, which replaces BIO-17 from the PSPP in its entirety, requires development of an American Badger and Desert Kit Fox Mitigation and Monitoring Plan that includes, but is not limited to, procedures and impact avoidance measures for conducting pre-construction surveys and avoidance measures to protect kit fox during construction and operation, would avoid this potential impact.

The Project would permanently remove approximately 3,901acres of foraging and denning habitat for American badgers and kit fox and would fragment and reduce the value of foraging and denning habitat adjacent to the Project site. This habitat loss and degradation could adversely affect American badger and kit fox populations within the NECO planning area. As discussed in the cumulative impact subsection, staff considers the PSEGS project to be a substantial contributor to the cumulative loss of the NECO planning area biological resources, including American badgers and kit fox. Staff's proposed Condition of Certification **BIO-12,** the desert tortoise compensatory mitigation plan, and **BIO-21,** compensatory mitigation for state waters, would offset the loss of habitat for this species and reduce the impact to less-than-significant.

Nelson's Bighorn Sheep

The PSEGS site is not within any of the bighorn sheep connectivity corridors identified in the NECO; in addition the NECO identifies I-10 as a barrier to bighorn sheep movement (BLM CDD 2002). Staff concluded that the Project site is not currently an important movement corridor because of the presence of I-10 and the width of the valley between suitable bighorn sheep habitat. The Society for Conservation of Bighorn Sheep has recommended a 1-mile buffer from the upper edge of any solar development to the base of the mountains to protect spring foraging habitat. The PSEGS site is over one mile from the base of either the Chuckwalla or Palen mountains. Barriers between the Chuckwalla Mountains and the Project site (I-10) and the Palen Mountains and the Project site (sand dunes) further restrict the availability and usefulness of the Project site for spring foraging habitat.

Also of interest are the potential impacts from project groundwater extraction to seeps, springs, or other water resources that are currently available to bighorn sheep that occupy the Palen Mountains. The Applicant has provided information (AECOM 2010a DR-S&W-193) about the closest water features, and has concluded that groundwater extraction for the Project would not affect these features. After reviewing the data provided in the Data Responses, staff agrees with the Applicant that the Project is unlikely to affect springs and seeps available for use by bighorn sheep.

As discussed in the cumulative impacts section, the PSEGS project would not directly affect habitat within any NECO connectivity corridors or Wildlife Habitat Management Areas (WHMAs), and would not conflict with Desert Bighorn Sheep Conservation goals and objectives outlined in the NECO. In addition, staff has concluded that the Project site does not represent significant direct or indirect impacts to bighorn sheep habitat connectivity or foraging.

Construction Noise

Construction activities would result in a temporary, although relatively long-term (34 months) increase in ambient noise level on the project site and in some adjacent habitat. Animals rely on hearing to avoid predators, obtain food, and communicate. Excessive construction noise could interfere with normal communication, potentially interfering with maintenance of contact between mated birds, obscuring warning and distress calls that signify predators and other threats, and affecting feeding behavior and protection of the young. High noise levels may also render an otherwise suitable nesting area unsuitable. Behavioral and physiological responses to noise and vibration have the potential to cause injury, energy loss (from movement away from noise source), a decrease in food intake, habitat avoidance and abandonment, and reproductive losses (Hunsaker 2001; National Park Service 1994).

Noise from operation of PSEGS and nighttime washing and maintenance activities of the heliostats could affect wildlife in adjacent habitats by interfering with breeding or foraging activities and movement patterns, causing animals to avoid areas adjacent to the project. This could disrupt foraging, breeding, sheltering, and other activities. However, lighting and noise from washing would disrupt nocturnal animals in adjacent habitat and those that remain within the project fence line. Staff considers noise effects to be of a concern for wildlife located in and adjacent to the project site.

The bighorn sheep WHMA, approximately 2.5 miles northeast of the PSEGS, is a sensitive noise receptor due to the presence of breeding Nelson’s bighorn sheep. Birds are also expected to nest in creosote scrub and desert dry wash woodland on the project site and on adjacent lands that border the site. Studies have shown that noise levels over 60 A-weighted decibels (dBA) can result in nest abandonment by birds and intense, long-lasting noise can mask bird calls, which can reduce reproductive success (Dooling and Popper 2007; Hunsaker 2001). Many bird species rely on vocalizations during the breeding season to attract a mate and noise from construction or peration could disturb nesting birds and other wildlife. Reijnen et al. (1995) demonstrated that for two species of European warbler (Phylloscopus spp.), sound levels between 26 dB(A) and 40 dB(A) reduced breeding density by up to 60 percent compared to areas without disturbance. Noise impact studies on bighorn sheep have not identified numerical noise impact thresholds. Weisenberger et al. (1996) found that bighorn sheep responded to aircraft over-flights (92-112 dBA) with increased heart rates and altered behavior; however, animal response decreased with increased exposure.

The project owner has not provided updated noise estimates to describe construction of the power towers or other facilities. Preliminary data from the project owner suggests noise levels would be similar to those described for the approved PSPP project. Assuming that construction noise is similar; the average construction noise of 85 dBA at 50 feet from the noise center and noise attenuation of 6 dBA per doubling of distance (Solar Millennium 2009a), normal construction noise would attenuate to about 60 dBA approximately 800 feet (0.15 mile) from the noise center. The majority of the construction activities would occur within the power blocks located approximately 3,750 feet (0.71 mile) from the Project boundary. Therefore, it is anticipated that average construction noise levels would typically be less than 60 dBA in the bighorn sheep DWMA and surrounding the Project site. The infrequent occasions when construction activities would occur near the Project boundary and resultant noise levels would be temporarily elevated beyond 60 dBA surrounding the Project would not significantly impact sensitive wildlife that occur in habitat adjacent to the PSEGS fence line Animals that remain within the fence line would be subject to potentially significant noise effects.

Although average construction noise levels would usually attenuate to 60 dBA at the Project boundary, unsilenced steam blows and pile driving produce short-term, sporadic, and loud noise that could substantially elevate noise levels in the bighorn sheep DWMA. The loudest proposed construction activity would be steam blows required to prepare a steam turbine for startup during the final phase before operation. This process cleans the piping and tubing which carry steam to the turbines; starting the turbines without cleaning these systems would destroy the turbine. High pressure steam blows require a series of short steam blows, lasting two or three minutes each, which would be performed several times daily over a period of two or three weeks. These steam blows can produce noise as loud as 130 dBA at a distance of 100 feet. This would attenuate to about 88 dBA at a distance of 2.5 miles from the Project site, and 77 dBA at 9 miles from the Project site. Silenced steam blows, however, are commonly reduced to 89 dBA at 50 feet, which would attenuate to less than 53 dBA at the Project boundary. At this time the project owner has not provided information if this process would be the same for the PSEGS project. For the approved PSPP project the project owner proposed to use a low-pressure technique for steam blows, which would release steam over a continuous period of about 36 hours and would result in noise levels of about 80 dBA at 100 feet and less than 50 dBA beyond the Project boundary. Another relatively loud and short-term construction activity is pile driving. If required, noise from this activity could be expected to reach 101 dBA at a distance of 50 feet and attenuate to less than 59 dBA at a distance of 2.5 miles from the Project site.

Elevated noise from steam blows and pile driving could adversely affect the breeding, roosting, or foraging activities of sensitive wildlife proximate to the Project area. To minimize these potential noise impacts, Condition of Certification BIO-8, requires avoidance of loud construction activities (i.e., steam blowing and pile driving) that would result in noise levels over 65 dBA at potential wildlife breeding sites (such as dry desert wash woodland) between February 15 and April 15, the height of the bird breeding season. With implementation of this condition, impacts from Project construction activities would be less-than-significant. Employing the low-pressure steam blow technique recommended by staff would further reduce noise levels and the potential for impacts to wildlife. For a complete analysis of construction noise impacts, refer to the Noise section of this PSA.

In order to efficiently produce and distribute concrete within the project site, the project owner will utilize a concrete batch plant for the PSEGS . The batch plant would have a similar impact as the concrete batch plant included as part of the project description for the PSPP. The PSPP would have had a concrete batch plant with a production capacity of 150 cubic yards per hour and would be expected to operate 10 hours per day, five days a week. Night operation of the batch plant would be required to overcome the difficulty of performing concrete placement in extremely high ambient temperatures.

The batch plant would be portable and would be moveable to a number of different locations to support current work activities but would occur entirely within the PSPP Project Disturbance Areas (Solar Millennium 2010p). The likely deployment locations for the produced concrete are the two power blocks and the project's main warehouse area. Batch plant noise levels would be approximately 90 decibels at 50 feet. The former project owner stated that although noise levels would be slightly higher than the construction noise levels at the project site boundary assessed in the Application for Certification, noise levels from the concrete plant would attenuate over a greater distance since the plant would be located within the Project boundaries (Galati & Blek 2010i).

The project owner states in the Petition to Amend that construction noise from the PSEGS is expected to be the same as for the PSPP. Therefore, Staff assumes noise impacts from the concrete batch plant would be similar to those for the PSPP. Staff still believes that operation of the concrete plant at 90 decibels from the PSEGS project boundary could have negative effects to nesting birds and other wildlife during their breeding seasons. Operation of the batch plant for a ten hour period that spans into night-time hours at intermittent levels of up to 90 decibels could alter breeding, foraging, and other behaviors of wildlife such as small burrowing mammals, bats, nesting birds, especially nocturnal wildlife. With the implementation of site design measures and best management practices outlined in condition of certification **BIO-8** (Impact Avoidance and Minimization Measures), the impacts of additional, loud noise from the concrete batch plant to wildlife would be reduced to less-than-significant levels. If any additional impacts would occur staff will include additional analyses in the Final Staff Assessment

Operational Impacts to Flighted Species

The project would introduce several factors which could result in mortality, morbidity, and reduced reproductive success in birds and in bats. Potential impacts of the operating facility to birds, bats, and insects include physical injury resulting from collision with power towers, heliostats, or other project infrastructure features; electrocution; and disorientation (disturbance from lighting, mirror reflection, etc.). Ocular damage, hyperthermia and, depending on period of exposure and level of flux, burning and other heat-caused damage to internal and external body parts, as well as residual damage (morbidity) may occur to bats, birds, or insects that enter the airspace over the heliostat field where elevated solar flux exists.

There are many factors that contribute to the potential risk of operational impacts (i.e., electrocution, collision, glare, or exposure to solar flux) to birds. In addition to weather, risk is a function of the birds ecological, physiological, and behavior characteristics. Some of these factors include when a bird is active (i.e., diurnal or nocturnal); the elevation in which a bird flies; their flight and foraging behavior; the size or mass of the bird; their color; and their residency pattern. Each of these factors is considered below when assessing risk to a given species of bird from the operation of the PSEGS project.

For example, collision risk at night would be expected to increase for nocturnal species including migrants. Nocturnal migrants, which include many species of passerines, would be expected to have a higher collision risk and a lower risk from exposure to elevated levels of solar flux. Conversely, birds that are more active during periods of daylight may have an increased risk of flying into areas containing elevated levels of solar flux. For example many raptors and soaring birds rely on thermals to aid in flight; aerial foragers including swifts and swallows feed on insects and these species would be expected to have a higher risk from exposure to elevated levels of solar flux or glare.

However, in any natural system activity patterns may vary and species may be active during both diurnal and nocturnal periods.

The birds foraging or flight behavior; the elevation at which a bird flies or migrates; and the period a bird is present in the region are other factors that effects risk. Low flying birds or ground foragers including roadrunners are likely have a reduced risk from exposure to solar flux. Each of these effects is discussed in detail below.

Electrocution

Large raptors such as golden eagle, red-tailed hawk, and great-horned owl can be electrocuted by transmission lines when a bird's wings simultaneously contact two conductors of different phases, or a conductor and a ground. This happens most frequently when a bird attempts to perch or take off from a structure with insufficient clearance between these elements. Electrocution can occur when horizontal separation is less than the wrist-to-wrist (flesh-to-flesh) distance of a bird's wingspan or where vertical separation is less than a bird's length from head-to-foot. Electrocution can also occur when birds perched side-by-side span the distance between these elements (APLIC 2006).

In addition, distribution lines that are less than 60 kV but greater than 1 kV pose an electrocution hazard for raptor species attempting to perch on the structure. The majority of bird electrocutions are caused by lines that are energized at voltage levels between 1-kV and 60-kV, and "the likelihood of electrocutions occurring at voltages greater than 60-kV is low" because phase-to-phase and phase-to-ground clearances for lines greater than 60-kV are typically sufficient to prevent bird electrocution (APLIC 2006).

The proposed transmission lines would be 230 kV and would be fitted on top of monopole structures are expected to be 120 feet in height and an average length of 1,100 feet between poles (Solar Millennium 2009a). The transmission line and pole fitting would be constructed in accordance with the guidelines of Institute of Electrical and Electronics Engineers (IEEE) Guide 524 "Guide to the Installation of Overhead Transmission Line Conductors" and would also follow the Suggested Practices for Avian Protection on Power Lines (APLIC 2006). Also, the lines would be insulated from the poles using porcelain insulators engineered for safe and reliable operation at a maximum operating voltage of 242-kV (Solar Millennium 2009a).

To minimize risk of electrocution, the Project should impose a “raptor-friendly” construction design for the transmission line with conductor wire spacing greater than the wingspans of large birds to help prevent electrocution as described in Suggested Practices for Avian Protection on Power Lines (APLIC): The State of the Art in 2006 (APLIC 2006). Certification **BIO-8** requires above-ground transmission lines and all electrical components to be designed, installed, and maintained in accordance with APLIC guidelines to reduce the likelihood of large bird electrocutions and collisions. With the Implementation of proposed Condition of Certification **BIO-8**, the project transmission lines would not pose a significant electrocution threat to birds. Additionally, the project owner has proposed to conduct power line retrofits per BIO-B (Palen 3013a). It is staff’s intention to incorporate elements of the project owner’s mitigation with mitigation currently being developed by staff, in cooperation with the REAT agencies. The draft version of this condition is described below and will likely be revised and available in the FSA.

Collisions, Lighting, and Glare

The modified project would include two power towers, heliostat fields, and ancillary equipment including boilers and control facilities. Onsite facilities range from a height of 750 feet (power towers), to 120 feet for boilers and the air-cooled condenser unit. Each of the heliostats is approximately 12 feet high. The remaining facilities are generally less than 80 feet in height (Palen 2013a). All of these features would pose a potential collision risk for birds. Birds are known to collide with communications towers, transmission lines, and other elevated structures including buildings. Estimates of the number of bird fatalities specifically attributable to interactions with utility structures vary considerably. Nationwide, it is estimated that hundreds of thousands to as many as 175 million birds are lost annually to fatal collisions with transmission and distribution lines (Erickson et al., 2001). Numerous studies have also documented extensive avian collision mortality associated with buildings and similar structures such as smokestacks or monuments (*ibid*). In California, even general estimates are unavailable, although it is plausible that such collisions result in the deaths of hundreds of thousands of birds each year (Hunting, 2002).

Collisions typically result when the structures are invisible (e.g., bare power lines or guy wires at night), deceptive (e.g., glazing and reflective glare), or confusing (e.g., light refraction or reflection from mist) (Jaroslow 1979). Collision rates generally increase in low light conditions, during strong winds, and during panic flushes when birds are startled by a disturbance or are fleeing from danger. The Avian Power Line Interaction Committee (APLIC) has determined that collisions are more probable near wetlands, within valleys that are bisected by power lines, and within narrow passes where power lines run perpendicular to flight paths (APLIC 1996). Collisions are more probable near wetlands, valleys that are bisected by power lines, and within narrow passes where power lines run perpendicular to flight paths. Passerines (e.g., songbirds) and waterfowl (e.g., ducks) are known to collide with wires (APLIC 2006), particularly during nocturnal migrations or poor weather conditions (Avery et al. 1978).

Diurnal birds, or those active during daylight hours, could also collide with tall structures. Staff has concluded that the risk of such impacts is low. Most diurnal bird collisions with tall structures are associated with guyed towers in poor visibility conditions such as fog or inclement weather (Manville 2001). The PSEGS does not include guyed structures.

The project would have two evaporation ponds (approximately two acres each) that could attract birds to the site. Existing date palm and jojoba farms and other agricultural practices in the area may also be an attractant to birds, subjecting them to greater risk of collisions.

To date little is known regarding the avian response to glare from solar technology. However, it is likely that glare will affect birds to some degree. In the same way that large mirrored buildings may be confused by birds as open sky; the mirrors will reflect light and take on the color of the image being reflected, and also polarize light, as discussed further below. This may result in birds confusing the heliostats as either open sky or water and increase the collision risk. Bird response to glare is not well understood. Staff has reviewed research by McCrary et al. (1986) which quantified bird mortality, including collisions, at a 10 MW pilot SRSG pilot facility (Solar One) near Daggett, California. The Solar One facility consisted of a 79-acre heliostat field and 282-foot solar receiver tower. McCrary et al. documented 70 bird fatalities during the course of a 40-week study, and the total average mortality rate was 1.9 to 2.3 birds per week. Staff is not aware of any other scientific study of bird mortality at any other comparable generator. The authors partially attributed these collisions to high numbers of birds attracted to the adjacent evaporation ponds and agricultural fields. Anecdotal reports of collisions are becoming more common as large-scale photovoltaic (PV) and concentrating solar power facilities are developed in the desert. Similar to heliostat mirrors, photovoltaic panels are can reflect light and may be confused by birds as water of sky. Although PV panels absorb solar radiation and are typically less reflective than heliostat panels they may still pose a collision risk to birds or bats. At the Desert Sunlight Solar Farm project site, a PV installation of approximately 4,000 acres, over 50 birds have been documented to have collided with the panels. Of these, the majority consisted of waterbirds, species that would be expected as migrants not typically found foraging in desert habitat, and whose presence would not have been expected to occur at the project site (Dr. Joel Pagel, personal communication). A federally endangered species, the Yuma clapper rail, was among the recorded mortalities.

Lighting also plays a substantial role in collision risk because lights can attract nocturnal migrant songbirds, and major bird kill events have been reported at lighted communications towers (Manville 2001), with most kills from towers higher than 300 to 500 feet (Kerlinger 2004). Disruption of birds' migratory path, such as happens during storm events can cause birds to fly at lower heights, and be at risk of collision with the tower or other project facilities. Many of the avian fatalities at communications towers and other tall structures have been associated with steady-burning, red incandescent L-810 lights, which seem to attract birds (Gehring et al. 2009). Longcore et al. (2008) concluded that use of strobe or flashing lights on towers resulted in less bird aggregation, and, by extension, lower bird mortality, than use of steady burning lights. Bright night lighting close to the ground at the project site could also attract bats and disturb wildlife that occurs adjacent to the project site (e.g., nesting birds, foraging mammals, and flying insects).

The project's transmission lines may pose a collision risk to bats. Although many studies have quantified bird strikes with transmission lines, analogous information on bats is very limited (Manville 2001). Collisions with distribution, collector or feeder lines will likely occur to some degree however collision risk is not thought to pose a significant risk to bats in the project area. The most likely collision risk for bats is associated with vehicle or equipment as bats forage near roads or work areas.

Installation of heliostats could also cause an increase in Polarized Light Pollution (PLP) which typically occurs from light reflecting off of dark colored anthropogenic structures, and been demonstrated to be generated from even low-reflectance photovoltaic panels (Horvath et al. 2009). It is unknown to what extant this phenomenon will occur from the heliostats; however staff is evaluating the potential for this effect to occur. According to Horvath et al., PLP caused by anthropogenic structures can alter the ability of wildlife to seek out suitable habitat and elude or detect the presence of predators (Horvath et al. 2010). It has also been documented that PLP can affect the ability to detect natural polarized light patterns in the sky which can negatively affect navigation ability and ultimately affect dispersal and reproduction (Horvath et al. 2009). Polarizing surfaces are also known to disrupt insect behavior, causing some insects to react as though the surface is water, and depositing eggs on polarizing surfaces (Horvath et al. 2009). Horvath et al (2009) determined that minimization of polarizing effects was possible by adding white grids onto solar panels, or otherwise minimizing the solar active area. The extent to which heliostats could serve as an attractant is not known.

Wagner et al. (1983) documented insect kills at a much smaller facility, Solar One, in excess of up 800 insects in under a minute, although the methods the authors used to make this estimate is unclear. The presence of insects may serve as an attractant to some species of birds and bats on the project site.

There is uncertainty regarding how many birds may be killed by collisions with project features, but bird mortality is expected. The significance of such mortality, in a CEQA context, is uncertain, and would vary depending on the number and species involved.

To minimize this risk of collision and disturbance to wildlife from lights, Condition of Certification **BIO-8** specifies that the lighting atop the towers be flashing strobe lights rather than steady burning lights, and that lighting be shielded, directed downward, and turned off when not needed. The project owner has proposed use of FAA lighting systems on the project, using only red lights at night with the longest permissible interval between flashes and the shortest flash duration permissible, which would further reduce the potential for nocturnal strikes. Staff has incorporated these measures into proposed Condition of Certification **VIS-3**, which directs the use, placement, and minimization of all lighting. Condition of Certification **BIO-16b**, which requires development of an Avian and Bat Protection Plan, would require the project owner to monitor, record, and report dead or injured birds found within the project footprint. The plan would also require the implementation of remedial actions including the placement of aerial markers, ribbons, or other devices to reduce bird mortality. Monitoring of operational impacts for seasonal factors, and data on species of birds affected, and types of injuries or mortalities, requested by the USFWS, are considered crucial in understanding operational impacts, bird behavior, responses to stresses, and identifying and implementing measures to avoid, minimize, or mitigate impacts. However, residual impacts to avian species may exist after implementation of the staff recommended conditions of certification. Condition **BIO-16b** also requires monitoring of bird mortality due to glare. Staff concludes that the Avian and Bat Protection Plan and mortality monitoring as recommended in Condition of Certification **BIO-16b** would effectively determine rates of bird and bat mortality from collisions with structures. Condition of Certification **BIO-16a** would implement annual funding for avian and bat conservation efforts, effectively improving habitat and removing risks to birds and bats. It may not be feasible to accurately determine the rate of latent mortality, when mortality occurs at a time and place removed from the project site.

Solar Energy Flux

Operation of the project would concentrate the sun's radiant energy (flux or solar flux) over the heliostat field. Flux levels increase approaching the power towers, and occupy the airspace over the heliostat fields. Any species of bird, bat, or insect that enter this airspace and are exposed to concentrated solar flux are at risk of injury, latent mortality on or off the project site, or mortality within the project footprint. The type and severity of damage experienced is not predictable; however, it is directly linked to the duration of exposure and the intensity of the flux encountered. While safe limits of flux have been established for humans, and the adverse effects of exposure well documented, little information exists to help staff understand what levels of flux may be safe for bats, birds, and insects.

Thresholds for solar flux exposure have been established for humans, and range from 1.42kW/m^2 (24CFR, Section 51.204 Appendix II) to 5kW/m^2 (49CFR Part 193). No published threshold for avian exposure has previously been identified. Exposure to solar flux has the potential to result in direct and indirect effects to birds by damaging their eyes, including the loss of sight; burning or singeing feathers; compromising the molecular structure of feathers (i.e., non-visible damage); and secondary, non-visible physiological changes including elevated body temperatures or thermal stress. In some circumstances exposure to elevated levels of solar energy flux (see **APPENDIX BIO1)** may result in the death of the bird either immediately or within a short period of time following exposure. The potential for injury depends on a variety of factors including the size and type of bird; length of exposure; and the level of solar energy flux. Staff has formulated a thermodynamic model to assist in evaluating impacts from exposure to elevated solar flux (see **APPENDIX BIO1**).

This model establishes a theoretical level of safe exposure for avian species (excluding bats and insects), at no more than a minute of exposure at 5kW/m^2. Solar flux will reach highest concentrations near the tower, likely approaching 500kW/m^2, as based on information filed for two separate BrightSource projects: the Rio Mesa Solar Electric Generating Facility (RMSEFG) and the Hidden Hills Solar Electric Generating System (HHSEGS). Staff assumed that flux fields created by PSEGS, would be essentially the same the Rio Mesa Solar Electric Generating Facility, which is based on the same proprietary technology. Therefore staff relied on previous data in evaluating expected levels of solar flux for the PSEGS project. This information included:

1. BS 2012a – Bright Source (TN 63357). Rio Mesa Solar Electric Generating Facility CEC Biological Resources Workshop Presentation, dated January 6, 2012. Submitted to CEC Docket Unit on January 12, 2012.

2. URS 2012a – URS/A. Leiba (TN 64060) Applicant's Data Response to Data Request Set 1A, dated March 8, 2012. Submitted to CEC Dockets Unit on March 8, 2012.

3. BS 2012m – Bright Source (TN 64467) Biological Workshop Presentation, dated March 13, 2012. Submitted to CEC Dockets Unit on March 28, 2012.

4. EHS 2012c – Ellison Schneider & Harris/C. Ellison (TN 64093) Applicant's Opening Brief for March 19, 2012. Status Conference, dated March 9, 2012. Submitted to CEC Dockets Unit on March 9, 2012.

5. URS 2012c – URS/A. Leiba (TN 64722) Response to Center for Biological Diversity Data Request, dated April 12, 2012. Submitted to CEC Dockets Unit on April 12, 2012.

6. URS 2012e – URS/A. Leiba (TN 64814) Supplemental Response, dated April 16, 2012. Submitted to CEC Dockets on April 16, 2012.

7. BS 2012r – Bright Source (TN 65431) Applicant's Supplemental Response to Data Requests, Set 1B, 143 and 144, dated May 23, 2012. Submitted to CEC Dockets Unit on May 23, 2012.

8. ESH 2012c – Ellison Schneider & Harris, LLP (TN 65696) Applicant's Notice – Staff's Data Requests Set 2A, dated June 8, 2012. Submitted to CEC Dockets Unit on June 8, 2012.

9. ESH 2012e – Ellison Schneider & Harris, LLP (TN 65745) Applicant's Supplemental Notice for CEC Staff's Data Requests Set 2A, dated June 13, 2012. Submitted to CEC Dockets Unit on June 13, 2012.

10. BS 2012u – BrightSource/ T. Stewart (TN 66280) Applicant's Response to Data Requests, Set 2A, #159 dated July 20, 2012. Submitted to CEC Dockets Unit on July 20, 2012.

11. BS 2012v – BrightSource (TN 68364) Applicant Submitted Power Point Presentation (Flux Impacts on Avian Species) for August 28, 2012 Joint Workshop on Rio Mesa SEGF and Hidden Hills SEGS , dated August 28, 2012. Submitted to CEC Dockets Unit on November 5, 2012.

12. BS 2012w – BrightSource (TN 68360) Applicant Submitted Slide on Dr. Pleguezuelos' Conclusions at GEMASolar Plant in Andulusia, Spain, for August 28, 2012 Joint Workshop on Rio Mesa SEGF and Hidden Hills SEGS. Submitted to CEC Dockets Unit on November 5, 2012.

13. BS 2012x – BrightSource (TN 68294) Applicant Supplemental Avian Study Information – 1: Assessment of Potential Impacts to Birds from Solar Thermal Power Plant, Dimona Israel; 2: Environmental Impact of the GEMASOLAR Thermosolar Plant on the Bird Community in the Monclova Surrounding Area (Fuentes de Andalucía, Seville, Spain, Juan M Pleguezuelos, Granada, 08-23-2012); 3: Impact of the GEMASOLAR Solar Power Plant (La Monclova, Fuentes de Andalucía, Province of Seville) on the Bird Population, Report 4 (September 2010): Nesting avifauna in the study area during the plant construction phase (March – July 2009-2010); 4: Impact of the GEMASOLAR Solar Power Plant (La Monclova, Fuentes de Andalucía, Province of Seville) on the Bird Population,

14. CH2 2012qq- CH2MHill/j. Carrier (TN: 68630) Data Response, Set 3. 11/21/2012

15. SJ 2012a- Dr. Johnsen Ph.D (TN 68785) Dr. Johnsen's Presentation at December 5, 2012 Joint Rio Mesa SEGF and Hidden Hills SEGF Workshop Submitted to CEC Docket Unit On December 5, 2012.

16. CEC 2013aa – California Energy Commission (TN: 69944). CEC Staff's Exhibit 329 - Staff's PP Presentation on the Summary of Conclusions Biological Resources. Dated March 18, 2013.

17. CEC 2013bb – California Energy Commission (TN: 69942). CEC Staff's Exhibit 330 - Typical Flux Concentration Increase. Dated March 18, 2013.

18. ESH 2013xx– Ellison Schneider & Harris, LLP (TN: 69610). Applicant's Sur-Rebuttal Testimony. Dated February 20, 2013.

19. CEC 2013cc – California Energy Commission (TN: 69558) CEC Staff's Rebuttal Testimony. Dated February 15, 2013.

20. USFWS 2013i. U.S. Fish and Wildlife Service (TN: 69553) U.S. Fish and Wildlife Service's Comments on the Applicant's Opening Testimony. Dated February 11, 2013.

21. CDFW 2013b. California Department of Fish and Wildlife (TN: 69789). Department of Fish and Wildlife (CDFW) Comment letter. Dated February 14, 2013.

22. CEC 2013dd – California Energy Commission (tn:69495). Commission Staff Rebuttal Testimony. Dated February 12, 2013.

23. USFWS 2013ii - U.S. Fish and Wildlife Service (TN: 70273) U.S. Fish and Wildlife Service's Public Statement re Region Eight. Docketed April 3, 2013.

24. BS 2013x – BrightSource (TN 69485). Applicant's Rebuttal Testimony, Exhibits 72 to 80. Dated February 11, 2013.

McCrary et al. (1986) found that 13 of the bird carcasses (19 percent) at the Solar One facility had been burned, reporting that the "heavily singed flight and contour feathers indicated that the birds burned to death," see **APPENDIX BIO2**, Figure 7. The authors interpreted these mortalities as the result of birds flying through that facility's standby points (i.e., areas of concentrated solar energy) though they did not observe the incidents, and that mortalities may have been caused by flying within elevated flux levels surrounding the SRSG during normal operation. Risk of burning was evidently higher for aerial foragers (swifts and swallows) because of their feeding behavior. The McCrary study was based on systematic searches of the 32 hectare (79 acre) Solar One site but not beyond the site boundaries. Thus, if any birds were injured but were able to fly beyond the site's boundaries (about 1,200 ft from the receiver tower), they would not have been found by the field biologists and could have been scavenged before being observed. For this reason, staff believes that actual mortality from burning may have been higher than reported. It is also possible that birds considered collision victims had suffered damage to flight feathers such that birds were unable to fly, or had experienced damage to the eyes and became disoriented, resulting in collision with the heliostats. However, the authors did not perform microscopic examination of feather structure or eyes that would make this determination possible.

Risk to Migratory and Resident Birds

The importance of migration to avian survivorship has been generally recognized for more than two centuries (Bewick 1797) and its significance has received even greater attention in the decades since, especially during the latter years of the 20th century. Carlisle et al (2009) suggest there is increasing recognition that migration is likely the most limiting time of year for migratory birds. It is during migration that the greatest number of bird species and individuals would be expected to pass through the PSEGS project area. Additionally, movement characteristics of migratory birds (for example: flocking, streaming, utilization of stopover locations, and responses to extreme weather) render them vulnerable to a host natural and anthropogenic risks along the way. Mortality rates “may be 15 times higher than those during the breeding and wintering periods when the bird is stationary” (Sillett and Holmes 2002). Thus exposing birds to additional risks during migration may have even greater significance relative to individual and species survivorship (at least at the meta-population or evolutionary significant unit levels). Although several features of the PSEGS facility impose additional threats that were not found with the PSPP (e.g., power towers, large mirror arrays; generation tie-lines), the virtually invisible but very large fields of elevated solar flux may be the greatest of these threats to migrant and resident birds.

There are more than 150 resident and/or spring migrant bird species that may occur at or near the PSEGS project site or Chuckwalla Valley. Some species have a high probability of occurrence in the region (i.e., neotropical song birds) although they occur in the project area for a limited period of time (i.e., during migratory periods); while others are year round residents. The risk to resident and migratory birds is a function of several factors, including: what species pass through the project area; which species have a high probability of occurring there in migration; and which species have the highest probability of experiencing adverse consequences resulting from exposure to elevated levels of solar flux. By investigating resident and spring migrants’ natural history traits, including: whether they are daytime or nighttime migrants; known flight characteristics (e.g., whether or not they soar, use thermal air currents, or move in slow and steady or fast flight); their social patterns (e.g., whether a species moves in a flock, an amorphous stream, or as individuals); and whether feeding occurs during stopovers or in flight.

The physical impacts to birds caused by exposure to solar flux will depend on the length of time spent in the solar flux field and at what level intensity the bird is flis through (e.g., McCrary et al 1986; Santolo unpubl. data). Shorter exposures of limited intensity are less harmful than longer exposures at higher intensities. In **APPENDIX BIO1**, staff combined occurrence potential with each species’ natural history to predict which species would have the highest probability of suffering flux-related adverse effects and in what relative numbers.

Based on this information, staff has described the potential risk to various groups of birds. Generally speaking diurnal birds that exhibit flight patterns that place them in the highest potential concentrations of solar flux would be expected to be greater risk.

However, some nocturnal migrants are expected to practice daytime migrations (e.g., as opposed to persisting at migratory stopover locations) or occur in the project area during daylight as a result of extreme weather conditions – high winds being one of the most prevalent in southern California deserts.

Species with the greatest potential to suffer adverse effects resulting from exposure to elevated levels of solar flux are expected to include members of two families, swallows (Family: Hirundinidae) and swifts (Family: Apodidae). There is existing documentation for the vulnerability of these families from previous studies at solar power tower energy generating facilities (e.g., McCrary et al 1986). These birds are diurnal migrants; they occur in large numbers throughout southern California deserts and have been documented at the Palen site. In addition, the period over which these species' migrations occur is lengthy (that is, the period between earliest and latest movements spans several months); they move at relatively slow speeds in flight (12 – 20 mph) and at modest heights (between 100 and 1000 feet) above the desert floor. The birds migratory flights occur in loosely-associated, broad streams. Individuals may feed while moving, especially if a food source (flying insects) is found opportunistically, which may increase the amount of time spent within a limited airspace. Vaux's swift (*Chaetura vauxi*), would have similar risk patterns as swallows; however, the Vaux's swift typically migrates through a more limited time period and often migrates in large aggregates. This latter quality renders the Vaux's swift a species that could potentially suffer catastrophic, single-incident adverse consequences in the event a large migratory pulse encounters a region of elevated solar flux.

Turkey vulture (*Cathartes aura*; Family: Cathartidae), which occurs as a migrant as well as a winter and spring resident in the project area is a highly vulnerable species due to its overall slow flight progress and reliance on thermal currents. This species has been documented on the project site during surveys conducted by the project owner. The vulnerability of this species is due to slow flight speed, static soaring flight pattern (e.g., they rarely wing-flap and are obligate soaring migrants) that often follow circuitous flight paths (Mandela et al 2008). This species commonly occurs within the range of elevations in which solar flux will be generated.

Doves (Family: Columbidae) of two species, the mourning dove (*Zenaida macroura*) and the white-winged dove (*Zenaida asiatica*) would be subject to risk. These two species occur in large numbers throughout southern California deserts and are common migrants in the vicinity of the project area. They migrate during the day; the migration period is lengthy; their migratory flights occur in loosely-associated, broad streams; and individuals may feed opportunistically along the migration route (e.g., they may stop to feed daily). Doves migrate at relatively high speeds - they are capable of sustained speeds of around 55 m/h (88 km/h) - but typically at modest heights (between 100 and 1000 feet) above the desert floor in flights that may be periodically interrupted in order to feed on the ground. Dovesflight patterns are often highly erratic and typically non-linear rendering them vulnerable to solar flux in spite of their rapid flight.

Hummingbirds (Family: Trochilidae), including Anna's hummingbird (*Calypte anna*), Costa's hummingbird (*Calypte costae*), calliope hummingbird (*Selasphorus calliope*), and black-chinned hummingbird (*Archilochus alexandri*) are at extreme risk during migration because they migrate during the day; must feed daily; and must locate suitable nighttime refugia. Their small size puts them at heightened risk relative to all other migrants.

Several hawks (accipiters, harriers, and buteos; Family: Accipitridae) including the Coopers' hawk (*Accipiter cooperi*), sharp-shinned hawk (*Accipiter striatus*), Swainson's hawk (*Buteo swainsoni*), and northern harrier (*Circus cyaneus*) rank relatively high in terms of risk from exposure to elevated levels of solar flux. All of these are diurnal migrants whose documented occurrence in the project area, flight patterns, migration speed, and opportunistic feeding strategies render them vulnerable to regions of generated flux for significant periods when in migration. Two large buteos, the red-tailed hawk (*Buteo jamaicensis*) and the ferruginous hawk *(Buteo regalis*), also diurnal migrants – and the former a nearby resident breeder – would likely be at a lower risk primarily due to their lower expected numbers at the project site.

Several occurring flycatchers (Family: Tyrannidae) including the state endangered northwestern willow flycatcher (*Empidonax traillii brewsteri*), western kingbird (*Tyrannus verticalis*), gray flycatcher (*Empidonax wrightii*), western flycatcher (*Empidonax difficilis*), and ash-throated flycatcher (*Myiarchus cinerascens*) – all of which are primarily nighttime migrants – exhibit extensive daytime movements during which feeding is an important behavior. Although their nocturnal migration habits minimize overall threat of exposure to elevated levels of solar flux, their documented occurrence, flight patterns, speed during diurnal movements, and requisite fly-catching/hawking feeding behaviors render them vulnerable to some degree. The common raven (*Corvus corax*) is ranked similarly in many threat categories with the higher risk species turkey vulture.

Another species that may be at risk is the house finch (*Haemorhous mexicanus*; Family: Fringillidae). Though not an obligatory migrant, this species may occur in small numbers as migrants, and is a regular fall, winter, and spring resident that probably includes a breeding population. Local meta-populations of house finch families may swell into post-breeding agglomerations of between scores and hundreds. Movements of these groups may place relatively large numbers of individuals at risk from exposure to elevated levels of solar flux.

Other, less predictable species and for which adequate occurrence data are lacking, but may be at risk because of their flight patterns and behaviors include: thrashers (Family: Mimidae), especially the sage thrasher (*Oreoscoptes montanus*); nighthawks (Family: Caprimulgidae), especially the lesser nighthawk (*Chordeiles acutipennis*); Grosbeaks (Family: Cardinalidae), especially the black-headed grosbeak (*Pheucticus melanocephalus*), several species of blackbirds (Family: Icteridae), including the red-winged blackbird (*Agelaius phoeniceus*) and the Brewer's blackbird (*Euphagus cyanocephalus*); and owls (Family: Strigidae) including burrowing owl (*Athene cunicularia*), short-eared owl (*Asio flammeus*), and long-eared owl (*Asio otus*)

Conversely some birds will likely be at lower risk from exposure. Although this finding may appear counter-intuitive based on numbers alone, resident species such as the verdin (*Auriparus flaviceps*), black-tailed gnatcatcher (*Polioptila melanura*), Gambel's quail (*Callipepla gambelii*) along with many ground-feeding, seed-eating, winter resident/nocturnal spring migrant species such as Brewer's sparrow (*Spizella breweri*), horned lark (*Eremophila alpestris*), and black-throated sparrow (*Amphispiza bilineata*), are less likely to succumb to flux-related impacts due to several factors. These include their nocturnal migration, ground-based feeding, consequent low-elevation flight (that is, relative to projected height above ground or areas of expected elevated levels of solar flux), and loss of foraging habitats within the project area may make them less vulnerable from the operation of the PSEGS.

As described above, staff believes that extended exposure to high-intensity solar flux would likely kill birds. Staff also believes that shorter exposures to high-intensity solar flux would cause tissue or feather damage that could impair flight or vision or cause physiological effects that ultimately cause or contribute to mortality from other causes (e.g., reduce ability to forage, escape from predators, or thermoregulate). Staff believes that longer exposures to lower-intensity solar flux levels are likely to cause feather damage or physiological effects. The following discussion is intended to illustrate the role of feathers in birds, and the types of behavioral or physiological functions that may be impaired or destroyed following exposure to concentrated solar flux in excess of safe thresholds, estimated to be no more than one minute's exposure at $4kW/m^2$.

Damage to Plumage and Flight Feathers

A birds' plumage is well adapted to its environment, and serves a variety of roles, such as: flight, thermoregulation, protection from impact, defense, incubating eggs and young, tactile hunting, seasonal displays such as breeding plumage in male birds, and camouflage from predators (Raptor Research Foundation, 2012). When exposed to elevated levels of solar radiation, plumage may show the first signs of damage. Exposed skin, such as feet and legs, and eyes are also expected to be highly sensitive to elevated solar radiation. Little information is available to help staff assess how skin or eyes are affected by elevated levels of flux, nor is information available to help staff evaluate the potential physiological effects of overheating. Eye exposure is further discussed below in the section entitled “Irradiance”. Staff has even less data regarding how bats or insects may respond to exposure to solar flux. All living organisms have general tolerance levels. Staff considers it highly likely that the level of flux, in combination with the size of the flux field, may exceed the level of tolerance for organisms that enter the flux field.

Surface feathers, or contour feathers, cover and streamline the remainder of the body and also contribute to aerodynamics. Insulating feathers are found beneath the contour feathers. Damage to insulating feathers may affect the bird's thermoregulation (body temperature control). A bird's plumage is critical to insulating the bird from the environment, and is influenced by color and structure of the plumage (Wolf and Walsberg 2000).

Bird feathers grow from lines, or tracts, pterylae (Raptor Research Foundation 2012) with bare patches of skin in between, called apteria (Ibid.) There are several types of feathers, including fluffy down insulating feathers (which are used in the manufacture of pillows); semi-plumes, which shape and insulate the bird, bristles, usually around the face and used in feeding; filoplumes, used to feel and sense vibrations, and contour feathers, which add shape to a bird. A diagram of a feather is depicted in **APPENDIX BIO2**, Figure 6. Feathers are comprised of a central shaft, or rachis, and barbs come off the rachis at an approximately 45 degree angle (45°). Between barbs are two sets of barbules, microscopic filaments that connect each barb (Doctors Foster and Smith

2012, Muller and Patone 1998). Barbules have even smaller microstructures, called barbicels, which hooks the barbules together. These barbules act like a zipper, connecting the barbs and making them airtight and able to withstand air resistance during flight (Ibid., see also Muller and Patone 1998). This microstructure of a feather, consisting of barbules and barbicels, comprises the majority of the feather, and is not visible to the naked eye. These components, so critical to flight, are used in establishing a safe avian exposure criteria (see **APPENDIX BIO1**).

Flight feathers may be one of the most important feathers at risk from exposure to high levels of solar energy. The long relatively rigid feathers of the wings and tail (flight feathers) are the bird's aerodynamic flight surfaces. These feathers provide lift and are adapted to the body style of the bird, that is, raptors have long wings and long pointed flight feathers that allow for catching air current and generating great speed, while other birds have wing lengths and flight feather construction that allow for various flight patterns and behaviors. The feathers used for flight include primary, secondary, and tertiary feathers which are located along the arm of the bird, while the large tail feathers are called retrices. Feathers are "instrumental in flying [and] they play a critical role in temperature regulation" (Sibley 2002), and are considered the most valuable asset a bird has (Raptor Research Foundation 2012).

Feathers damaged by concentrated solar flux could only be replaced during a molt. Birds have no physiological means to replace damaged feathers other than seasonal molting. Molting generally occurs during or after the breeding season (Raptor Research Foundation 2012), and birds are known to time molting to optimize fitness such as after migration, or in concert with breeding. During a molt, the bird replaces all of the feathers over a period of four to 16 weeks. Typically the molt is staggered to allow the bird to fly and maintain thermal protection. Depending on the stage of molt, the existing plumage would provide varying degrees of protection from solar energy. A bird in the middle of molt, that may have areas of exposed skin, would be expected to have an increased risk from exposure to elevated levels of solar energy flux and may experience immediate tissue damage to tissue; having no thermal protection from plumage.

Birds replace lost feathers slowly and even minimal damage to flight feathers can significantly affect flight performance. Large birds, such as eagles and vultures may take up to two years to molt (Raptor Research Foundation 2012); although a few species will molt all flight feathers at once (Ibid.). When a feather is actively growing, blood is supplied to the shaft of the feather. When fully grown and formed, the vessels that supply blood to the feather constrict and the feather is considered dead tissue, without feeling, similar to human hair. A feather broken while in the blood feather stage remains damaged until molt (Chubb 2003). Birds exposed to elevated levels of solar energy flux while in the blood feather stage may be subject to increased risk of feather damage. Additionally, it is unknown if a feather heated by flux could conduct heat through the feather shaft and into the follicle or skin of a bird.

Molting requires additional energy to create the feather components and synthesize them (Murphy 1999). A bird that has experienced damage from elevated levels of solar energy flux may have diminished abilities to meet existing energy requirements. Damaged plumage may require the use of additional energy to fly, forage, and perform normal behaviors lowering the survivability of the bird. Hawks and eagles have been demonstrated to manage the nutritional cost of molting by shedding just two feathers on each wing at a time, and typically having around 24 flight feathers total to be molted (Chubb 2003). Feathers produced during periods of poor nutrition can be faulty, showing ridges and other abnormalities (German Assn. for the Prot. Of Common Swifts 2012), therefore, one or more molts may be necessary to repair the damage, and a bird would be energetically challenged to do so if damaged feathers reduced the birds success at foraging.

Exposure to elevated levels of solar flux would be expected to damage feathers such that insulating and flight capacities are lost, impaired or even destroyed. Birds exposed to damaging levels of solar energy flux either during or after a recent molt may also have an increased the risk of mortality or decreased fitness. In a desert environment, staff expects that a bird exposed to high temperatures and with limited access to water would have low survivability, either succumbing to heat, or extreme cold during cold desert nights, or from being more susceptible to predation. Birds with exposed skin are considered "greatly disadvantaged" (Chubb 2003). As with most species, older and younger individuals would be considered more susceptible to injury or mortality from elevated levels of solar flux. For example, juvenile birds have feathers that are much softer, and are not as adept at maintaining feathers as adults (The Modern Apprentice 2012); and may be more susceptible to injury or mortality than older birds.

Flight Performance

Flight performance is critical to foraging, evading predators, conducting seasonal migration and breeding displays, and performing other life history characteristics. In pet birds, incorrect feeding or caging can cause damage and weakness in feathers such that swifts cannot thermoregulate or fly (German Assn. for the Prot. of Common Swifts 2012). Seemingly minor damage to flight feathers may affect a bird's flight speed or its ability to maneuver; more significant damage to flight feathers would prevent flight altogether. Length of flight feathers, and asymmetry in flight feathers were noted to reduce take-off speed in birds, when impaired by damage, or during molt (Swaddle et al 1996). In rehabilitating wild birds, the condition of plumage is critical to determining if the bird can be released. If plumage conditions allow the bird to fly, thermoregulate, and waterproof themselves, the survival rate is much greater (Wildlife Rehabber 2012). Additionally, damage to flight feathers may impact a birds' capability to migrate. Passerines with impaired flight feathers have been demonstrated to avoid long-distance flights (Hedenstrom 2003). Birds prevented from seasonal migrations due to the inability to effectively fly may experience mortality from the lack of food or exposure. Birds damaged by exposure to elevated solar energy flux would likely have limited abilities to complete these actives, and may suffer mortality at a later time or after leaving the site (i.e. off the project site). See **APPENDIX BIO1** for further discussion of flight mechanics.

Flight performance is also important in raising young. Adult birds make numerous trips back and forth from foraging grounds to the nest, carrying food items to young. A bird attempting to feed young with damaged flight feathers would have impaired flight capabilities that reduce the bird's ability to forage or hunt. Raptors in particular carry large prey to young, and have feathers adapted to these heavy loads. Bald eagles are capable of carrying up to half of their weight (Nye 2005), and damaged flight feathers would be detrimental to successful fledging of chicks.

Flight speeds and patterns will affect the length of time a bird is exposed to solar flux while moving across the project site. Flight speeds are reported to be typically within 20 to 50 miles per hour (mph) (USGS 1998), and vary dramatically on the upper end of the range. **APPENDIX BIO1** provides estimates of the time required to traverse the solar field at various flight speeds, and also provides data for select flight paths and concentrated solar flux dose at the Solar 1 site. For reference purposes, horned larks and ravens are known to occur on the project site, and fly from 22 to 28 miles per hour, (mph) (USGS 2006), whereas mourning doves, which could also occur onsite, are faster flying, around 35 mph. It is unclear how flight speed may affect the likelihood of exposure to elevated levels of solar flux. Flight patterns would also affect the dose of solar flux a bird receives. Depending on species and behavior, birds exhibit various flight patterns such as continuous flapping, as well as non-continuous flapping such as soaring or gliding, flap-bounding and flap-gliding. Furthermore, flap speed varies depending upon energetics, weather conditions and speed needed, with swallows having a very low flap speed for birds of comparable size (Park et al 2001).

While it is unknown what the behavioral response of a bird will be from exposure to elevated levels of solar energy flux, passage through an area of high energy intensity could result in injury to the birds. Bird behavior will likely act in conjunction with flight speed to influence the probability of the exposure risk. Birds that fly at low elevations below elevated levels of solar energy flux are not expected to experience an exposure risk. However, aerial foraging birds, such as swifts and swallows, have been documented to be more likely to experience exposure to this risk (McCrary 1986).

The type and color of the plumage will also influence the potential risk to the bird. Plumage will absorb various amounts of solar radiation, depending on many factors. Plumage color, position of bird, density and structure of feathers, and flight speed, will all affect a birds' tolerance to this heat (Walshburg 1992). Other factors such as behavioral response to elevated flux levels, age of the bird, ambient temperature and humidity level will also affect how exposure to elevated solar energy levels will impact a bird. Birds will not be able to see the solar energy flux over the heliostat field, and therefore would not be expected to avoid the airspace where solar energy is concentrated. Birds may also become confused or disoriented and depending on behavioral response, such as flying lower, higher, or making evasive maneuvers will affect duration of exposure.

It is unknown what protection plumage will afford the different species of birds that may move into solar fields and experience elevated levels of solar energy flux. At low levels and short durations the birds may suffer little permanent damage and be able to survive post exposure. However, at exposure to high levels of solar energy flux even short durations may be lethal even if the bird is able to fly out of the flux field. For a large powerful bird, such as golden eagle, lethal damage to plumage, skin, or eyes from exposure to high levels of solar energy flux may occur, yet the bird may be able to fly away from the site. Documenting incidences of latent mortality that occur off the project site is likely not feasible nor is it possible to accurately predict what percentage of birds would be subject to this effect.

Irradiance

When the project is operating, the heliostats will reflect the sun's rays onto the SRSG, which occupy the top 130 feet of each solar power tower. During these times, the boilers absorb approximately 95 percent of the light that reaches them. Light that is not absorbed will be visible reflecting off of the surfaces of the solar boilers.

The perceived brightness of objects is measured in terms of retinal irradiance, which is a measure of the intensity of the light reaching the retina. Retinal irradiance also has the potential to cause adverse impacts. The avian eye is comparatively larger than the human eye (Brooke et al 1999), and raptors have even larger size eyes than non-predatory birds of the same weight (*Ibid*). Birds eyes are typically fixed in the socket and unable to turn (Project Beak 2012), although some species such as raptors have limited ability to turn their eyes (White et al 2007) (O'Rourke et al 2007), and have very wide fields of view (O'Rourke et al 2007). Some birds may be unable to look away or avoid exposure, given their physiological attributes (Dr. Gregg Irvin, personal communication). This lack of response would be considered similar to a "deer in the headlights". In humans, the sensation of pain is not linked to retinal damage, nor does it seem to be linked in animal species (*Ibid*).

Staff has no further data regarding the impacts of irradiance exposure on wildlife. It should be noted that the possibility exists for wildlife to experience damage, yet still be able to fly off the site. For the purposes of evaluating significance thresholds, staff believes irradiance has the potential to cause injury or lethality to avian species that fly within an un-quantified area of the solar field. Estimates of species most susceptible, or numbers of individuals exposed to damage from irradiance is not currently available. Injury or death from exposure to irradiance would be in conflict with LORS. It should be noted that the monitoring and mitigation protocol outlined in conditions of certification **BIO-16a** and **BIO-16b** would not detect eye damage, as necropsy of a live or freshly killed specimen would be needed to quantify damages. Staff has accounted for the lack of data by incorporating a safety margin (see **APPENDIX BIO1**) for flux exposure on feathers, and therefore will rely on damage to keratin (feathers) as the lowest endpoint of toxicity.

Conclusions and Discussion of Mitigation

Based on staff's understanding of solar energy flux intensity and exposure limits, staff believes that birds flying through energy flux in excess of safe thresholds will likely suffer significant damage to flight feathers, eyes, or skin. In some cases, where they fly through higher flux levels, these birds will fall to the ground with evidence of severe burning as reported by McCreary et al. (1986). Staff believes that many birds may continue flying for a few seconds or minutes, perhaps long enough to escape the hazard, but will be unable to fly effectively, find food, or escape predators and will die a short time after the exposure or persist for longer periods but with reduced reproductive success.

Staff believes that some birds exposed to concentrated solar flux will be at risk of suffering (1) hyperthermia, which may result in disorientation and/or other damaging physiological repercussions and, depending on time and level of exposure (2) feather damage and consequent flight impediment or anatomical effects. These effects are influenced by both the dose level and exposure time. These effects are considered significant and may be unmitigable.

Project Owner's Offered Mitigation

The project owner has proposed three avian conditions of certification: **BIO-A**, **BIO-B**, and **BIO-C**, containing meaningful mitigation for avian and bat impacts. The project owner has suggested that these replace the existing condition **BIO-16**, developed for the PSPP project, as they are appropriate to mitigate impacts associated with the PSEGS. Condition **BIO-A** offers compensatory mitigation at a 1:1 ratio for habitat impacts (approximately 3,794 acres of habitat), with selection criteria that would ensure the acquiaition of high quality habitat. This acreage is intended to "nest" within desert tortoise mitigation (e.g. lands acquired would be comparable to habitat impacted by construction of the project), and would not entail additional offsets outside of those required for desert tortoise mitigation, given that all selection criteria are met. These lands would be managed and preserved in perpetuity.

Condition **BIO-B**, Avian Enhancement and Conservation Measures, offers further avian mitigation in a two-pronged approach: the project owner has offered to fund the retro-fit or installation of avian diverters at non-APLIC compliant power poles within the greater vicinity of the project, and has pledged an amount of $300,000 towards this effort, to be held in trust under the National Fish and Wildlife Foundation's Bald and Golden Eagle Protection Act Account. The other part of **BIO-B** would mitigate for losses of migratory birds through funding of conservation actions. The project owner has offered $500,000 towards this effort, and has identified the following 11 conservation areas as having benefit to migratory birds:

1. Restoration of degraded habitat with native vegetation;
2. Restoration of agricultural fields to bird habitat;
3. Movement of agricultural fields to enhance bird populations;
4. Invasive plant species and artificial food or water source management;
5. Control and cleanup of potential avian hazards, such as lead or microtrash;
6. Retrofitting of buildings to minimize collisions;
7. Retrofitting of conductors and above-ground cables to minimize collisions;
8. Animal control programs;
9. Support for avian and bat research and/or management efforts within mitigation lands acquired pursuant to desert tortoise mitigation (**BIO-12**);
10. Funding efforts to address avian diseases or depredation due to the expansion of predators in response to anthropomorphic subsidies that may adversely affects birds; and

11. Contribute to the Migratory Bird Conservation Fund managed by the Migratory Bird Conservation Commission.

Condition **BIO-C**, Avian and Bat Surveys, Monitoring and Adaptive Management, outlines an extensive onsite program designed to monitor operational effects, if any, and to outline a pathway toward managing those impacts on an ongoing basis. These efforts would be memorialized in a Birds and Bat Conservation Strategy, or BBCS. Condition **BIO-C** details various efforts, including monitoring bird and bat use at the site, evaluation of wildlife behavior at the project site in comparison with behavior of birds in an unaltered environment; implement onsite mortality and injury monitoring to gauge operational effects of the project; identify conservation measures to minimize impacts, and develop and implement an adaptive management framework to respond directly to the results of project monitoring. The condition proposes monitoring golden eagle nest locations within 10 miles of the project site.

The project owner has outlined several meaningful approaches to benefit the range of potentially affected species, as well as the larger ecosystem within the NECO planning area. Staff has adapted as many of the tenets of **BIO-A**, **BIO-B**, and **BIO-C** as possible, and has revised Condition of Certification **BIO-16** to reflect these measures. At the time of preparing the PSA, staff is working in conjunction with the REAT agencies' biologists to refine recommended conditions for the project. Following publication of the PSA, staff intends to workshop this issue with the project owner, public, and the resource agencies, and present final conditions within the FSA. The following is a discussion and explanation of how staff has blended the project owner's **BIO-A**, **BIO-B**, and **BIO-C**, into conditions **BIO-16a** and **BIO-16b**.

Staff's Blended Mitigation Approach

Staff appreciates the comprehensive nature of the project owners' offered mitigation, and has blended the most valuable tenants into two conditions, **BIO-16a** and **BIO-16b**. Staff has not carried forward the project owner's offer of 1:1 habitat offsets for avian and bat species. While acquisitions are valuable, and ensure long-term preservation of habitat, staff feels that the requirements of **BIO-12** are equally conservative, ensuring acquisition of high quality habitat for the desert tortoise, which would also benefit avian species. Additionally, the stated selection requirements would likely "nest" or overlap with the desert tortoise offsets, and therefore would not ultimately result in acquisitions further than already recommended within **BIO-12**. Habitat acquisition is a useful tool however, when attempting to mitigate potential ongoing losses of such a mobile and diverse group of vertebrates such as migratory birds in particular, and insects and bats to a lesser degree, restoration and enhancement of habitat may prove more useful than placing conservation easements. Restoration of habitat is one of few means of "creating" new habitat, and has the possibility of expanding both abundance and, in some instances, the range, of birds, bats, and insects. Therefore, staff's approach entails focusing on the project owner's mitigation **BIO-B**, part B, enhancement and conservation actions. The essence of this mitigation is now present in **BIO-16a**, with several key modifications proposed by staff.

The project owner offered $500,000 towards funding various habitat enhancement and conservation actions, and staff has also adapted this. However, rather than payment of a lump sum, staff would prefer that the project owner fund a non-wasting account to achieve this same goal. Monies held in an interest-bearing account would be managed by a non-profit investment entity (e.g., a community foundation such as the Imperial Valley Community Foundation) from which only annually earned interest and fund management fees may be distributed; that is, the investment vehicle will be designed and managed as a non-wasting account.

Staff has considered a minimum annual benefit of approximately $50,000 is necessary to fund bird mitigation actions, during the operational life of the project. Staff believes in order to yield approximately $50,000 annually, the project owner would need to provide approximately $1,500,000 into a nonwasting fund. The recommended funding amount was determined by considering three primary factors:

a. A reasonable/achievable rate of capitalization (4.0% per annum);

b. Adequacy of the amount of the investment to allow for portfolio diversification; and

c. An annual funding amount of significant benefit to the affected resource

The actual funds needed to support this program may vary. While this approach is more costly than originally proposed by the project owner staff believes the approach is reasonable and may provide indirect benefits to the project owner; primarily that funds would be available to the owner at the end of the project; the program would provide not only annual revenue for an extended period but does so in a fiscally responsible manner; and the level of funding is expected to provide a significant, demonstrable, and measurable mitigation value that is linked directly, both spatially and temporally, to facility operation.

Condition of Certification **BIO-16** is designed to compensate for death, injury/morbidity, and/or generally reduced reproductive success of individuals or a distinct population segment or segments of bird and bat species resulting from adverse contact with elevated levels of solar flux, mirror-related disorientation, and power tower collisions. The specificity of these conditions links the proposed mitigation directly to project component-specific impacts and furthermore, links the funding of the mitigation measure solely to the period of project duration. The funding for this mitigation measure does not involve the establishment of an endowment that is intended to provide a funding mechanism in perpetuity. This mitigation measure is separate from all other project-related mitigation measures and responds directly to the question posed by the Palen Project REAT agencies team; namely, how do we mitigate for flux-related adverse effects to migratory birds and, albeit probabilistically at a more limited threshold, to bats during the operational life of the PSEGS.

Conservation Opportunities

Condition of Certification **BIO-16a** would, among other things, require the development and implementation of conservation opportunities. Staff has conferred with various agencies to determine where conservation opportunities may exist. While the final determination of specific conservation actions would be made during development of the Avian, Bat, and Golden Eagle Protection Plans, and are not limited to those opportunities presented here, the following are viable examples of conservation actions that may be taken by the project owner.

1. Funding support for the U. S. Bureau of Land Management's strategic plan for migratory bird conservation Emphasis Area 3: Habitat Management Maintenance, Enhancement, and Restoration. Areas to be served by this component of the plan include Important Bird Areas, Areas of Critical Environmental Concern, Watchable Wildlife, Habitat Management Plan Areas, and Habitat Management Areas, all of which have been identified and designated in the BLM's planning process.

2. Funding support for the California Wildlife conservation Board's Riparian Habitat Conservation Program, the mission of which is the development of coordinated conservation efforts aimed at protecting and restoring the state's riparian ecosystems.

3. Funding support for the California Migratory Bird Conservation Partnership, a cooperative venture of Audubon California, PRBO Conservation Science, and The Nature Conservancy that seeks to protect, restore, and enhance lands that support bird populations in California.

4. Funding support for the USFWS Joint Venture, a collaborative, regional partnership of government agencies, non-profit organizations, corporations, tribes, and individuals that conserves habitat for priority bird species, other wildlife, and people. Joint Ventures bring these diverse partners together under the guidance of national and international bird conservation plans to design and implement landscape-scale conservation efforts. Joint Ventures have been widely accepted as the model for collaborative conservation in the 21st century. JointVenture actions include: biological planning, conservation design, and prioritization; project development and implementation; monitoring, evaluation, and research; communications, education, and outreach; and funding support for projects and activities.

Within California, several JointVentures exist in the Central Valley, Intermountain, and Sonoran. Based on personal conversations with USFWS and the Sonoran JointVenture Coordinator, means of compensation benefitting desert avian species are in place (Robert Mesta, personal communication), and further, the Sonoran JointVenture program also has the capability of designing conservation plans responsive to certain bird species or specific geographic locales.

5. Project owner could fund an existing need (e.g., preservation, restoration, and enhancement) at an acknowledged important migratory stopover. For example, this fund would be adequate to support funding needs at the Ash Meadows National Wildlife Refuge to support their Habitat Management Goal 2: to restore and maintain the ecological integrity of natural communities within the refuge. Their current plan calls for the need to "[o]btain funding for and hire: 1 Integrated Pest Management Coordinator/Botanist, biological technician, or GIS specialist (part-time)".

6. The dedication of $50,000.00 in funds could facilitate a grant of $200,000 or *more under the Neotropical Migratory Bird Conservation Act* if the program identified is selected for funding. In accordance with the act, for every federal dollar, three non-federal dollars are required in matching contributions. For projects in the United States, the non-federal share must be monetary.

In developing conditions of certification **BIO-16a** and **BIO-16b** with respect to species that are fully protected under the California Fish and Game Code (golden eagle, bald eagle, American peregrine falcon, Yuma clapper rail), mitigation is provided for potential ongoing direct loss of individuals from project operation. However, take of fully protected species is not permitable under state law. Thus, even if project impacts to golden eagle and other fully protected species can be mitigated to less-than-significant under CEQA, take of golden eagles or other fully protected species would potential violate Fish and Game Codes that protect fully protected species. However, recent changes at the CDFW will allow the take of some fully protected species, including golden eagles, through the context of an adopted Natural Community Conservation Plan (NCCP). Although not adopted, the DRECP would provide coverage for some fully protected species including the golden eagle.

Implementation of **BIO-16a** and **BIO-16b** would require the project owner to monitor, record, and report bird deaths and injuries from project construction and operation. Monitoring the project's operational impacts for seasonal factors, the species of birds affected, and the types of injuries or mortalities that occur have also been requested by the USFWS. This type of monitoring is considered crucial in documenting bird behavior, noting responses to stress, quantifying impacts, and subsequently identifying and implementing any available measures to avoid, minimize, or mitigate these impacts. If take occurs, it will be reported to the US Fish and Wildlife Service (USFWS) for further action.

Condition **BIO-16b** requires development of avian, bat, and golden eagle protection plans. These plans require development of project monitoring methodology and implementation of compensatory mitigation according to clear performance standards provided in the condition, should monitoring reveal significant impacts to avian or bat species. This mitigation shall be implemented as needed based on the levels of take revealed by monitoring, and would detail all appropriate minimization and compensatory actions, as determined in consultation with USFWS, CDFW, BLM, and the Energy Commission. These actions would vary from restoration of avian habitat that supports the species impacted by the project, power line retrofits or other means of minimizing take and enhancing habitat, and will allow for flexibility in measures imposed, based on effectiveness monitoring. These plans will also incorporate a means of accounting for individuals that may suffer damage from exposure to elevated levels of solar flux, yet still be capable of flying off the site. These animals would not be detected during onsite carcass searches, yet would be adversely impacted by the project.

While data collection is important, and could potentially inform new mitigation or adaptive management strategies, feasible mitigation to reduce impacts to avian species from exposure to elevated levels of solar energy flux or irradiance to below the level of significance may not exist. This is because mitigation cannot avoid bird mortality, and mitigation may not adequately replace birds in the local population that may be killed by solar flux exposure. Further, because golden eagle is a full protected state species, take of this species would violate Fish and Game Codes that protect this species.

Evaporation Ponds

The project has proposed various modifications to the PSEGS Project (Palen 2012a), including the reduction from two double-lined 4-acre evaporation ponds to two double-lined 2-acre evaporation ponds. These ponds will receive industrial waste streams that would primarily come from the PSEGS project's auxiliary cooling tower and boiler.

A variety of waterfowl and shorebirds could seasonally use evaporation ponds as resting, foraging, and nesting areas. Evaporation ponds in the Sonoran Desert pose several threats to wildlife. First, creation of a new water source to an area where water is scarce would attract ravens to the Palen Project, potentially increasing predation rates on juvenile desert tortoise in adjacent habitat. Second, waterfowl, shorebirds, and other resident or migratory birds that drink or forage at the ponds or Couch's spadefoot toads and their eggs could be harmed by selenium or hyper-saline conditions resulting from high total-dissolved-solids concentrations that would exist in the waste contained in the evaporation ponds (EPTC 1999; Lemly 1996; Wingdingstad et al. 1987). Monitoring results from 2007 and 2011-2012 at NextEra Harper Lake Solar Electric Generating System (SEGS) VIII and IX located near Harper Lake in the Mojave Desert revealed that numerous waterfowl, primarily eared grebes died at the evaporation ponds due to salt toxicosis (Luz 2007). Staff, CDFW, and USFWS are concerned about these threats to wildlife posed by the evaporation ponds.

Staff proposes Condition of Certification **BIO-26**, which requires installation of netting over the evaporation ponds to exclude birds and other wildlife as well as a monitoring program to ensure the effectiveness of exclusion. Implementation of this measure would reduce evaporation pond impacts to birds and other wildlife to less-than-significant levels. The use of netting over ponds has its own drawbacks, primarily that birds may become entangled in netting from time to time, and be unable to escape. Staff believes that even with this risk, netting the evaporation ponds is still a better choice than leaving them uncovered because of the known risk of salt toxosis to wildlife. Staff is researching additional means of making the evaporation ponds unappealing to wildlife; preliminary data shows that the addition of an orange or red colorant has served as a deterrent, as well as placement of large floating rafts in the ponds.

Special-status Plant Species

Regional Overview

The Sonoran Desert region of southeastern California, a region bounded by the Mojave Desert to the north and by the higher elevations of the Peninsular Ranges to the west, has a uniquely 'tropical' warm desert climate influenced by the addition of monsoonal summer rains; a contrast to the dry summer Mediterranean climate that characterizes much of California. This under-surveyed southeastern corner of California has a bi-modal rainfall pattern, with cooler late fall and winter rains that originate in the North Pacific Ocean, and tropical summer storms from southern Mexico (Conservation Biology Institute 2009).

The unique position of the region at the junction with the Neotropic ecozone to the south contributes to the presence of a number of rare and endemic plants and vegetation communities specially adapted to this bi-modal rainfall pattern, and not found elsewhere in California. These include microphyll woodlands, palm oases, and a number of summer annuals that only germinate after a significant warm summer rain.

This distinctive bi-modal climate of the Sonoran Desert distinguishes it, floristically, from other deserts, including the Mojave Desert, and from the rest of California, which is characterized by warm dry summers and a single rainy season in winter. In addition to being hotter and drier, the Sonoran Desert region also rarely experiences frost. Although the region supports numerous perennial species, including a wide variety of cacti, more than half of the region's plant species are herbaceous annuals, which reveal themselves only during years of suitable precipitation and temperature conditions (*ibid*).

This region also occupies an important biogeographic location and zone of ecological transition on the Pacific coast of North America, and so its floristic diversity includes many widespread taxa on the edge of their range. This includes all of the California Rare Plant Rank (RPR) 2 plants occurring in the region—species that are more common outside of California but here they represent geographically marginal, peripheral populations on the frontiers of their range. The evolutionary significance—and therefore the conservation value—of peripheral populations are well documented, as is their greater risk of extirpation (Leppig & White 2006).

The results of spring 2009 and 2010; fall 2010 surveys for the PSPP ; and spring 2013 surveys of the PSEGS project linears indicated that construction of the Project including the plant facility, transmission line, access road, telecommunication line, and construction water supply line could directly and/or indirectly impact five special-status plant species:

- Harwood's woolly-star(*Eriastrum harwoodii*, also sometimes referred to as Harwood's phlox or Harwood's eriastrum), a BLM Sensitive species, RPR 1B (rare, threatened, or endangered throughout its range);
- Harwood's milk-vetch (*Astragalus insularis* var. *harwoodii*), a RPR List 2 (rare, threatened, or endangered in California but more common elsewhere);
- Ribbed cryptantha (*Cryptantha costata*), a RPR List 4 meaning it is on a watch-list and not tracked in the CNDDB;
- California ditaxis (*Ditaxis serrata* var. *californica*), a RPR List 3.2 species (a review list) with a questionable taxonomic status; however, its occurrences in California are fairly endangered, and
- "Palen Lake saltbush" (*Atriplex* sp. nov. Andre), a potentially new taxon of saltbush detected on the margins of Palen Lake

These five special-status plant species would have the potential to be directly and/or indirectly impacted by construction of the PSEGS including the plant facility, transmission line, access road, telecommunication line, natural gas line, and construction water supply line. However, dune associated species are less likely to be present on the natural gas pipeline alignment.

A discussion of the methods staff used to assess the regional significance of PSPP effects to special-status plants is provided below, followed by a discussion of the impacts to plants detected during the spring 2009 and 2010 surveys for the PSPP and spring 2013 surveys for the PSEGS. Also, a discussion of the significance of impacts to late-season species, if detected during the fall 2013 botanical surveys is provided below. No additional late-season species were detected in fall 2010. Included in this discussion is a summary of the mitigation measures staff devised to reduce the direct, indirect, and cumulative impacts of the project to special-status plants to a less-than-significant level. Staff has requested additional information for all new areas of the project including the natural gas line corridor and the unsurveyed segment of the generation tie-line. The project owner has submitted preliminary information regarding rare plant surveys conducted in March 2013 (Palen 2013m). However, the project owner has not yet submitted a final survey report that includes a list of all taxa occurring on the project site. Staff will work with the project owner to resolve this outstanding information need prior to publication of the Final Staff Assessment (FSA).

Assessment Methodology and Analytical Tools

Staff's determinations of significance were based on the following considerations:

- Proportion of occurrences affected by the Project relative to the total number of documented occurrences in California;
- CNDDB (NatureServe) rank (which encompasses rarity, threats, and population trend);
- Impacts to the local or regional population from all proposed modified projects;
- Impacts to hydrologic or geomorphic processes necessary to sustain the habitat (e.g., diversion or alteration of desert washes, altered sediment transport, interrupted wind transport of dune-maintaining sands);
- Ecological integrity of affected and remaining habitat;
- Cumulative effects and threats to remaining occurrences;
- Ownership and management threats to remaining occurrences;
- Status as a peripheral or disjunct population (or position within the species range);
- Indications of any other population characteristics that may assign it local or regional significance, and
- Indirect effects, such as introduction or spread of invasive plants, operation impacts (dust, chemical drift), fragmentation (and its effects on gene flow)

In addition to state and federal-listed plant species, and BLM sensitive species, staff's definition of special-status plants also included California Rare Plant Rank (RPR) 1B, 2, 3 and 4 plants, any potentially new species found, and a few currently unlisted plants that are proposed additions to the CNPS Inventory. RPR List 3 plants (plants of questionable taxonomic status) may be analyzed under CEQA if sufficient information is available to assess potential impacts to such plants (CDFG 2009). RPR List 3 and 4 may be considered regionally significant if, for example, the occurrence is located at the periphery of the species' range, exhibits unusual morphology, or occurs in an unusual habitat/substrate (ibid).

Staff consulted with several recognized experts in the region's rare plant flora during the preparation of the data requests and its analysis of impacts to special-status plants for the PSPP (J. Andre, T. LaDoux, D. Silverman, A. Sanders, pers. comm.). Other sources consulted include the CNDDB (CNDDB 2010), the CNPS online inventory (CNPS 2009) and the BLM Palm Springs occurrence records (unpublished). The Consortium of

California Herbaria (CCH 2010) was reviewed to determine if there were additional documented occurrences that were not already included in CNDDB. To improve its analysis, staff entered occurrence data from all sources into a GIS-based web application that allowed staff to view all CNDDB and CCH occurrences overlain on various jurisdictional, biological, landform, utility, USGS topographic maps and aerial imagery. This allowed staff to assess a species' threats and management vulnerabilities relative to probable future renewable energy projects throughout their range. This included an examination of their distance and proximity to projects or features, their peripheral status, potential for fragmentation and other indirect effects from nearby development, potential for mitigation through acquisition or restoration. Because additional rare plant occurrences were not detected on the project site staff reviewed the datasets available for the Approved PSPP project. The datasets that were utilized in staff's analysis for the PSPP project included:

- PLATTS Transmission Data: licensed 3-rd party commercial transmission data);
- CA State County boundaries: http://atlas.ca.gov/download.html?sl=casil
- CNDDB RareFind: http://www.dfg.ca.gov/biogeodata/cnddb/cnddb_info.asp
- BLM Renewables Projects: BLM online solar and wind project data: http://www.blm.gov/ca/gis/
- CA STATSGO Soils: NRCS soil mapping from http://SoilDataMart.nrcs.usda.gov/
- CA Cities boundaries: Part of PLATTS Transmission Data delivery
- CA State Parks boundaries: http://atlas.ca.gov/download.html?sl=casil
- Federal Wilderness boundaries: http://www.blm.gov/ca/gis/
- Federal Lands ownership boundaries: http://www.blm.gov/ca/gis/
- CA GAP Vegetation: http://www.biogeog.ucsb.edu/projects/gap/gap_data_state.html
- Landforms NECO: from BLM Palm Springs Office – no Metadata – based on CA GAP but improved by BLM for NECO area
- Landforms MDEP: Mojave Desert Ecosystem project: http://www.mojavedata.gov/datasets.php?&qclass=geo
- Aerial Imagery – ESRI Data from ArcGIS.com
- USGS Topo – ESRI Data from ArcGIS.com

Impacts to Special-Status Plants Found During Spring and Fall Surveys

This section includes a detailed discussion of the special-status plants detected during the spring 2009 and spring and fall 2010 surveys within the Project Disturbance Area and one-mile buffer for the PSPP and spring 2013 within the Project Disturbance Area and 1,000 foot buffer for all new areas of the project including the natural gas line corridor and the unsurveyed segment of the generation tie-line.

The spring 2009 surveys encompassed the entire Project Disturbance Area including the solar facility footprint, transmission line corridor, and survey buffer area. The new areas surveyed during 2010 were areas not previously surveyed during 2009 and included the Reconfigured Alternative footprint, Reconfigured Alternatives 2 and 3, new transmission line route, and associated buffer areas. The PSEGS project occurs within a sub-set of these areas. Staff has requested additional information for all new areas of the project including the natural gas line corridor and the unsurveyed segment of the generation tie-line. The project owner has submitted preliminary information regarding rare plant surveys conducted in March 2013 (Palen 2013m). However, the project owner has not yet submitted a final survey report that includes a list of all taxa occurring on the project site. Staff will work with the project owner to resolve this outstanding information need prior to publication of the Final Staff Assessment (FSA).

Harwood's Woolly-star

Harwood's woolly-star, also sometimes referred to as Harwood's phlox or Harwood's eriastrum, is a BLM Sensitive species, and RPR 1B.2 species, which indicates it is rare, threatened, or endangered throughout its range. This spring annual is associated with sandy plains or dunes, but typically semi-stabilized habitat (versus active dunes) (CNPS 2010). Its global distribution and range is restricted to 14 known locations in San Diego, Riverside, and San Bernardino counties, typically in dunes associated with the margins around dry lakes such as Dale, Cadiz, and Soda lakes. Recently, surveys conducted in spring of 2010 for the Blythe Solar Project located this plant primarily in the sandy areas south of I-10, where 2,134 plants were located and mapped, the majority of these plants of which occurred at the Colorado River Substation site (AECOM 2010v). Harwood's woolly-star was not previously known to occur in the Project vicinity; the nearest known occurrences were at Anza Borrego, to the west, and to the north in the Dale Lake, Cadiz Valley and Ward Valley dune systems in San Bernardino County.

Staff reviewed the occurrence data in the Consortium of California Herbaria and detected two new occurrences that were not in the CNDDB (CCH 2010). Both of these are historical records from 1939 and 1958. Of the total of 14 occurrences in California (12 CNDDB plus two additional historic records), 3 of these are protected under National Park Service or State Park ownership. A total of three records are historical records. Four of these occurrences have documented threats, including OHV and non-native plant impacts.

A total of 13 GPS points totaling 169 plants were found in the dunes to the east of the PSEGS Project. No plants were found within the Project Disturbance Area. The closest occurrences appear to be located on the dunes approximately 3,000 feet from the Project Disturbance Area. Based on these results, staff determined the project would not result in direct impacts from construction, or indirect impacts from hydrologic changes to downstream areas supporting Harwood's woolly-star. However, staff remains concerned about the potential for the spread of Sahara mustard into the dunes north of the Project from construction-related disturbance near the dunes, transport of seeds on vehicles during construction and operation and transport via surface runoff). Construction-related soil disturbance and sedimentation from surface runoff render habitat vulnerable to noxious weed invasion, and the potential for the spread of Sahara mustard into the sensitive dune habitats north of the Project is very high and the ecological consequences would be considerable. Several large infestations of this highly invasive plant occur along the area roads and the channel intake. The potential for Sahara mustard to spread quickly and aggressively, and the severe ecological consequences, are well documented (Barrows & Allen 2007; Brooks et al 2004; Pavlik

2008, and others). Although the Project will have no direct effects, staff believes that Project may contribute to the spread of Sahara mustard within Chuckwalla Valla and its dune habitats is cumulatively considerable. Staff recommends conditions of certification to reduce the projects potential effects to Harwood's woolly-star. These include condition of certification: **BIO-8** (Impact Avoidance and Minimization Measures) #1, 5, 19-22), **BIO-14** (Weed Management Plan). Implementation of **BIO-8** and **BIO-14** would reduce the Project's contribution to the spread of Sahara mustard into Harwood's woolly-star habitat to a less-than-significant level. No new conditions of certification are proposed for the PSEGS.

Harwood's Milk-Vetch

Harwood's milk-vetch is a RPR 2.2 species; a rank that indicates it is rare, threatened, or endangered in California but more common elsewhere. It is also a covered species under the NECO Plan. It is found in desert dunes and sandy or gravelly areas in portions of Imperial, Riverside, and San Diego counties (CNPS 2009). Herbarium collections occur for this species from Ogilby Road in Imperial County and three locales west of Blythe, the Pinto Basin, and Chuckwalla Basin in Riverside County. Harwood's milk-vetch has also been reported from Baja California, Sonora Mexico, and portions of Yuma County, Arizona (Reiser 1994). There are several CNDDB records for this species within the Project vicinity (CNDDB 2010). There is a record in the Consortium of California Herbaria database from Wiley's Well Road between McCoy and Mule Mountains from 400 feet elevation (CCH 2010). The Harwood's milk-vetch populations on the southern deserts are presumed stable given limited disturbance to their desert habitats (Reiser 1994), but the recent push for renewable energy development threatens a large portion of its habitat in Chuckwalla Valley and the broader NECO planning area.

Staff reviewed the occurrence data in the Consortium of California Herbaria and detected three new occurrences that were not in the CNDDB. All of these are historical occurrences. Of the total 21 documented occurrences in CNDDB, 9 of these are protected under National Park Service or State Park ownership. A total of 11 records are historical records. Sixteen of these occurrences have documented threats including development, OHV, agriculture, transmission lines, road maintenance, and trash dumping. The population of Harwood's milk-vetch in the Project area would fall within the previously documented CNDDB occurrences in Chuckwalla Valley (CNDDB Occurrence numbers 16, 17 and 18).

It is important to clarify here that CNDDB protocol for mapping occurrences is to lump closely-spaced occurrences (<1/4 mile), that are in similar and unbroken habitat, into one 'occurrence'. Typically, project surveys map rare plants at a high level of detail to facilitate avoidance or calculation of impacts. Thus, many of the GPS points would be lumped into a smaller number of 'occurrences' in CNDDB.

Spring 2010 surveys identified only seven Harwood's milk-vetch individuals in the Project Disturbance Area for the PSPP (AECOM 2010u) out of a total population of ± 146 plants (Solar Millennium 2010l). However, many of the 139 plants documented in the buffer area for the PSPP (Solar Millennium 2010m) are located in close proximity to the northern boundary of the PSEGS Project and in areas downstream of the site. Based on a review of the PSEGS project it appears that only three of the seven plants would be directly impacted impacts by the proposed project. The 139 plants documented in the buffer area for the PSPP are also located adjacent to the PSEGS northern boundary so impacts would be similar.

Staff considers the direct loss of three plants to be a minor direct effect, given the large number of plants found off the Project site (Solar Millennium 2009a, Solar Millennium 2010b, Solar Millennium 2010m) and in the buffer zone of other Projects in the vicinity. Approximately 700 Harwood milk-vetch were documented in the Genesis Project study area, and 2,748 plants in the Blythe Project and the Colorado Substation study areas). It is important to note that although the 2010 populations are robust, significantly fewer plants (<100) were found in the disturbance area of three projects during the 2009 surveys—a relatively dry year. Staff expects that the local Harwood's milk-vetch population size expands and contracts with the normal wide variations in annual rainfall, similar to many other desert annuals. Thus, the same population in the next dry season could be expected to contract to a number that more closely resembles the population size documented in 2009.

Although the direct impacts of the PSEGS Project to Harwood's milk-vetch would be minor, staff is concerned about the close proximity of the off-site populations to the Project Disturbance Area. Staff believes additional accidental impacts could occur during construction, and that indirect impacts from the spread of Sahara mustard and other weeds into adjacent habitat—an effect readily observable in nearby transmission projects, and along roads—could result in impacts to this species. Staff also believes, plants located downstream of the project could be indirectly affected through the spread of weed seed, altered hydrology or sediment transport. Harwood's milk-vetch may respond favorably to disturbance (loose, sparsely vegetated soils) but most weeds also quickly colonize disturbed soils.

Condition of Certification **BIO-14**, staff directs the Project owner to finalize and implement a detailed weed management plan, which specifies detailed mapping, monitoring, and reporting requirements. Weed management would minimize the risk of Saharan mustard and other invasives from colonizing the disturbed soils along temporary access roads and transmission corridors; both of which are a common conduit for the spread of invasive pest plants. **BIO-19, Section A** (Special-status Plant Avoidance and Minimization Measures) will protect the off-site occurrence from accidental impacts during construction, and indirect effects during operation and decommissioning activities. **BIO-27** (Revegetation of Temporarily Disturbed Areas) was designed to minimize the risk of Saharan mustard and other invasives from colonizing the disturbed soils along temporary access roads and transmission corridors; both of which are a common conduit for the spread of invasive pest plants. During a September 27, 2010 Workshop staff and Solar Millenium agreed to delete **BIO-27** for from the approved PSPP project under the condition that: 1) avoidance and minimization measures described in **BIO-27** are incorporated into **BIO-8** (Impact Avoidance and Minimization Measures), and 2) weed management measures described in **BIO-27** are incorporated into **BIO-14** (Weed Management Plan).

No compensatory mitigation is required for Harwood's milk-vetch as only a small number of plants would be directly affected; however, staff is requiring that the compensatory mitigation for dunes and washes (habitat for Harwood's milk-vetch) in

BIO-20 and **BIO-22** must be acquired within the Chuckwalla Valley region. This additional requirement will minimize the cumulative effects of fragmentation by protecting, in perpetuity, private lands in the range of the species in Chuckwalla Valley from future development.

Ribbed Cryptantha

Ribbed cryptantha is a RPR 4.3 species, meaning that it has limited distribution in California; however it is not very threatened in California. There are 116 records of this species from several locations throughout Riverside, San Diego, and Imperial counties in the Consortium of California Herbaria database; the nearest collection is from the Palen Valley approximately three miles east of the Desert Center Airport (CCH 2010).

Spring 2010 botanical surveys identified several large populations of this species, estimated in the millions, within both the Project Disturbance Area and buffer area for the approved PSPP project. Sampling was used in the field to establish an estimate of 8,903 plants per acre (Solar Millennium 2010m). Approximately 285 acres and 1,309 acres of occupied ribbed cryptantha acreage were estimated within the Project Disturbance Area and buffer area, respectively (Solar Millennium 2010m, Table 3). It was estimated that an area of approximately 406 acres (estimated 3.6 million plants) located within the Project Disturbance Area would be directly impacted by the PSPP Project (AECOM 2010u). Staff expects similar numbers of this species to be impacts from the PSEGS project.

Many similarly large occurrences of ribbed cryptantha have been found in the disturbance areas for the Genesis and Blythe solar projects (TTEC 2010a, GSEP 2009a, Solar Millennium 2009a, Solar Millennium 2010b, and Solar Millennium 2010 m), totaling over 100,000 plants. Given the large number of ribbed cryptantha plants detected by all the I-10 projects, within and outside of their project areas, staff believes it is reasonable to expect that ribbed cryptantha are likely to occur in similar habitats nearby. Staff concluded that because of the local abundance of ribbed cryptantha and its apparently stable range in California, the direct impacts of the PSPP Project to this RPR List 4 species are less-than-significant. The impacts from the PSEGS project to potential ribbed crypthantha habitat would be similar and would be considered less-than-significant.

Staff believes that with implementation of **BIO-8, BIO-14**, Section A of **BIO-19** (avoidance and minimization measures), **BIO-20** and **BIO-21**, the impacts to this species would be further reduced.. **BIO-20** and **BIO-21** help minimize future fragmentation of the habitat and other indirect impacts to the local population by placing large portions of private land within the Chuckwalla Valley under a permanent conservation easement.

California Ditaxis

California ditaxis is a CNDDB Rank 2 (imperiled) species known from 15 occurrences statewide (CNDDB 2010). It is RPR List 3.2 species, meaning that it is on a review list and its taxonomic status is questionable. The ".2" threat rank means that the 15 documented occurrences in California are fairly threatened (CNPS 2009).

In general, RPR List 3 plants (plants of questionable taxonomic status; more information is needed) may not warrant consideration under CEQA §15380. However, List 3 plants may be analyzed under CEQA §15380 if sufficient information is available to assess potential impacts to such plants (CDFG 2009) According to one regional botanical expert, it appears to be a glabrous variety of the common *Ditaxis neomexicana* but the variety appears to be legitimately rare (Silverman pers. comm.). Staff prefers to take the conservative position and treat it as a special-status species warranting consideration under CEQA until there is documented evidence otherwise.

Staff reviewed the occurrence data in the Consortium of California Herbaria and detected four new occurrences that were not in the CNDDB and three of these are historical records from between 1921 and 1952. Although one more recent occurrence was found at Anza-Borrego Desert State Park near Starfish Cove Canyon. There are no previously documented occurrences in this portion of Chuckwalla Valley (east of Highway 177); all of the occurrences are to the west, from Desert Center to the Mecca Hills (CNDDB 2010; CCH 2010).

One group of 11 California ditaxis plants were observed within the Project Disturbance Area along the generation tie-line alignment for the approved PSPP project, approximately four miles west of the Project. The generation tie-line for PSEGS also falls within this population observed during surveys for the PSPP. Another group of 11 plants were found in the survey buffer area (Solar Millennium 2010m, Table 3, and Solar Millennium 2010p, Figure 7).

In addition to the direct impacts to plants within the PSEGS Project Disturbance Area (50 percent of the local population), plants adjacent to the alignment could be indirectly affected by the spread of Sahara mustard, which out-competes with the plants, degrades the habitat, and increases the risk of fire. Roads and transmission corridors are common vectors for the spread of Sahara mustard. Vehicles are also common ignition sources for roadside fires, and the weeds that typically recolonize disturbed soils along roads and transmission corridors tend to increase the flammability. Changes to the vegetation management regime may increase the risk of spread of Sahara mustard. Staff has requested the project owner supply further data relative to onsite vegetation management regimes, and specifically, to provide data reqarding the long-term effects of mowing native vegetation (CEC 2013h). Staff considers the loss of half of the occurrence, combined with the indirect effects of Sahara mustard, to be significant, given that there are no other documented occurrences in the valley west of Desert Center. However, staff believes that the direct loss of plants can be avoided with implementation of the avoidance and minimization measures contained in Section A of **BIO-19**. Section A, #2-a, requires the Project owner to limit the width of the work area, adjust the locations of poles, road and pipeline alignments, establish the occurrences as fenced Environmentally Sensitive Areas, and a variety of additional measures aimed at preventing accidental impacts during construction and indirect impacts during operation. Staff believes that with implementation of **BIO-8** (Impact Avoidance and Minimization Measures) and **BIO-14** (Weed Management Plan) , the contribution of the Project to the spread of Sahara mustard will be less-than-significant. Pending receipt of data from the project owner staff will provide a final analysis, and any necessary changes to recommended condition **BIO-14** in the FSA.

"Palen Lake Atriplex" (Atriplex sp. nov. Andre)

A potentially new taxon of saltbush (*Atriplex*) was discovered on the saline playa margins of Palen Dry Lake in 2009, and has been proposed in a preliminary report (Andre and La Doux, pers. comm.). The unnamed saltbush was first collected in 2005 at the dry lake just northeast of the Interstate 15 and Highway 95 junction, approx 35 miles east and northeast of Las Vegas, Nevada (Andre pers. comm.). The first vouchered observation of it in California was at Palen Lake in 2009. According to Andre (pers. comm.), there is potential for it to occur along the I-8 corridor in Imperial County. It may also have been observed in the Ford Dry Lake area (unconfirmed) and it has been observed in other saline (but non-playa) habitats on remnants of the lower Colorado River flood plain (ibid).

The BLM State Botanist and Plant Conservation Program Lead (Lund pers. comm.) indicated that BLM would treat all new taxa as BLM Sensitive species. Discoveries of new taxa are unusual in California, and are typically assigned to a CNPS list and considered as special-status species by the Forest Service, BLM, and other resource agencies. Staff will take a conservative position and assume that a new taxon proposed by a recognized expert in the flora of the California Desert region warrants consideration under CEQA until documented otherwise.

According to Andre (pers. comm.), although the unnamed saltbush resembles the common four-wing saltbush (*Atriplex canescens*)—a common plant of dunes which has very linear leaves—the new taxon has obovate leaves that distinguish it from all four-wing saltbush and its subspecies. It is also generally more confined to subsaline/saline playa margins than the common four-wing saltbush (ibid).

The preliminary botanical survey report (AECOM 2010d, Figure 2) shows several GPS localities of a saltbush recorded as the common four-wing saltbush, and indicated a total population size of 920 plants within the buffer. However, the report provided no other information, such as the characteristics used to distinguish the plants or whether the author even considered the plants to be distinct from the common four-wing saltbush. Four-wing saltbush is reported to hybridize more often than any other saltbush (Howard 2003). Even non-woody saltbush species may cross with four-wing saltbush and produce fertile offspring (ibid). Although their plasticity in fruit and vegetative characters hinders description and identification, many of the four-wing saltbush subspecies have been demonstrated to differ in ploidy level and chemical constituents and thus their biological validities are confirmed (Sanderson & Stutz 1994). Although the new taxon is distinct from the common species in its obovate leaves, it would be easy to overlook where the common and new taxon co-occur, even by experienced botanists (Andre pers. comm.). Until more information is available, staff presumes that the plants documented by the Applicant in a map of special-status plants are the proposed new taxon—not the common species or varieties—and that the occurrences warrant consideration under CEQA.

According to the Applicant's map of special-status plants in the preliminary 2010 botanical report (Solar Millennium 2010m, Figure 7), no plants would be directly affected; however, some of the 920 plants documented in the buffer occur in close proximity to the northeastern boundary of the PSEGS project and could be indirectly affected by For the PSEGS there is a considerable buffer between the boundary of the project and the location of the mapped saltbush. Therefore, staff believes that for the PSEGS, the avoidance and minimization measures described in Section A of **BIO-19** would not be necessary; however, staff would prescribe **BIO-19** (Section A) to minimize the PSEGS project's potential for indirect impacts during operation and accidental construction impacts.

The PSEGS also carries a risk of indirect impacts from the proposed groundwater pumping, which is estimated to be reduced from 5,750 acre feet per day for the PSPP to 1,130 acre feet per day during the 34-month construction phase, with a predicted drawdown of 1 to 5 feet in the area just north of the northern Project boundary. However, the PSEGS would use less groundwater during both construction and operation than the originally approved PSPP project. Construction groundwater use is stated to be 1,130 acre-feet per year (AFY), a reduction from the original permitted project groundwater consumption of 1,917 AFY. Operational groundwater use is stated as 201 AFY, a reduction of nearly 100 AFY. Alternatives 2 and 3 both reduced the potential for groundwater impacts in the dependent habitats north of the Project, where the saltbush is located, by shifting the location of the wells approximately 3,000 feet to the south and away from shallow groundwater area. The PSEGS will use the same number of groundwater wells which will also be in the same location as for the PSPP.

Because the potential new taxon is reported to occur in the saline margins around dry lakes, and because a drawdown in the water table *reduces* salinity (Patten et al. 2007), staff believes there is a potential that the PSEGS project's groundwater pumping could eventually cause a habitat conversion from halophytic obligates (salt-loving plants) to non-halophytes (ibid) in the affected area. Staff expects that this would also render the habitat unsuitable for the new taxon. A detailed discussion of the impacts of groundwater pumping to dependent vegetation is provided above under "Impacts to Groundwater-Dependent Vegetation", and in **SOIL & WATER RESOURCES**.

Condition of Certification **BIO-23** specifies vegetation, soil and groundwater monitoring in the area affected by pumping, for the life of the Project. **BIO-24** prescribes remedial measures and compensatory mitigation if the monitoring indicates an impending decline in habitat function and value. **BIO-19**, Section A, would minimize the indirect effects of the Project and avoid accidental impacts during construction for plants located in close proximity to the PSEGS project. With implementation of these measures, staff believes that the indirect impacts of the Project to the "Palen Lake saltbush" (Andre, sp. *nov*.) would be minimized to a less-than-significant level.

Utah Vining Milkweed

Until recently discovered growing on the Palo Verde Mesa (AECOM 2010v), this RPR List 4 species was not expected to occur in the Project area and it was believed that the Project was outside of the range of Utah vining milkweed. As a RPR List 4, it is not tracked in CNDDB but there are 58 records of this species from the Consortium of California Herbaria database primarily from San Bernardino and San Diego counties; there is one record from the Big Maria Mountains from wash and stabilized dune habitat at approximately 1,200 feet elevation (CCH 2010). One population of Utah vining milkweed was found east of the Project site at least 2.5 miles east of the eastern Project boundary and outside of the Project Disturbance Area for the PSEGS and buffer area

(Solar Millennium 2010m). Therefore, staff believes no direct or indirect impacts would occur to this species and no mitigation is needed.

Impacts to Summer-Fall Special-Status Plants

Although not detected during late season surveys conducted in fall 2010 for the PSPP there are a number of potentially occurring late-season special-status plants that have the potential to occur in the project region. In addition, late season special-status plant surveys have not been completed along the proposed new generation tie-line corridor but were conducted in the vicinity of the new natural gas line corridor for the PSEGS. Late season special-status plant surveys would be required for both new area of the PSEGS. These species include:

- Abram's spurge, a CNDDB Rank 1 and RPR List 2 species;
- Flat-seeded spurge, a BLM Sensitive species, CNDDB Rank 1 and RPR List 2,
- Lobed ground cherry, a CNDDB Rank 1 and RPR List 2 species.
- Glandular ditaxis, a CNDDB Rank S1/S2 and a RPR List 2, and
- California ditaxis, a CNDDB Rank 2 and RPR List 3

Staff identified these late-season special-status plants to have the highest potential for occurrence based on the presence of suitable habitat in the Project area and known occurrences in the region. Their rarity, status, and known distribution are discussed below (California ditaxis was observed in the Project Disturbance Area and is analyzed in the previous section). Staff acknowledges that there is potential for unanticipated finds because the area is generally under-surveyed.

It has been estimated that 30 to 40 percent of the species in the California Desert flora reach their reproductive maturity in late summer or fall (Andre pers. comm.). However, there is a long-standing precedent of spring season surveys for special-status plants in California, based on the dry summers and summer-dormant flora of the Mediterranean climate that dominates California. There are exceptions, of course, for late-season blooming species, but the plant survey effort in California typically consists of a major spring survey with narrowly focused summer surveys for any late season species that may occur in the region. Regional botanical experts (J. Andre, T. LaDoux) concluded that significant finds could be missed without late season botanical surveys.

Because the region's flora is so under-surveyed and poorly understood, relative to other parts of the desert or state, and because its flora is so intertwined with its variable and unpredictable climate, it is difficult to predict accurately what special-status plants have potential to occur in this region. This is evidenced by the discovery of a potentially new taxon of saltbush on Palen Dry Lake (Andre pers. comm.), a new undescribed species of lupine on a renewable energy project near Barstow (Lund pers. comm.), and a recent discovery of a new perennial spurge in the Orocopia Mountains by Victor Steinmann (LaDoux pers. comm.). Further, several unanticipated range extensions of special-status plants have been found, such as for Utah vining milkweed, and a slight range extension for Harwood's woolly-star. Additionally, some rare plants have been found in habitats in which they were not previously known to occur. For example, lobed ground cherry was recently discovered growing outside of its characteristic playa margin habitat in upland habitats (Andre pers. comm.).

For the Approved PSPP project staff required the project owner implement Condition of Certification **BIO-19** , Section B; conduct late-season surveys in summer-fall 2010 to ensure that any special-status plants missed during the spring 2009-2010 surveys were detected and mitigated to a less-than-significant level. The project owner conducted late season surveys in 2010 and did not detect any sensitive late-season species. Staff believes that most of the footprint for the Project has a low potential for supporting special-status plants because: 1) these areas have been significantly degraded by the near complete diversion of its ephemeral washes into one central wash and two outer washes, and 2) the soils and biotic soil crusts were compacted during the military training exercises during World War II. This assumption was validated by the results of the spring 2009 and 2010 surveys, which detected almost no rare plants in the proposed solar facility. An analysis of PSEGS Project impacts to the late-season plants with the highest potential for occurrence along the two new proposed linear features, if detected, is provided below. The analysis includes a discussion of mitigation that will be required if these species are detected.

To ensure that impacts to any unanticipated finds, including new species, are analyzed for significance, Section C of **BIO-19** summarizes the avoidance and compensatory mitigation that would be required for impacts, based on the species rarity and status, whether it exhibits any local or regional significance, and the portion of the local population affected. These are the factors upon which rare plant impact analyses are typically based. The CNDDB rank is based on the NatureServe protocol for assessing extinction risk, and encompasses a cumulative assessment of threats from invasive plants, development, ORV, mining, grazing, and many other factors. Section C of **BIO-19** also requires the consideration of indirect and cumulative effects, and specifies downstream/downwind impacts from altered hydrology or geomorphic processes shall be considered as direct impacts. Section C also requires the preparation of a Special-Status Plant Mitigation Plan, subject to review and approval of staff. Implementation of a Special-Status Plant Mitigation Plan based on the strict guidelines for fall surveys and reporting requirements, and performance standards for mitigation specified in **BIO-19** would reduce impacts to species detected during the late season surveys to less-than-significant levels.

Section D also includes a *contingency* measure in the unlikely event that no opportunities are available for off-site mitigation through either acquisition or restoration. The contingency measure provides detailed specifications and performance standards for conducting or funding a distribution and status study and preparing a management plan for future preservation and enhancement of the affected species. Information about the distribution and management of these under-surveyed species would help offset Project impacts by providing the tools that BLM, NPS and other land managers need to protect and manage these species. The information can also be used to offset future impacts from other projects by providing critical information on ownership, threats, and management opportunities.

With the options and detailed performance standards for mitigation through either acquisition (preservation) or restoration, combined with mandatory avoidance requirements along the linears and facility perimeter, and the contingency measures, security requirements and verifications specified in **BIO-19**, staff concludes that the mitigation is feasible and that it would reduce Project impacts to less-than-significant levels.

Abram's Spurge

Abram's spurge is a CNDDB Rank 1.2 species, meaning it is 'critically imperiled' within its range in California and is known from fewer than five viable occurrences statewide. However, CNDDB lists 15 occurrences for this species; 9 of which have been seen since 1990. Its RPR Rank of 2 (and its NatureServe Global Rank of 4) indicates that it is more common outside of California.

CNDDB indicated to CEC that the CNDDB ranks are currently out-of-date and need to be updated to the 2009 NatureServe protocol[7] (Bittman pers. comm.). The 2009 protocol incorporates the rank extension for threats into a single rank; thus, a Rank 2.1 species could, theoretically, be upgraded to a 1 (ibid), assuming the threats are still present. Based on the recent (2010) addition of 7 new records of recent (and presumably viable) occurrences, the CNDDB rank for Abram's spurge could potentially be downgraded to a 2, unless its threat rank was increased.

Abram's spurge is a summer annual that is triggered to germinate by significant summer monsoonal rains; consequently, its year-to-year population size is highly variable. The playa margins and washes could support this species; it is known from similar habitats nearby at Ford Dry Lake (CNDDB Element Occurrence #5). This species is known to occur in halophytic (saline-alkaline) flats, playas, and along inlets and floodplains of playas. It tends to prefer the lower floodplain ecotone but can also extend higher up along the washes that feed the playa (Silverman, pers. comm.). The blooming period is described in the CNPS Inventory (CNPS 2009) as September through November but may be detected earlier if significant (>0.10mm) summer rain event occurred in June. On average, August receives the most rainfall, but the warm monsoonal rains sometimes overlap the start of the fall-winter rains of Pacific Northwest origin.

The CNDDB (CNDDB 2010) lists 15 occurrences of this plant in Riverside, Imperial, San Bernardino, and San Diego counties in California, east through Nevada to Arizona, and as far south as Baja California, Mexico. Of the total of 15 occurrences in California, 7 of these are protected under Park Service, CDFW, or State Park ownership. A total of 4 records are historical (pre-1972) that have not been confirmed since collected; 9 records have been observed since 1990. One of these occurrences is described as threatened by grazing. A recent (2000) CNDDB record (#5) is from a location approximately 0.50 mile east of Ford Dry Lake on Gasline Road just south of I-10 and the occurrence was reported as a "substantial population" (CNDDB 2010). The habitat at this site is described as "Silt and fine sand in flat areas with shallow depressions where water collects after rains, adjacent to the bank of the freeway" (CNDDB 2010).

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[7] Master, L., D. Faber-Langendoen, R. Bittman, G. A., Hammerson, B. Heidel, J. Nichols, L. Ramsay, and A. Tomaino. 2009. *NatureServe Conservation Status Assessments: Factors for Assessing Extinction Risk*. NatureServe, Arlington, VA. Online: http://www.natureserve.org/publications/ConsStatusAssess_StatusFactors.pdf

If Abram’s spurge occurs within or near the Project Disturbance Area, staff concludes that direct or impacts would be significant unless only a minor portion of its local population, or habitat, was affected. Even if the occurrence was off-site, it could be indirectly affected if it occurs in close proximity to construction. Staff is also concerned about the contribution of the Project to the spread of Sahara mustard and other invasives. Construction-related disturbance, roads, transmission corridors, and the transport of seed via washes are common vectors for Sahara mustard and other weeds.

All but one primary wash through the center of the Project, and two washes on the western and eastern edges, were already diverted by the construction of I-10 and the diversion of all sheet flow and washes into the three primary channels. The effects of this diversion are apparent in the many dead or declining ironwood trees, stunted creosote bush, and overall low cover and low diversity over much of the site. Although the site has a history of disturbance from military training exercises during World War II, staff believes that the primary cause of the site’s degraded habitat function and value (outside of the primary washes) is due to the changes in surface drainage patterns from the construction of I-10. Nevertheless, the site, north of I-10, has a large enough watershed to support the development of a few smaller washes (outside of the primary washes) in the northeast portion of the Project, washes that could potentially support Abram’s spurge or other summer annuals the prefer similar habitat.

Staff believes that potential direct impacts to Abram’s spurge can be mitigated to a level less-than-significant through implementation of subsection B of **BIO-19**, which mandates late-season botanical surveys, and by subsection C, which prescribes a level of avoidance and off-site mitigation depending on the species status, rarity, and other factors. Section D provides measurable performance standards for off-site mitigation for unavoided impacts. Section A protects any occurrences found in close proximity through a variety of BMPs and other measures.

To address indirect and cumulative impacts to Abram’s spurge, **BIO-8** (Impact Avoidance and Minimization Measures) and **BIO-14** (Weed Management Plan) would minimize the contribution of the Project to the spread of Sahara mustard and other weeds. Staff’s conditions of certification require that acquisition for dunes and washes (**BIO-20, BIO-21**) occur within the Chuckwalla Valley region. This would minimize future fragmentation of Abram’s spurge habitat (playa margins and washes) by placing private lands under permanent protection and preventing future development and the indirect effects of weeds and fragmentation that accompany development.

Flat-seeded Spurge

Flat-seeded spurge is a RPR 1 B.2 species, meaning it is rare, threatened, or endangered throughout its range and it is fairly threatened in California. It is also a BLM Sensitive species and has a NatureServe rank of 1.2. Some experts have speculated that it may be a “waif” in California, or a species that is not naturalizing, and note that it is more common in Arizona and Mexico (CDFG 2010). Very little is known about the species because there are few or no extant occurrences. Its micro-habitat preferences are described in CNDDB (2010) as “sandy places or shifting dunes”, and by the Arizona Native Plant Society as “shifting dunes of low to medium height”. This suggests that the northeastern corner of the Project was the most likely place for it to occur. It was not detected in this part of the PSPP during fall 2010 surveys. However, one botanist suggested that weedy disturbed areas and culverts where water collects should not be overlooked (Silverman pers. comm.). If present, impacts to flat-seeded spurge, a BLM Sensitive species, would be considered significant.

The Jepson Desert Manual (Baldwin et al. 2002) and the Arizona Native Plant Society indicate that it blooms in May. However, the CNPS Inventory (2009) lists the bloom period as February to September. Regional botanical experts consulted by staff indicated that it was also a “summer active” species, and like so many plants in the upper Sonoran/southeast Mojave transition zone, it flowers after it rains, and rains are about equally distributes in this region between spring and summer-fall (Andre pers. comm; Sanders pers. comm.; NOAA 2009).

Flat-seeded spurge has only 4 occurrences listed in the CNDDB (2010); the most recent observation was in 1974. Staff reviewed the occurrence data in the Consortium of California Herbaria and detected 1 new occurrence that was not in the CNDDB. This occurrence is also a historical record (1933). Of the total five occurrences in California (CNDDB plus one additional occurrence from CCH), only 1 of these are protected under State Park ownership. A total of three records are historical records. None of these occurrences documented threats.

The closest known occurrence of flat-seeded spurge is approximately 50 miles away. By virtue of its rarity and the distance to known occurrences, its occurrence in the Project area is “unlikely” or “speculative”, but it occurs along the western edge of the California desert and in Arizona; hence, it occurs on both sides of the Project area (Silverman pers. comm; Sanders pers. comm.). The absence of known occurrences in this area may be because it is easily over-looked (Reiser 1994) or because the area is generally under-surveyed.

If present, potential indirect effects include the spread of Sahara mustard and other invasive pest plants into dune habitat; the ecological impacts of Sahara mustard and the potential for restoration are described in Barrows & Allen (2007); Barrows et al. 2009; Pavlik 2008, and others). Channel diversion and the interruption of aeolian and fluvial sediment transport could also adversely affect its persistence, if detected in the Project area.

BLM requests 100 percent on-site avoidance for BLM Sensitive plants but the BLM State Botanist would decide the level of avoidance on a case-by-case basis, if present (Lund pers. comm.). Staff believes that the avoidance required in Section C of **BIO-19**, and the requirement for rescue of an off-site population for any unavoidable impacts, as specified in Sections C and D of **BIO-19**, that the Project’s direct impacts would be minimized to a less-than-significant level. Staff believes that the Project’s contribution to the spread of Sahara mustard, which immediately threatens dunes and other sandy habitats, would be less than cumulatively considerable with the implementation of **BIO-8** (Impact Avoidance and Minimization Measures) and **BIO-14** (Weed Management Plan) Staff’s requirement for dune and wash compensation to occur locally (**BIO-20, BIO-21)** will minimize future fragmentation of flat-seeded spurge habitat in Chuckwalla (if present) by preventing future development and the indirect effects of weeds and fragmentation that accompany development.

Lobed Ground Cherry

Lobed ground cherry is a RPR 2.3 species, meaning that is rare, threatened, or endangered in California, but more common elsewhere; the threat rank indicates that it is not very endangered in California. It has a CNDDB rank of 1.3, indicating that it is known from fewer than 5 viable occurrences in California but the occurrences are somewhat stable Its Global rank of 5 indicates that it is relatively stable outside of California. It occurs largely on alkaline dry lake beds but it has also been found in drier, less saline-alkaline environments on decomposed granitic soils in Mojave Desert scrub habitat. Due to its preference for lakebeds, mudflats, and desert sinks, and its apparent preference for alkaline and sub-alkaline habitats, staff believed that the northern and northeastern portions of the Project have the highest potential for occurrence but staff does not dismiss the possibility that it could occur anywhere on the Project. It was not detected in these areas during fall 2010 surveys however surveys would be required along the two new proposed linear features.

Staff reviewed the occurrence data in the Consortium of California Herbaria and detected two new occurrences that were not in the CNDDB. Both of these are more recent occurrences, including one from Joshua Tree National Monument and one in the eastern Mojave Desert. The two additional occurrences could (theoretically) reduce the CNDDB rank from 1 (less than 5 viable occurrences) to a rank of 2 (“6 to 20 viable occurrences”), unless the threats to occurrences have increased. None of the 6 occurrences are historical records and none have documented threats (CNDDB 2010).

If present, staff would consider that impacts to this very rare species in California would be significant. Such an occurrence would also represent a range extension (i.e., occur at the periphery of its range in California). Potential indirect effects, if present, include the spread of Russian thistle and other alkaline-tolerant weeds into its habitat. Russian thistle is already present in the playa margin habitats and in the northeast portion of the Project area. Construction-related disturbance and vehicle use along the existing roads are common vectors for the spread of invasive pest plants. Even if found off-site in the playa margins, it could be indirectly affected by alteration of the site hydrology or sedimentation, if located directly below the engineered channel discharge points.

If present, implementation of the avoidance and compensatory mitigation requirements in Sections C and D of **BIO-19** would reduce the Project’s impacts to a less-than-significant level. There does not appear to be opportunities for acquisition of occupied habitat at this time but there are private lands adjacent to the Lanfair Valley occurrence at Ox Ranch. If lobed ground cherry is downgraded to a Rank 2 as a consequence of detecting new occurrences and a low risk of extinction from other threats, then acquisition could include adjacent lakebed or other alkaline and sub-alkaline habitats that are at risk of development. If such lands are acquired within Chuckwalla Valley, as proposed in **BIO-20** (compensatory mitigation for dunes and MFTL habitat) and **BIO-21** (compensatory mitigation for desert washes), then the acquisition would minimize the threat of future fragmentation of remaining habitat surrounding the Project.

Implementation of **BIO-8** (Impact Avoidance and Minimization Measures) and **BIO-14** (Weed Management Plan), and the Best management Practices and other measures in Section A of **BIO-19** would minimize the Project’s contribution to the spread of Russian thistle and other weeds to a less-than-significant level.

Indirect Impacts to Special-Status Plants

Staff considered the following indirect impacts to special-status plants, (i.e., impacts outside the Project Disturbance Area or that occur following construction): introduction and spread of invasive plants; alteration of the surface hydrology and basic geomorphic processes that support rare plants and their habitat (e.g., disrupted aeolian and fluvial sand transport processes from obstructions or diversions); population fragmentation and disruption of gene flow; potential impacts to pollinators; increased risk of fire; erosion and sedimentation of disturbed soils which render the habitat vulnerable to invasion by pest plants; disturbance of the structure and ecological functioning of biological soil crusts which affect seed germination, reduces soil nutrition, carbon sequestration, and renders the soil vulnerable to water and wind erosion (Belnap & Eldridge 2001); herbicide and other chemical drift; and disruption of photosynthesis and other metabolic processes from fugitive dust during construction and operation of the Project.

Changes to drainage patterns downslope of the Project area could have significant impacts to special-status plant species. Although, the current design of the PSEGS project would allow flows to pass through the project; some disruption will still occur from roads and project facilities. Therefore, staff has included a measure in **BIO-21** (mitigation for impacts to state waters) and **BIO-19**, Section A (avoidance and minimization measures for special-status plants).

Following construction, invasive species could occupy disturbed soils within the Project Disturbance Area, and then spread into adjacent undisturbed habitats—naturally disturbed habitats such as dunes and washes are particularly vulnerable to colonization by weeds. Staff is particularly concerned about the potential spread of Sahara mustard, which is already present along roads and near the freeway. The primary conduit for spread, however, is along roads and transmission corridors. The dramatic increase in vehicle use of the Project vicinity roads and construction of transmission corridors and new roads is expected to increase the spread of this highly invasive wildland pest. Sahara mustard has shown a clear negative impact on native flora (Barrows et al. 2009). Sahara mustard can form dense stands and potentially crowd out native annual plants. Sahara mustard plants growing early in the season may dominate available soil moisture which may adversely affect native annuals which start growing a little later in the season (Barrows et al. 2009). Barrows et al. (2009) found that native annuals growing under a canopy of Sahara mustard were often taller and were etiolated, at the expense producing branches, flowers, and fruits. This led to a shift in the dominance of the following year's species composition from native annuals to Sahara mustard.

Staff has requested the project owner supply further data relative to onsite vegetation management regimes, and specifically, to provide data reqarding the long-term effects of mowing native vegetation (CEC 2013h). Staff has concerns that throughout the life of the project, successional changes to vegetation may occur. As native vegetation is mowed, the regrowth will happen quickly, and after several years, may deplete nutrients in the soil. It is possible that the vigor of native plants may suffer, and invasive species, which are tolerant of poor conditions, may then proliferate.

Tamarisk, Russian thistle, Sahara mustard and Mediterranean grasses are already present in the Project area and are expected to increase as a result of construction- and operation-related disturbance. The proliferation of many non-native plants has dramatically increased the fuel load and frequency of fire in many desert ecosystems (Lovich & Bainbridge 1999). Unlike other ecosystems in California, fire was not an important part of the Mojave Desert ecosystems and most perennials are poorly adapted to even low-intensity fires, and the animals that coevolved are not likely to respond favorably to fire either. The potential spread or proliferation of non-native annual grasses, combined with the proximity to ignition sources could potentially increase the risk of fire, and the effects to these poor-adapted desert communities would be harmful, particularly to cacti and most native shrubs species. Burned creosote and other native shrubs are typically replaced by short-lived perennials and non-native grasses (Brown & Minnich 1986). The spread of invasive plants is a major threat to biological resources in the Colorado Desert because non-native plants can displace native plants, increase the threat of wildfire, and supplant wildlife foods that are important to herbivorous species.

Wildfires (caused by construction or downed transmission lines) are rare but the increase in daily vehicle use in the area from an anticipated 200 new jobs during operation and up to 1,000 jobs during construction could significantly increase the risk of ignition. Other temporary and permanent impacts from the Project could occur to surrounding vegetation communities from grading activities creating air-born, fugitive dust, sedimentation, and erosion, which disruption of photosynthesis and other metabolic processes. The destruction of plants and soil crusts by windblown sand and dust also exacerbates the erosion of the soil and accelerates the loss of nutrients (Okin et al. 2001).

Indirect impacts to sensitive plants would be significant absent mitigation. Implementation of the following mitigation measures: avoidance and minimization measures (**BIO-8**);, compensating for habitat loss by preventing the future development of desert lands through acquisition and permanent protection under conservation easements, and management of lands these lands to sustain enhanced populations of sensitive species and habitats (**BIO-12, BIO-19, BIO-20** and **BIO-22**); focusing the acquisitions into important linkages for species dispersal into critical refugia, restoring degraded portions of acquired lands (**BIO-12** and **BIO-19**); and minimizing the size of the disturbance area along the linears (**BIO-8** and **BIO-19**); would reduce project impacts to less-than-significant levels.

Impacts of Climate Change to Plants

In a recent study “Climate Change and the Future of California's Endemic Flora” (Loarie et al 2009), anticipated climate change is projected to cause greater than 80 percent reductions in range size for up to 66percent of California’s endemic species within a century. These results are comparable to other studies, but projected reductions depend on the magnitude of future emissions and on the ability of species to disperse from their current locations. California's varied terrain could cause species to move in very different directions, breaking up present-day floras. However, these projections also identify regions where species undergoing severe range reductions may persist. Protecting these potential future refugia and facilitating species dispersal will be essential to maintain biodiversity in the face of climate change (*ibid*). These include the cooler, more mesic microclimates of the mountainous areas, which may protect significant components of biodiversity into the next century. Many of these areas are already in some degree of federal wilderness protection. However, the value of these refugia depends critically on the ability to of species to disperse, underscoring the importance of landscape connectivity and potential restoration in the face of increasing urbanization, land use change, and disturbance (*ibid*).

The PSEGS project is expected to contribute to a cumulative reduction in greenhouse gases. However, the benefits gained by the Project's reduction in greenhouse gases must also be weighed against the potential loss of carbon sequestration benefits from the desert vegetation and biological soil crusts. In order to build the facility, the plants, animals and soil of the native desert acreage are damaged and destroyed, which releases CO2. Presently, there is still dispute among scientists as to how to accurately measure the benefits and the loss (Campbell et al. 2009).

Biotic Soil Crusts and Other Carbon Sinks

Numerous studies conducted over the past 40 years have attempted to identify and quantify the major pools of carbon uptake for the various components of desert ecosystems as well as desert ecosystems as a whole (Schlesinger et al. 2009). The estimates of carbon uptake vary immensely between sites and researchers. In addition to vegetation, alkaline soils and biological soil crusts (BSCs), which are composed primarily of photosynthetic cyanobacteria, algae, lichens, and mosses, play a key role in arid and semi-arid ecosystems and are able to fix carbon. Schlesinger et al. (2009) point out, however, that those pools of carbon that biological crusts fix are relatively small. New evidence suggests alkaline desert soils may be responsible for considerable uptake of carbon. Although there is much uncertainty regarding where and how carbon is stored in desert ecosystems but the recent evidence suggests desert soils have the potential to be a carbon sink. Whether a result of biotic crusts, vegetation, alkaline soils, or an increase in average precipitation, the rate of carbon absorption in the soil has scientists considering whether desert ecosystems play a more critical role in the carbon cycle than previously believed (Stone 2008; Campbell et al. 2009). Some scientists, however, dispute these findings and attribute them to an anomaly caused by increased rain for the study period reported (Campbell et al. 2009). A study is currently underway by the University of Oregon "to determine whether the installation and operation of solar thermal plants will impact carbon sequestration capabilities of the Mojave Desert ecosystem and ecosystem services (assessment endpoint) to the extent that more carbon is released or inhibited from being stored than saved while utilizing solar technology." (Campbell et al. 2009).

Until the dispute about the sequestration benefits of alkaline soils and other carbon sinks is resolved, staff assumes that the answer may vary on a case-by-case basis. For example, project sites that are very sparsely vegetated with only a minor component of soil crusts may confer less sequestration capabilities than sites with a rich cover of biological soils crusts and succulent desert scrubs. Nevertheless, there is little dispute that the loss of desert vegetation and biological soil crusts on a solar thermal plant site permanently eliminates the carbon sequestration benefits, and the soil disturbance during grading and construction releases the stored carbon back into the atmosphere.

Staff believes that the loss of sequestration benefits and release of stored carbon from the PSEGS is speculative. Staff believes that implementation of the conditions of certification for the PSEGS project would reduce potential adverse effects from the loss of carbon sequestration. These include avoidance and minimization measures (**BIO-8**), compensating for habitat loss by preventing the future development of desert lands through acquisition and permanent protection under conservation easements (**BIO-12, BIO-19, BIO-20** and **BIO-22**), focusing the acquisitions into important linkages for species dispersal into critical refugia, restoring degraded portions of acquired lands (**BIO-12** and **BIO-19**), minimizing the size of the disturbance area along the linears (**BIO-8** and **BIO-19**), and revegetating after closure and decommissioning (**BIO-23**).

Cacti, Yucca, and Native Trees

The 2009 and 2010 surveys included an inventory of native cacti, succulents and native trees that are not considered rare (e.g., they are not tracked by CNDDB or included on the CNPS special-status plant lists) but the harvesting of these native plants is regulated under the California Native Plant Protection Act (Fish and Game Codes 1900-1913) and the California Desert Native Plant Act of 1981 (i.e. Food and Agricultural Code 80001, et . seq. and Fish and Game Codes 1925-1926), and prevent unlawful harvesting of non-listed native desert plants of the state (see Biological Resources Table 1).

During 2009 and at the request of the BLM, the former project owner conducted sampling plots for cacti, yucca, and native trees in the Study area primarily to search for and map any locations of California barrel cactus, cottontop cactus, or hedgehog cactus for future salvage when construction begins (Solar Millennium 2009a, Appendix F Biological Resources Technical Report). None of these species were observed in the study area during spring 2009; however, a total of four species in the Cactaceae family were observed during 2009 field surveys including teddybear cholla (*Opuntia bigelovii*), silver cholla (*Opuntia echinocarpa*), pencil cholla (*Opuntia ramosissima*), and common fishhook cactus (*Mammilaria tetrancistra*).

Native trees found during 2009 field surveys included smoke tree (*Psorothamnus spinosus*), ironwood (*Olneya tesota*), blue palo verde (*Cercidium floridium* ssp. *floridium*), ocotillo (*Fouquieria splendens* ssp. *splendens*), and honey mesquite (*Prosopsis glandulosa* var. *torreyana*). Additional mapping of cacti species was performed during 2010 and California barrel cacti, cottontop cactus, and hedgehog cactus were found; a single location with five barrel cacti was observed within the buffer study area and south of I-10 and a single location of cottontop cactus was found in the eastern portion of the Project Disturbance Area (Solar Millennium 2010m, Table 3 and Figure 7).Staff has requested additional information for all new areas of the project including the natural gas line corridor and the unsurveyed segment of the generation tie-line. The project owner has submitted preliminary information regarding rare plant surveys conducted in March 2013 which included mapping of all individuals of cacti, yucca, and trees protected by the California Desert Native Plant Act (Palen 2013m). However, the project owner has not yet submitted a final survey report that includes a list of all taxa occurring on the project site. Staff will work with the project owner to resolve this outstanding information need prior to publication of the Final Staff Assessment (FSA).

Staff's Condition of Certification **BIO-27** required the applicant to prepare and implement a Revegetation Plan which would address the salvaging of topsoil and native desert plants to aid in the revegetation of temporarily disturbed areas following Project construction. During a September 27, 2010 Workshop staff and Solar Millenium agreed to delete **BIO-27**, under the condition that: 1) avoidance and minimization measures described in **BIO-27** are incorporated into **BIO-8** (Impact Avoidance and Minimization Measures), and 2) weed management measures described in **BIO-27** are incorporated into **BIO-14** (Weed Management Plan). Restoration and revegetation of the solar facility and other permanently disturbed areas upon decommissioning is addressed separately in **BIO-22**.

PROJECT CLOSURE AND DECOMMISSIONING

The original project owner (Solar Milliennium) submitted a Draft Conceptual Decommissioning Plan – Palen Solar Power Project (Solar Millennium 2010a) in January 2010 in response to staff's data request for a conceptual decommissioning plan that addressed the fate of the engineered channels (CEC 2009a). Staff requested a conceptual plan for filling the re-created channels and restoring drainages on the Project site, including a description of a revegetation plan for restoring the function and values of the ephemeral drainages. Staff also requested a cost estimate, adjusted for inflation, for implementing the closure, including the revegetation component of the closure activities for the drainages, and asked for a conceptual plan and funding mechanism for monitoring and maintenance of the ephemeral drainages until existing functions are reestablished. The proposed PSEGS eliminates the large drainage control channels and the majority of the project site would maintain the original grades and natural drainage features (Palen 2012a). A Revised Draft Conceptual Decommissioning Plan and cost estimate for the PSEGS project would still be required to meet BLM Regulations.

Regulations promulgated by BLM at 43 CFR 3809.550 et seq. require a detailed reclamation plan and an estimate. Page 5 of BLM's Instructional Memo for Oregon/Washington BLM Policy for 43 CFR 3809 Notice and Plan-level Occupations, 43 CFR 3715 Use and Occupancy and Reclamation Cost Estimates (BLM 2009b) lists the requirements for a reclamation plan as follows:

"(c) Reclamation Plan. A plan for reclamation to meet the standards in §3809.420 with a description of the equipment, devices, or practices proposed for use including, where applicable, plans for:

(i) drill-hole plugging;

(ii) regarding and reshaping;

(iii) mine reclamation, including information on the feasibility of pit backfilling that details economic, environmental, and safety factors;

(iv) riparian mitigation;

(iv) wildlife habitat rehabilitation;

(v) topsoil handling;

(vi) revegetation;

(vii) isolation and control of acid-forming, toxic, or deleterious materials;

(ix) removal or stabilization of buildings, structures, and support facilities; and

(x) post-closure management."

Page 3 of the same document also explicitly requires an estimate of the costs of reclamation, as follows:

"Reclamation Cost Estimate. An estimate of the cost to fully reclaim disturbances created during the proposed operations as required by §3809.552. The reclamation cost estimate must be developed as if the BLM were to contract with a third party to reclaim the operations according to the reclamation plan."

Condition of Certification **BIO-22** requires the project owner to develop a Decommissioning and Reclamation Plan and cost estimate that meets the requirements of BLM's 43 CFR 3809.550 et seq. prior to the start of Project-related ground disturbing activities or alternate date as agreed to with the BLM. With implementation of Condition of Certification **BIO-22**, impacts to biological resources resulting from decommissioning and closure activities would be mitigated to less than significant levels.

PROJECT-RELATED FUTURE ACTIONS

REASONABLY FORESEEABLE DEVELOPMENT SCENARIO: SOUTHERN CALIFORNIA EDISON RED BLUFF SUBSTATION

This subsection was deleted as construction of Southern California Edison's (SCE's) 220 kV Red Bluff Substation is currently nearing completion. Unlike the transmission line that would go from the Project power plant to the Red Bluff Substation distribution lines (the "gen-tie") SCE's Red Bluff Substation is not part of the Palen project description. Rather, SCE acquired a permit from the California Public Utilities Commission, and is currently constructing and will own and operate the Red Bluff Substation to serve several projects in the area. The analysis of the Red Bluff Substation was made as part of the Environmental Impact Statement process for the Desert Sunlight Solar Farm Project near Desert Center (BLM 2011). BLM issued its Record of Decision approving the project in August 2011 (BLM 2011)

CUMULATIVE IMPACT ANALYSIS

ANALYSIS OF CUMULATIVE EFFECTS TO BIOLOGICAL RESOURCES

"Cumulative" impacts refer to a proposed project's incremental effect viewed over time together with other closely related past and present projects and projects in the reasonably foreseeable future whose impacts may compound or increase the incremental effect of the proposed project (Public Resources Code Section 21083; California Code of Regulations, Title 14, Sections 15064[h], 15065[c], 15130, and 15355). The following sections present a definition of the geographic extent within which cumulative impacts are analyzed and an analysis of the project's potential incremental effects when combined with other past, present, and future projects.

SUMMARY OF THE APPROVED PSPP AND PROPOSED PSEGS PROJECT

Cumulative impacts of the Approved PSPP project were considered in light of existing and reasonably foreseeable future projects that threaten plant and animal communities within the context or geographic scope of the Northern and Eastern Colorado Desert Coordinated Management Plan (NECO) (BLM-CDD 2002). The approach employed a combination of quantitative and qualitative analyses. A Geographic Information System (GIS)-based quantitative analysis was reviewed for assessing the direct cumulative effects to habitat loss, and a qualitative analysis was employed of the cumulatively considerable indirect effects, based on consultations with REAT agencies' biologists and regional experts, and a literature review of the threats to species and their habitats.

For the PSEGS project a qualitative assessment of cumulative effects was based on a review of the Approved PSPP project's existing data; the conclusions regarding significance; a review of any new or anticipated projects in the region. The review also considered the projects onsite and offsite survey data, databases, literature, and consultation with regional experts. In addition to the combined effects of habitat loss and direct mortality, staff identified a range of indirect effects that combine with similar effects from other past, present, and foreseeable future project that must be factored into the cumulative analysis. This suite of indirect impacts to which the project would contribute includes: increase in ravens, coyotes, and other predators; introduction and spread of invasive weeds; the effects of groundwater pumping on ecosystems; altered surface drainage patterns; fragmentation; increased risk of fire; erosion and sedimentation of streams; potential for the introduction and or spread of wildlife diseases; diminished habitat values from increased noise and lighting; exotic wildlife invasions; dust and air pollution; road kills; human disturbance; and other factors contributing to a significant cumulative effect.

GEOGRAPHIC SCOPE

This cumulative impact analysis makes a broad, regional evaluation of the impacts of existing and reasonably foreseeable future projects that threaten plant and animal communities within a 50 mile radius of the project area and includes portions of the Northern and Eastern Colorado Desert Coordinated Management Plan (NECO) (BLM-CDD 2002). The NECO planning area is located in the southeastern California Desert Conservation Area (CDCA). It occurs primarily in the Sonoran Desert region but includes a small portion of the southern Mojave Desert region. For some biological resources, a different geographic scope was warranted, such as the use of watershed boundaries to analyze cumulative effects to desert washes and desert dry wash woodland, or the Chuckwalla Valley for locally significant populations and dune systems restricted to that geographic area.

REGIONAL OVERVIEW

This overview of regional impacts is followed by a more detailed discussion of the effects of past, present, and future projects to biological resources of the Project vicinity, with an emphasis on resources found within the Chuckwalla Valley of eastern Riverside County. The California desert remained a desolate area for the first few decades of the 20th century. Disturbance was more or less restricted to highways, railroad, and utility corridors, scattered mining operations, and sheep grazing. In the 1940s, several large military reservations were created for military training, testing, and staging areas. The deserts of eastern Riverside County comprise 40 percent of the county's land area but less than one percent of its population. Outside of the small urban-agricultural center of Blythe, near the Colorado River and Arizona border, there are only a few scattered, small residential and agricultural areas between Indio (to the west) and Blythe; most of the lands are under BLM management. The BLM manages land for multiple uses. While maintenance of habitat features and functions is a priority, the BLM must allow uses that stand in direct conflict with many conservation goals. Mining claims, grazing leases, renewable energy and other project development, and recreational uses may all be permittable under certain circumstances.

Populations of many of the desert's sensitive plants and animals were considered relatively stable until recently, as the push for renewable energy development has placed many populations at risk. Renewable energy projects are part of the solution to climate change, one of the biggest environmental challenges of our time; however, renewable energy development has its own ecological consequences and portions of the Sonoran and Mojave deserts of California bear the brunt of these effects. Energy providers have submitted project applications that would collectively cover more than one million acres of the region (BLM 2010). Poorly planned development could contribute to habitat loss and fragmentation and barriers to species movement and gene flow. Although project permitting and regional planning evaluate basic environmental impacts of such projects, often they do not fully consider impacts on connectivity, conduct thorough cumulative effects analyses, or implement regional monitoring of effects or the efficacy of mitigation.

In the areas identified for renewable energy development in eastern Riverside County, some of the many sensitive biological resources at risk include: desert washes and desert dry wash woodland, desert tortoise, Mojave fringe-toed lizard (including an important local population), western burrowing owl, fragile dune ecosystems, dry lakes, groundwater-dependent ecosystems, and a wide variety of special-status wildlife and plants. Approximately 51 acres of the southwestern corner of the Project overlaps the northern boundary of the Chuckwalla Desert Tortoise Critical Habitat Area. The Project also lies within a proposed Wildlife Habitat Management Area (Palen-Ford Wildlife Habitat Management Area), and is immediately northeast of the Chuckwalla DWMA.

The incremental, direct loss of habitat and individuals is more significant when considered with the significant indirect effects of fragmentation and its effects on gene flow, disrupted wildlife movement and connectivity, the introduction and spread of non-native plant species, and increases in predators such as ravens, which has also contributed to population declines and range contractions for many special-status plant and animal species (Boarman 2002a). Combined with the effects of historical grazing, agriculture, military training, and highway and aqueduct construction, the proposed wind and solar energy projects have the potential to further reduce and degrade native plant and animal populations. In the context of this large scale habitat loss, the Project would contribute, at least incrementally, to the cumulative loss and degradation of habitat for desert plants and wildlife, including desert tortoise and Mojave fringe-toed lizards, in the Chuckwalla Valley and NECO planning area.

MAKING CONCLUSIONS ABOUT THE SEVERITY OR SIGNIFICANCE OF THE EFFECT

“No net loss” does not necessarily mean there are no cumulative impacts. The standard for a cumulative impacts analysis is defined by the use of the term "collectively significant" in the CEQA Guidelines section 15355; the analysis must assess the collective or combined effect of development. Cumulative impact assessments cannot conclude that contributions to cumulative impacts are not significant because the contributions represent a small percentage of the overall problem. Doing so could improperly omit facts relevant to an analysis of the collective effect that the Project and other related projects would have upon biological resources. The result could be approval of projects based on an analysis that avoided evaluating the severity of impacts which, when taken in isolation appear insignificant, but when viewed together appear significant. For each cumulative effect the following questions were considered in making conclusions about the severity or significance of an effect:

- The health, status or condition of the resource as a result of past, present and reasonably foreseeable impacts;
- The contribution of the proposed modified project to the overall cumulative impact to the resource;
- The Project’s mitigated effect, when added to the effects of these planned future projects, and;
- Impact avoidance and minimization: any Project design changes that were made, or additional opportunities that could be taken, to avoid and minimize potential impacts in light of cumulative impact concerns.

PROJECTS CONTRIBUTING TO CUMULATIVE EFFECTS TO BIOLOGICAL RESOURCES

This analysis evaluates the impacts of the Project in addition to the current baseline of past effects, present (existing) projects, and reasonably foreseeable or probable future projects in the I-10 corridor within a 50-mile radius of the proposed Modified project. For golden eagle, cumulative impact analysis extends to a 140-mile buffer around the project. **Biological Resources Figure 7**, at the end of the **BIOLOGICAL RESOURCES** Section (C.2), illustrates the numerous proposed renewable projects on BLM, state, and private land in the I-10 corridor between Desert Center and the Colorado River, near Blythe, in eastern Riverside County. **Biological Resources Table 9** lists the existing and foreseeable future projects (proposed) that were included in the quantitative analysis of cumulative effects for the approved PSPP project and the qualitative approach used to support the proposed modified project; these projects are illustrated spatially in **Biological Resources Figure 7.** Refer to **Executive Summary -Table 1**, **Executive Summary -Table 2**, and **Executive Summary -Table 3**, for a complete list of projects considered cumulative to the PSPP project, and therefore part of this analysis.

Biological Resources Table 9
Existing and Proposed Future Projects Considered in Cumulative Effects Analysis for the PSEGS Project

Existing Projects (analyzed quantitatively)	ROW Area[1] (acres)	Foreseeable Future Projects[1] [Proposed] (analyzed quantitatively)	ROW Area[1] (acres)
Chuckwalla State Prison	1,044	Palen Solar Electric Generating System (PSEGS)[2]	3,001
Ironwood State Prison	681	Blythe Solar Power Project[2]	7,239
Eagle Mountain Pumping Plant (MDWSC)	378	NextEra Energy – McCoy (solar)	20,560
Kaiser Mine	5,772	Genesis Solar Energy Project[2]	1,768
I-10 Corridor (200-ft freeway buffer from CL)	6,494	Bull Frog Green Energy – Big Maria Vista (solar)	22,663
State highways (50-ft highway buffer from CL)	2,640	Chuckwalla Solar 1	4,091
DPV2 transmission line and existing access roads (100ft T-line Tower Buffer; 20-ft oad width)	2,861	Rice Solar Energy Project	3,859
Landfills (BLM NECO dataset)	n/a	Desert Quartzite (solar)	7,530
Blythe Energy Project I	153	Desert Sunlight (solar)	5,119
BLM Campgrounds – Wiley's Well, Coon Hollow, Cottonwood Spring, and Midland Long-Term Visitor Area	8,042	EnXco 1 (solar)	1,325
BLM Off-Road Vehicle-authorized/designated routes in Meccacopia SRMS. (BLM NECO Human Use LTVAs dataset)	3,031	Chuckwalla Valley Raceway	493
Blythe area urban and agricultural lands (GAP Analysis vegetation dataset)	88,317	Mule Mountain Solar Project	6,618
Desert Center area urban and agricultural lands (2005 NAIP imagery)	8,424	Eagle Mountain Pumped Storage Project	252
Pipeline (NECO pipelines dataset)	4,392		
Projects Considered Qualitatively			
Existing	**Area** (acres)		**Area** (acres)
BLM Grazing – cattle and sheep allotments (Lazy Daisy, Chemehuevi, Rice Valley, and Ford Dry Lake (recently closed)	n/a	Paradise Valley (residential "new town" development)	6,724
BLM Multiple Use – intensive multiple-use classes	n/a	Blythe Airport Solar I Project	639
General Patton military training areas	n/a	Eagle Mountain Landfill	1,,633
Colorado Aqueduct – open portions	n/a	Blythe Energy Project II	153
Chocolate Mountains Aerial Gunnery Range	n/a	DPV2 proposed roads (2-foot width) and towers (100 sq ft/tower)	256
Four approved commercial and 12 residential developments near Blythe	n/a	Genesis Solar Project access road	29
Solar projects at Arizona border	n/a	Blythe Energy Project transmission	148

Projects Considered Qualitatively			
Existing	**Area** (acres)		**Area** (acres)
		line towers	
BLM renewable energy study areas (future, proposed)	n/a	Genesis Solar Project gas line (100-ft width)	85
BLM transmission corridors	n/a	EnXco 2 Mule Mountain	~2,021
		Red Bluff Substation – for Palen Solar Electric Generating System	90
		Colorado Substation – for Blythe Solar Power Project	44
Total Future Projects[1,3] – 02/05/2010			**339,704 acres**
Total Existing Disturbances[1,3]			**134,750 acres**

1 - Not all of the projects depicted here will complete the environmental review, not all projects will be funded and constructed, and many will not use the entire ROW area** 150,272 acres of agricultural and urban development mapped within the NECO boundary according to the NECO Plant Communities dataset (BLM CDD 2002).
2 - Acreage impacts depicted reflect the project footprint only; not the entire ROW. The unused portions of the ROW would be returned to BLM and not included in the final ROW permit
3 - Because some future projects are proposed on disturbed lands; the numbers shown above subtracted for overlap and represent the acreages used in this cumulative effects analysis.

ANALYSIS OF CUMULATIVE EFFECTS TO BIOLOGICAL RESOURCES

Waters of the State

The geographic scope for the analysis of cumulative impacts to desert washes (including intermittent and ephemeral washes) included the Palen watershed and greater Chuckwalla Valley. The primary hydrologic feature in the Palen watershed is Corn Springs Wash; several branches of the wash pass through or around the site, some of which abate before reaching Palen Dry Lake. This dry lake is the receiving basin for the 1,496 miles of desert washes that drain the watershed (USGS 2010a). Most of the desert washes that pass through the Project site are distributary channels of the alluvial fan—or bajada—that drains the northeastern flank of the Chuckwalla Mountains. Staff analyzed the cumulative effects within the context of the watershed because this relatively small watershed would be affected by several proposed solar projects: Palen Solar Electric Generating System; First Solar Desert Sunlight; enXco 2; and Chuckwalla Solar 1 (see **Biological Resources Figure 9**). Existing impacts to desert washes in the Palen watershed include: urban and agricultural lands around Desert Center, segments of the I-10 and Highway 177 corridors, Kaiser Mine, and various transmission corridors (gas and electric).

The watershed area analysis was based on the U.S. Geological Survey (USGS) National Hydrographic Dataset (2010a) within the watershed boundary as defined by the California Interagency Watershed Map of 1999 (California Interagency Watershed Mapping Committee 1999) (**Biological Resources Figure 3**: Desert Washes–Palen Watershed).

The cumulative effects to desert washes within the Palen watershed are cumulatively considerable and the Project itself would be a major contributor to those effects. The effects of all projects are compounded by the fact that they also cause impairment of hydrologic, geochemical, geomorphic, and habitat function and values of the remaining reaches downstream of the impact.

Many of the existing washes in the Chuckwalla Valley have been subject to extensive impairment north of I-10. The highway roadbed and a series of collector ditches south of I-10 have permanently diverted stream flows into a few primary features and deprived flows from many miles of smaller washes. Standing dead ironwood trees, stunted, drought-stressed creosote bushes and other shrubs provides sparse cover with very low species diversity occurring north of I-10 in the Palen watershed. The decline in cover, vigor, and habitat function in this area is a testament to the downstream effects that channel diversions can have on both upland and riparian plant communities. Many of the smaller washes on the Project site were already diverted and impaired by construction of I-10. Those washes were diverted, historically, into the three primary washes that pass through or around the site. Theoretically, the extra flows may have enhanced the extent of the desert dry wash woodland on these three washes, but the negative impacts apparent in the thousands of acres outside of these washes reflects the importance of these smaller washes to both riparian and upland ecosystems. For the Project, impacts downstream from the site would be minimized by allowing existing flows to pass through the project. Allowing flows to pass through the project would therefore not result in a cumulatively considerable impact to desert washes in downstream areas.

The effects of these past, present, and foreseeable future projects combine with the project's effects and contribute to a significant cumulative effect on desert washes in the local watershed, particularly on the habitat functions and value of the washes. These effects include impacts to water quality and sediment transport from the numerous channel diversions; culverts and road crossings; fragmentation of the habitat and the corresponding loss of habitat function and values, including wildlife movement; and the effects of interrupted fluvial sand transport on the Chuckwalla Valley dune system. Impacts to connectivity and wildlife movement from these diversions are discussed in more detail later in this cumulative effects analysis.

Energy Commission staff has concluded that the Project's contribution to the direct loss or diversion of desert washes in the Palen watershed and surrounding region to not be cumulatively considerable with implementation of staff's proposed Condition of Certification **BIO-21** , which requires the acquisition of desert washes within or adjacent to the Palen watershed. The residual effects, although individually minor, are cumulatively considerable, and these effects are minimized through compensatory mitigation for indirect effects (**BIO-21**). Conditions of certification **BIO-8** (impact avoidance and minimization measures), and **BIO-7** (monitoring and reporting requirements) are designed to minimize accidental impacts during construction and operation; impacts that are individually minor but cumulatively considerable.

Special-Status Wildlife

Desert Tortoise

The geographic extent of the analysis of cumulative impacts to desert tortoise is the range of the Mojave Desert portion of the population with special emphasis on the Colorado Desert Recovery Unit, as recognized by the USFWS (USFWS 2011a). Habitat within this recovery unit has been described as being in excellent condition despite declines in tortoise densities over the past several decades; disturbance was estimated at less than 1.3 percent throughout (USFWS 2005).

The PSEGS project is also located in the Riverside Solar Energy Zone (BLM 2012). The Riverside Solar Energy Zone (SEZ) is situated between the Chuckwalla and Pinto Mountains and the SEZ may provide important connectivity for desert tortoise movements between the DWMAs (BLM 2012 and CDFG 2002; Stout 2009). According to habitat suitability models, approximately 136,800 acres (554 km2) of potentially suitable habitat could be directly affected by construction and operations of solar energy development on the revised SEZ (BLM 2012 Table 9.4.12.1-1).

The analysis also considers the current USGS Desert Tortoise Habitat Model (Nussear et al. 2009) in defining potential habitat for desert tortoise and is a useful tool for evaluating different land-use issues that tortoises face at a landscape scale. **Biological Resources Figure 7** is a spatial representation of the predicted habitat potential index values for desert tortoise, based on the 2009 model. Nussear et al. (2009) identified approximately 5,547,333 acres of habitat for desert tortoise in the NECO planning area. The model is not intended to be used, or viewed, as a substitute for ground-based and site-specific field surveys. Model scores reflect a hypothesized habitat potential given the range of environmental conditions where tortoise occurrence was documented. Nussear et al. (2009, p. 15) specifically states:

> "*As such, there are likely areas of potential habitat for which habitat potential was not predicted to be high, and likewise, areas of low potential for which the model predicted higher potential. Finally, the map of desert tortoise potential habitat that we present does not account either for anthropogenic effects, such as urban development, habitat destruction, or fragmentation, or for natural disturbances, such as fire, which might have rendered potential habitat into habitat with much lower potential in recent years*".

Most of the proposed modified projects in the region appear to impact moderate- to low-quality desert tortoise habitat. Staff considers the Project contributions to cumulative habitat loss, even for moderate-to low-quality desert tortoise habitat, to be cumulatively considerable, given the species' decline and its present and future threats. The Project would also make cumulatively considerable contributions to loss of desert tortoise connectivity between the Chuckwalla and Chemehuevi DWMAs and critical habitat areas. One of the objectives for desert tortoise recovery in the NECO is to "*mitigate effects on desert tortoise populations and habitat outside DWMAs to provide connectivity between DWMAs*." Maintaining connectivity is particularly important given the threats posed by global climate change, according to the USFWS 2008 Draft Revised Recovery Plan. Probable desert tortoise linkages between the Chuckwalla and

Chemehuevi critical habitat areas and DWMAs are shown in **Biological Resources Figure 6.**

The establishment of the Recovery Units was also intended to protect the species and its habitat requirements so that desert tortoises can maintain self-sustaining populations within each recovery unit into the future (USFWS 2011a). The linkages depicted represent areas of the best habitat quality for tortoises between the DWMAs and critical habitat, and therefore represent the most probable linkages and most important areas to protect to maintain connectivity between the Chemehuevi and Chuckwalla DWMAs. This area represents about 3.3 percent of available suitable habitat of the desert tortoise in the region. The BLM concluded that overall impacts on the desert tortoise from construction, operation, and decommissioning of utility-scale solar energy facilities within the revised Riverside East SEZ is considered moderate, because the amount of potentially suitable habitat for this species in the area of direct effects represents between 1 and 10% of potentially suitable habitat in the region, and the implementation of programmatic design features alone is unlikely to substantially reduce these impacts (BLM 2012).

With implementation of proposed Condition of Certification BIO-12 (acquisition of desert tortoise compensation lands), staff believes that the Project's contribution to the cumulative loss of desert tortoise habitat would be reduced to a level less than cumulatively considerable. Condition of Certification **BIO-12** specifies that compensation habitat acquisitions occur within the Colorado Desert Recovery Unit in areas that have potential to contribute to desert tortoise habitat connectivity and build linkages between desert tortoise designated critical habitat, known populations of desert tortoise, and/or other preserve land. Many additional measures were devised to minimize indirect effects during operation and accidental impacts during construction, including: **BIO-1** through **BIO-11**, monitoring and reporting requirements (**BIO-7**), and desert tortoise compliance verification (**BIO-11**). Staff considers that the Project's contribution to the spread of Sahara mustard in desert tortoise habitat is individually minor but cumulatively considerable, and devised a condition to minimize this effect: **BIO-14** (Weed Management Plan).

Although project-specific desert tortoise mitigation measures reduce the Project's contribution to cumulative effects to a level less than cumulatively considerable, there are still minor residual effects that could contribute to cumulative effects. These include fragmentation, impaired connectivity, and degradation of the function and values of remaining habitat from predators, non-native invasive plants, fire, and disease. These residual cumulative effects can only be addressed through a regional and coordinated planning effort aimed at preserving and enhancing large, intact expanses of wildlife habitat and linkages, including maintaining connections between wildlife management areas and other movement corridors.

Ongoing collaborative efforts by federal and state agencies to develop the Desert Renewable Energy Conservation Plan and the recent BLM Solar Energy Development Programmatic EIS offer an appropriate forum for such planning.

Nelson's Bighorn Sheep

The Approved PSPP project analysis of the NECO bighorn sheep WHMAs and connectivity corridors indicated that occupied and unoccupied ranges would be relatively unaffected by past and future projects (from habitat conversion), due largely to their position in wilderness areas and at higher elevations. However, large-scale renewable energy development could significantly impact gene flow between sheep populations through significant cumulative impacts to connectivity corridors, potentially decreasing the viability of the metapopulation of bighorn sheep. The Project itself, however, would have no direct contribution to the loss of habitat within the identified connectivity corridors or WHMAs.

Proposed future projects could also cumulatively and significantly affect bighorn sheep through the loss of spring foraging habitat on the upper bajadas adjacent to occupied range. The impact of development within a one-mile buffer from the base of occupied ranges (or potentially restored populations in unoccupied ranges) was assessed for potential impacts to bighorn sheep foraging habitat. No significant direct impacts to bighorn sheep WHMAs, connectivity corridors, or spring foraging habitat would result from the proposed project; therefore, no mitigation measures relating to bighorn sheep are proposed by staff.

The Project is located within the proposed Palen-Ford multi-species WHMA (BLM CDD 2002; map 2-21); however, bighorn sheep are not expected to frequently use the I-10 box culvert undercrossing of Corn Springs Wash. Further, NECO identifies I-10 as a barrier to bighorn sheep movement (BLM CDD 2002). Although the Project is expected to affect wildlife movement and connectivity with important wildlife areas north and south of I-10, the Project is not expected to significantly affect—directly, indirectly, or cumulatively—bighorn sheep movement.

Mojave Fringe-toed Lizard

Reasonably anticipated cumulative effects considered by staff in a qualitative manner include habitat loss; fragmentation and diminished habitat values of remaining lands; and mortality from increased vehicle traffic through lands supporting this species. Other anticipated cumulative effects to Mojave fringe-toed lizard include impacts to sand transport systems and the maintenance of dunes from renewable energy projects (wind fencing and the obstruction of sand-carrying winds and water-deposited sands); premature stabilization of dunes by the spread of noxious weeds, which also fuel wildfires; and increased risk of fire from transmission lines or vehicle use; the effects of past and future grazing and off-road vehicle use; edge effects and fragmentation of the remaining habitat and reduced gene flow; and an increase in predation by ravens and other predators from an increase in perching structures. Obstructions to the wind-sand transport corridor from structures and wind-fencing, and the indirect effects of the obstruction to the maintenance of dunes downwind of the obstruction, are expected to be cumulatively considerable, and would result in an additional—and cumulatively considerable—loss of Mojave fringe-toed lizard habitat.

Within Chuckwalla Valley Mojave fringe-toed lizard habitat would be directly impacted by the construction of all proposed modified projects, and the Project is a major contributor to that effect. These effects are significant when combined with the expected indirect effects to Mojave fringe-toed lizard habitat, including: interruption of aeolian (wind-deposited) sand transport processes from projects and their wind fencing; diversions of desert washes and interruption of fluvial transport of sand that contribute to the maintenance of habitat; an increase in avian predators from the new perching structures provided by these projects, and the continuing spread of Sahara mustard.

The project's contribution to the loss of habitat, increased noise and lighting, road kills, fragmentation, and the spread of invasive pest plants is cumulatively considerable. However, the project's contribution to these effects would be reduced to a level less than cumulatively considerable through implementation of several conditions of certification designed to address indirect effects as well as habitat loss. Staff has concluded that the loss of Mojave fringe-toed lizard habitat resulting from the PSEGS project could be mitigated to less than cumulatively considerable levels with implementation of proposed Condition of Certification **BIO-20.** Staff believes that by requiring the Applicant to acquire and preserve habitat within the Chuckwalla Valley dune system, at a ratio of 3:1, fragmentation from anticipated future development of private lands can be minimized by protecting, in perpetuity, these lands from future development. The Project's contribution to the spread of Sahara mustard, which degrades the quality of Mojave fringe-toed lizard habitat is individually minor but cumulatively considerable. Staff believes this effect can be reduced to a level less than cumulatively considerable through implementation of **BIO-14** (Weed Management Plan).

Golden Eagle

The habitat loss from the Project contributes to cumulatively considerable loss of golden eagle foraging habitats in the Chuckwalla Valley and the NECO planning area. The Project's contribution to the cumulative impacts is more significant when combined with the reasonably foreseeable indirect effects of habitat fragmentation from the construction of proposed future projects. The USFWS and others (USFWS 2009b; Kochert et al. 2002) estimate there are approximately 30,000 golden eagles in the western U.S., down from an estimated 100,000 in the late 1970s. Survey data from 2003 and 2006–2008 indicate a decline of 26 percent since 2003. Climate change is also expected to impact golden eagle by increasing drought severity, and the CO_2 concentrations are expected to exacerbate the spread of non-native invasive plants, which displace native species and habitats, fuel wild fires, and alter fire regimes. Additionally, the proposed transmission lines for this and other proposed future projects are also expected to increase raptor collisions and electrocutions. The use of power tower technology may further contribute the decline of golden eagles from exposure to elevated levels of solar energy.

Proposed future projects within the NECO planning area and Chuckwalla Valley would cumulatively displace substantial amounts of foraging habitat for this species including creosote bush scrub and desert dry wash woodland. The Project's contribution to the cumulative loss of foraging habitat within the NECO planning area would be minimized to level less than cumulatively considerable through mitigation measures for acquisition of 4,863 acres of Sonoran creosote bush scrub habitat, as specified in staff's proposed Condition of Certification **BIO-12.** Further, 753 acres of desert washes and riparian habitat within or adjacent to the Chuckwalla- Ford Dry Lake watershed would be placed under permanent protection under Condition of Certification **BIO-22**. While acquisition does not address the net loss of foraging habitat in the immediate future, it is expected to prevent future losses of habitat by placing a permanent conservation easement and deed restrictions on private lands that could otherwise be converted for urban or agricultural uses or energy development.

The Project's contribution to the spread of invasive non-native plants such as Sahara mustard, which degrades the habitat and fuels fires, would be less than cumulatively considerable after implementation of Condition of Certification **BIO-14** (Weed Management Plan.

The Project's associated transmission lines contribute to a cumulatively considerable effect from collisions and electrocutions for golden eagle and other raptors. With implementation of Condition of Certification **BIO-8** (#5) which requires that transmission lines and all electrical components be designed, installed, and maintained in accordance with the Avian Power Line Interaction Committee's (APLIC's) Suggested Practices for Avian Protection on Power Lines (APLIC 2006) and Mitigating Bird Collisions with Power Lines (APLIC 1994). Implementation of Condition of Certification **BIO-16a and BIO-16B** would further minimize the Project's contribution to cumulatively considerable impacts from collisions, electrocutions, and habitat loss and degradation through the development of monitoring and an adaptive management program, power line retrofits, and annual funding for the life of the project for avian conservation actions, including habitat enhancement and restoration, to avoid, minimize, and mitigate future Project-related avian impacts.

At this time, staff is unable to make determinations of cumulative effects to golden eagle and migratory birds resulting from the operation of the project. Project operation could result in injury or mortality (take) of golden eagle and migratory birds due to exposure to elevated levels of solar flux and or irradiance. Staff is working collaboratively with the regulatory agencies and the project owner to finalize analysis of impacts to all migratory birds, including golden eagles.

American Badger and Desert Kit Fox

Reasonably anticipated cumulative effects considered by staff in a qualitative manner include habitat fragmentation and the diminished habitat values of remaining habitat from increased noise, lighting, exotic plant invasions including their ability to fuel wildfires and alter fire regimes, exotic wildlife invasions, dust and air pollution, increase in predators, agriculture, urban development and the consequences of human intrusion into previously undisturbed habitats: hunting, use of rodenticides and other poisons, road kills, trapping, and human disturbance.

American badger and desert kit fox habitat would be displaced by proposed future projects in the Chuckwalla Valley and NECO planning area. Staff considers this effect cumulatively considerable when combined with the anticipated indirect effects to remaining habitat and populations described above. Staff believes that the PSEGS project's contribution to the loss of habitat, increased noise and lighting, road kills, fragmentation, and the spread of invasive pest plants is cumulatively considerable. Staff concluded that the Project's contribution to these effects would be reduced to a level less than cumulatively considerable through several conditions of certification designed to address indirect effects as well as habitat loss. These include: Badger- and kit fox-specific avoidance and minimization measures in **BIO-17**, and **BIO-8** (general avoidance and minimization measures) contains specific measures to minimize noise and lighting impacts; and **BIO-14** (Weed Management Plan) to address the Project's contribution to the spread of invasive plants, which degrade habitat and fuels fires; **BIO-12** for acquisition of 4,863 acres of desert tortoise habitat, which is expected to contain suitable habitat for badger and kit fox; and **BIO-21**, which requires acquisition and protection of desert washes and adjacent habitat within the local watersheds, which will minimize future fragmentation in the Chuckwalla Valley area by protecting lands from future development.

Western Burrowing Owl

The Project's contribution to the cumulative loss of burrowing owl habitat is comparable to the cumulative loss of badger and kit fox habitat, described above. Staff concluded that the loss of habitat from all proposed future projects to be significant, and the Project's contribution to that effect is cumulatively considerable. The Project will also contribute to a cumulatively considerable impact from habitat fragmentation and edge effects, noise and lighting, increased road kills, increased risk of fire from weed invasion and increased ignition sources (vehicles), and an increase in avian predators, all of which ultimately degrade the function and values of the remaining habitat. Burrowing owls may also be at risk from operation of the facility from collisions or exposure to elevated levels of solar energy.

The Project's contribution to these indirect effects and loss of habitat would be mitigated to a level less than cumulatively considerable through: **BIO-18** avoidance and minimization measures specific to burrowing owl; measures for addressing impacts from noise, lighting, and traffic (road kills) through a variety of measures in **BIO-8**; **BIO-14** (Weed Management Plan and **BIO-27** (Revegetation of Temporarily Disturbed Soils) to address the Project's contribution to the spread of Sahara mustard and other weeds; **BIO-12** for acquisition of 4,542 acres of desert tortoise habitat, which is expected to contain suitable habitat for badger and kit fox; and **BIO-21**, which requires acquisition and protection of desert washes and adjacent habitat within the local watersheds, which will minimize future fragmentation in the Chuckwalla Valley area by protecting lands from future development. The Raven Management Plan **(BIO-13)** is expected to minimize the Project's contribution to the increase of avian predators of burrowing owl.

Le Conte's Thrasher

The Project's contribution to the cumulative loss of habitat for Le Conte's thrasher is comparable to the cumulative loss of badger and kit fox habitat, described above. The Le Conte's thrasher is showing steep population declines due to loss of habitat resulting from urbanization and water use combined with prolonged drought. Climate change is expected to exacerbate drought and compound the impacts of surface and groundwater use in the desert region. Further loss, fragmentation, and degradation of habitat could cause local extirpations and imperil Le Conte's thrashers in the Mojave and Sonoran deserts (CalPIF 2006). Current research indicates that many desert birds, including Le Conte's thrasher, are highly susceptible to habitat fragmentation and disturbance (Kershner, pers. comm.). The Le Conte's thrasher is typically found in very low densities and has large territories, and is therefore at risk of local extirpation from habitat loss.

The cumulative effects from foreseeable future projects on habitat loss are substantial. Although the Project's contribution to these effects is individually minor, it nevertheless contributes, at least incrementally, to a cumulatively considerable effect. This species may also be at risk from operation of the facility from collisions or exposure to elevated levels of solar energy.

Staff believes that the Project's contribution to the cumulative loss of habitat and the indirect effects described above would be minimized through implementation of the following proposed conditions of certification: **BIO-21**, which requires acquisition and enhancement of 562 acres of desert dry wash woodland to be mitigated within the same local watersheds as the site of the impact; **BIO-15** requires pre-construction nesting bird surveys; **BIO-16**, which requires monitoring of bird kills and adaptive management; **BIO-23** and **BIO-24** would require monitoring for impacts to groundwater-dependent vegetation around Palen Dry Lake and remedial action if adverse effects are detected, and **BIO-8**, which includes measures for minimizing the effects of noise, lighting, traffic, and other impacts. **BIO-21** will also minimize future fragmentation in the Chuckwalla Valley region by permanently protecting these critical resources from future development and its associated indirect effects.

At this time, staff is unable to make determinations of cumulative effects stemming from loss of migratory birds from the operation of the project. Project operation could result in injury or mortality due to exposure to solar flux and or irradiance. Staff is working collaboratively with the regulatory agencies and the project owner to develop a mitigation package to minimize impacts to migratory birds.

Burro Deer

Burro deer is a subspecies of mule deer found in the Colorado Desert of Southern California, primarily along the Colorado River and in Desert Wash Woodland communities in upland areas. During hot summers, water is critical, and deer concentrate along the Colorado River where water developments have been installed and where microphyll woodland is dense and provides good forage and cover. Impacts are most important within ¼ mile of natural or artificial watering sites.

The Project's contribution to the loss of burro deer range is not cumulatively considerable. However, the Project would contribute to a cumulatively considerable loss of desert dry wash woodland (microphyll woodland) within the Palen watershed.

Staff concluded that with implementation of **BIO-21**, which requires acquisition and enhancement of 562 acres of desert dry wash woodland to be mitigated within the same local watersheds as the site of the impact, the Project's contribution would be less than cumulatively considerable. **BIO-21** will also minimize future fragmentation in the Chuckwalla Valley region by permanently protecting these critical resources from future development and its associated indirect effects.

Couch's Spadefoot Toad

One researcher (Dimmitt 1977) has indicated the Palen Lake area as being an area of interest for potential marginal populations; however, Dr. Dimmitt indicated (in consultations with staff) that the area containing suitable breeding habitat was observed on the north and east side of the Palen dunes, which intercept washes coming off the Palen Mountains. Recently this species was discovered east of the project site at the Genesis project and near the Colorado River substation; an ongoing SCE project. It is extremely likely that the western boundary of the Couch's spadefoot toad range extends farther west than reported by Dr. Dimmitt. Range extensions for many species have been recorded in recent years; in part due to the extensive survey efforts conducted to support renewable energy projects. Based on information from the Applicant (AECOM 2010t) and Dr. Dimmitt (Dimmitt pers. comm.), staff concluded in the Approved PSPP that no suitable habitat (temporary pools at the base of dunes, in washes, channels, or playas) occurs in the Project area, and therefore the Project would not result in cumulatively considerable impacts to this species. However, it is possible that this species may occur along portions of the natural gas pipeline.

Although not required the implementation of **BIO-12** for desert tortoise would preserve 4,542 acres of desert tortoise habitat, which may contain some habitat for Couch's spadefoot toad which may benefit this species by preserving land. The project owner has indicated that further data would be collected during spring 2013 regarding the potential of onsite occurrence, and staff will incorporate that information into the FSA.

Wildlife Movement and Connectivity

Connectivity refers to the degree to which organisms can move among habitat patches and populations. Individuals must be able to move between patches to meet their resource needs, and in the long term populations must be connected to allow for dispersion, gene flow, and re-colonization. This discussion includes a qualitative assessment of cumulative effects to connectivity. The PSEGS project lies within the same area as the PSPP project, and therefore, analysis conducted for movement corridors is largely still applicable; staff has updated this analysis after developing a new list of projects considered cumulative to the PSEGS project.

In both the Palen-Ford WHMA and DWMA Continuity WHMA, the Project is a major contributor to the cumulative effects of future projects on the loss of Sonoran creosote bush scrub within the WHMAs. Thus, the Project could impede wildlife movement in these corridors and obstruct connectivity for wide ranging wildlife such as burro deer, kit fox, coyotes, and badgers, and on a population level could impede gene flow for desert tortoises. However, some would remain from existing underpasses along I-10. The project owner indicated that connectivity of habitat along 32-miles of I-10, including 24 undercrossings is preserved along this stretch of the freeway (AECOM 2010f). Based on this information staff concluded that with implementation of the measures described below, the Project or its alternatives would not result in cumulatively considerable unmitigated impacts to connectivity for desert tortoise and other wildlife.

Staff's proposed Conditions of Certification **BIO- 21** requires that the compensation for the loss of desert washes, desert dry wash woodland, and their associated upland habitat must occur within Palen and adjacent watersheds; this is expected to minimize impacts in the Ford WHMA and DWMA Continuity WHMA to less than cumulatively considerable levels by ensuring that mitigation occurs locally and that further fragmentation is prevented by permanently protecting these lands from future development. Impacts to connectivity for desert tortoise could be minimized if the desert tortoise compensation lands were targeted for areas that would enhance wildlife connectivity within the same WHMA and corridor**.** Staff's proposed Condition of Certification **BIO-12** requires that the land acquisitions be within the Colorado Desert Recovery Unit, and have potential to contribute to desert tortoise habitat connectivity and build linkages between desert tortoise populations and designated critical habitat.

Although the implementation of staff's proposed conditions of certification would reduce the Project's contribution to cumulative impacts to wildlife movement and connectivity to less than cumulatively considerable levels, there may still be minor residual impacts. These residual effects from all future projects can only be addressed through a regional and coordinated planning effort aimed at preserving and enhancing large, intact expanses of wildlife habitat and linkages, including maintaining connections between wildlife management areas and other movement corridors.

Ongoing collaborative efforts by federal and state agencies to develop the Desert Renewable Energy Conservation Plan (DRECP) and the recent BLM Solar Energy Development Programmatic EIS offer an appropriate forum for such planning.

Natural Communities

Significant cumulative effects to plant communities from proposed future projects are expected to occur in many community types, particularly playa, Sonoran creosote bush scrub, and desert dry wash woodland. Similarly, indirect effects to remaining habitat would occur from fragmentation, alteration of the surface drainage patterns which support many common and rare species, to both riparian *and upland* habitats. Other reasonably anticipated indirect effects which the Project has a cumulatively considerable effect is an increase in the risk of fire (from increased vehicle use of area roads) and the introduction and spread of noxious weeds. Sahara mustard is of particular concern because it is already infesting many areas on and adjacent to the Project and has the potential to spread explosively if not carefully managed. Climate change is expected to exacerbate the effects of drought and noxious weed spread. The Project may also have a cumulatively considerable impact on groundwater-dependent ecosystems in the Palen Lake watershed from its proposed construction-related groundwater pumping. The Project contributes at least incrementally to the cumulative loss of Sonoran creosote bush scrub and desert dry wash woodland. Sonoran creosote bush scrub is a common and widespread community in the southeastern deserts of California; however, this broad designation does not reflect the importance of large, intact blocks of habitat to wildlife movement, or to foraging and breeding habitat for wildlife, including state and federal listed species. The NECO mapping of plant communities also does not reflect the many uncommon and even rare plant assemblages within creosote scrub that have been documented and are monitored by the CDFW (CDFW 2003).

Staff's proposed Condition of Certification **BIO-12** for acquisition of 4,863 acres of desert tortoise habitat (Sonoran creosote bush scrub) in Chuckwalla Valley, and Condition of Certification **BIO-21** for acquisition and protection of 753 acres of desert washes and desert dry wash woodland, would minimize the Project's contribution to the cumulative loss of these habitat to a level less than cumulatively considerable. While acquisition does not address the net loss of habitat in the immediate future (a temporal net loss of habitat), it is expected to prevent future losses of habitat by placing a permanent conservation easement and deed restrictions on private lands that could otherwise be converted for urban, agricultural, or energy development.

Condition of Certification **BIO-14** for weed management would offset the Project's contribution to the indirect cumulative effects of all projects on the spread of non-native invasive plants and their effects on wildlife and fire risk. Staff's proposed Condition of Certification **BIO-23** and **BIO-24** for monitoring of groundwater-dependent vegetation (and remedial action in the event of adverse effects) would reduce the Project's contribution to this effect to a level less than cumulatively considerable.

Playas and dry lakebeds appear to be disproportionately affected by the cumulative effects of potential future projects across NECO. Due to their limited extent and potential status as jurisdictional state waters, and their hydrologic importance and seasonal value to wildlife, staff considers this a significant cumulative effect. However, the Project does not contribute directly to this effect. Staff concluded that the Project's potential indirect effects to nearby playa habitats would be minimized to a level less than cumulatively considerable through the implementation of **BIO-23** and **BIO-24.**

Landforms

The cumulative effects of future (proposed) projects to dunes, playas, and plains (including sandy plains, which make up a large portion of Mojave fringe-toed lizard habitat) would be substantial. Dunes and sandy plains provide habitat for several rare plants including Harwood's milk-vetch. The Project's contribution to these effects, even when seemingly minor can be significant if they affect an extremely rare or limited resource, and the cumulative impact may be substantial, according to Council on Environmental Quality (CEQ) guidance. Staff considers the Project's contribution to cumulative effects to sand dunes cumulatively considerable.

Staff's proposed Condition of Certification **BIO-20** requires implementation of impact avoidance and minimization measures and acquisition of dune habitat at a 3:1 ratio for the sand dune habitat loss attributable to the Project, and a 1:1 ratio for other sandy habitats that support Mojave fringe-toed lizards (e.g., sandy plains, sand-covered fans, and sand-covered playas). These acquisitions would need to be targeted for dune habitat within the Chuckwalla Valley with potential to contribute to Mojave fringe-toed lizard habitat connectivity. Staff believes that implementation of **BIO-20** would offset the Project's contribution to the loss of habitat.

The Project's contribution to cumulatively considerable indirect effects from the spread of Sahara mustard and other invasive pest plants into dunes and the adjacent habitats upslope will be minimized to a level less than cumulatively considerable through implementation of Conditions of Certification **BIO-14** (Weed Management Plan), **BIO-27** (revegetation of temporarily disturbed areas using locally native seed). Impacts to the groundwater-dependent ecosystems that occur around the playa and in dunes will be minimized through **BIO-23** and **BIO-24** (monitoring of groundwater-dependent vegetation and remedial action in the event of adverse effects).

Desert Dry Wash Woodland (Microphyll Woodland)

The small overall area typically represented by this community, relative to Sonoran creosote bush scrub, belies its importance to wildlife. Although the project would attempt to maintain existing surface drainage, rather than divert the runoff around the project perimeter, staff considers the perimeter exclusion fencing, and regular vegetation mowing and spraying and road construction and maintenance, and human activity to be a significant impact to the habitat functions and value of the streams. Desert dry wash woodland is a sensitive natural community recognized under many LORS and area plans. Because it has a limited distribution (relative to common and widespread communities such as Sonoran creosote bush scrub) and carries an ecological importance that is disproportionate to its limited extent, staff considers this a cumulatively considerable effect, particularly in light of the Project's contribution to cumulative effects to desert washes in the Palen watershed. The Project's contribution to the cumulative loss of desert dry wash woodland would be mitigated to a level less than cumulatively considerable through Condition of Certification **BIO-21,** which specifies acquisition and enhancement of desert wash woodland within or adjacent to the Palen watershed a 3:1 mitigation ratio.

Active Dune Habitat

Dunes provide habitat for a variety of special-status plants and animals; locally these include the Chuckwalla Valley population of Mojave fringe-toed lizard and a variety of special-status plants: Harwood's milk-vetch; Harwood's woolly-star; jackass clover; Palmer's jack-ass clover, and ribbed cryptantha. The effects of these past, present, and foreseeable future projects combined with the project's effects contribute to a significant cumulative effect to dune habitat from: obstruction of wind and fluvial sand transport systems (which are essential for the maintenance of the dunes) by new structures and wind fencing; fragmentation and degradation of remaining habitat by roads; development; off-road vehicles; altered drainage patterns; and the spread of noxious weeds and other invasive plants such as Russian thistle and Sahara mustard. Habitat values for dune-dependent wildlife are also affected by increased predation from avian predators, which benefit from new perching structures**.** Staff concluded that the direct, indirect, and cumulative impacts of the Projects to dune habitat function and value were cumulatively considerable and may not be adequately mitigated through habitat acquisition proposed under Condition of Certification **BIO-20** when considering the Project's significant indirect impacts to the sand transport corridor. Other mitigation measures recommended by staff to minimize indirect effects of the Project on dunes and dune-dependent wildlife and plants include the raven and weed management plans (**BIO-13** and **BIO-14**).

Groundwater-dependent Vegetation

The cumulative impact analysis in the **SOIL AND WATER RESOURCES** section indicates that groundwater extraction during construction and operation of this and other foreseeable projects would place the Chuckwalla Valley groundwater 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, water resources staff concluded that the Project's contribution (300 acre-feet per year) to this cumulative effect is less than cumulatively considerable but recommended a number of monitoring conditions to ensure that the Project's impact to area wells was less than cumulatively considerable.

Groundwater pumping could have a significant indirect impact to biological resources if it lowers the water table in areas where deep-rooted phreatophytes occur, such as mesquite bosques and succulent chenopod scrubs or alkali sink scrub. To ensure that the Project would not adversely affect groundwater-dependent vegetation near the Project well staff has also proposed Condition of Certification **BIO-23** for groundwater-dependent vegetation monitoring within two to three miles of the Project well for the life of the Project. Staff's proposed Condition of Certification **BIO-24** proposes a remedial action plan that would be triggered in the event that impending impacts to groundwater-dependent vegetation are detected during the vegetation, soil and shallow groundwater monitoring prescribed in **BIO-23**.

Special Status Plants

Harwood's Milk-Vetch

New occurrences of Harwood's milk-vetch have been found during surveys of proposed solar projects in the I-10 corridor and this species appears to be fairly well distributed in the dune habitats in the Chuckwalla Valley. Of the 46 total occurrences (CNDDB and CCH) known from 2010; 11 are historical occurrences and approximately 10 occurrences appear to be protected in federal wilderness or state park lands. Most of the remaining occurrences are not located on lands under federal or State protection. It is important to note, however, that survey data from projects in the region have not yet been incorporated into CNDDB or other databases. The new occurrences could theoretically downgrade the CNDDB rank of a species, but if many of the new occurrences would also be directly or indirectly affected by the various projects whose surveys resulted in their discovery, this would also be considered in the evaluation of extinction risk. Staff concludes that although the Project's direct impacts to Harwood's milk-vetch are minor, they are cumulatively considerable, when combined with the reasonably expected indirect effects of noxious weeds and fragmentation.

Harwood's milk-vetch habitat would be disproportionately affected by renewable development in the region, and the species' range in California is nearly restricted to the NECO planning area. In the Chuckwalla Valley, its habitat is affected by probable future projects and some has already been lost from development. The loss of habitat quantified is exacerbated from the combined indirect effects of spread of noxious weeds, fragmentation and reduced gene flow among isolated populations from existing and future projects.

Although the Project's contribution to these effects may be individually small, it contributes, at least incrementally to a cumulatively considerable effect. According to CEQA guidance, in situations where the cumulative impact is substantial, even small incremental impacts may be cumulatively considerable.

Other species restricted to dune and playa habitats, washes and other sandy habitats also have occurrences outside of federal wilderness or state park lands and are threatened by renewable energy development, but the cumulative effects to Harwood's milk-vetch are of particular concern due to the position of many occurrences in the immediate vicinity of probable future projects and the likelihood of significant indirect effects. Other species that would be subject to loss from reasonably anticipated cumulative effects include: lobed ground cherry, Abram's spurge, jack-ass clover, California and glandular ditaxis. Harwood's eriastrum is somewhat more affected than these aforementioned plant species, and dwarf germander and flat-seeded spurge have very few documented occurrences in California. They also have occurrences that are not protected in federal wilderness designation or in national or state park ownership.

Indirect effects to Harwood's milk-vetch and other plants occurring in close proximity to the Project, and to which the Project has a cumulatively considerable contribution, include: altered drainage patterns, disrupted wind- or fluvial-sand transport processes, fragmentation of the habitat and reduced gene flow between isolated populations, the spread of non-native plants, which fuel fires and degrade habitat. Climate change is expected to exacerbate the effects of drought, and CO_2 concentration has already been demonstrated to promote the spread of invasive plants.

California ditaxis, the only other special-status plant that would be directly affected, is documented with 21 occurrences (17 in CNDDB and four additional occurrences from the Consortium of California Herbaria that were not in the CNDDB). The occurrence found in the Project area is not included in the 17 documented. Four of the records are historical records from between 1921 and 1952. Three are documented with threats from ORV; power line construction threatens another occurrence, and road grading is also a concern for one occurrence. Many occurrences of this species are on private land. However there are both threats to remaining occurrences, and opportunities for restoration and protection through acquisition.

Staff concludes that the Project's contribution to cumulatively considerable impacts to all special-status plants in the Project area, including the four late-season species analyzed, will be minimized to a level less than cumulatively considerable through implementation of **BIO-19**, Section A (Avoidance & Minimization Measures for special-status plants) and through the additional avoidance and compensation requirements described in **BIO-19.**. The Project's contribution to the spread of noxious weeds will be minimized through **BIO-14** (Weed Management Plan). All of the special-status plants, including the four late-season species, are associated with dunes, washes or playa. **BIO-20** (dune compensation) and **BIO-21** (compensation for desert washes) will minimize future development and fragmentation in the Chuckwalla Valley region by requiring that compensation occur locally.

Overview: Cumulative Impacts to Biological Resources of the Chuckwalla Valley

The direct and indirect effects of the Project on many biological resources, when combined with past, present, and foreseeable future development of the Chuckwalla Valley, and other portions of the I-10 region are cumulatively considerable. Of particular concern are the cumulative losses of desert washes, dune habitat, obstruction of the active aeolian sand transport corridor, the spread of Sahara mustard, increase in predation by ravens, roadkills, and fragmentation of the remaining habitat for Mojave fringe-toed lizard and several dune- and playa-associated rare plant species. Reasonably anticipated renewable energy development in Chuckwalla Valley could threaten what remains of the habitat and places several populations at risk of local extirpations—most notably, the local Chuckwalla Valley population of the Mojave fringe-toed lizard. Past and present impacts in Chuckwalla Valley that have already contributed to a decline in aeolian dune habitat, loss of habitat for Mojave fringe-toed lizard and dune-dependent rare plant species, or have indirectly degraded habitat include:

- Compaction and habitat degradation from historic military training operations during World War II;
- Past, present, and future off-road vehicle use around Ford Dry Lake;
- Past and recent sheep grazing around Ford Dry Lake;
- Electric and Natural Gas Transmission line construction;
- Road construction associated with the transmission construction;
- Construction and operation of the Wiley Wells Rest Stop;
- Construction of Interstate 10 (I-10) and the network of diversion ditches south of I-10;
- State Highway 177 and a network of both paved and unimproved roads;
- Urban and agricultural conversion around Desert Center (8,424 acres);
- DPV 1 and 2 Transmission Line and Access Road;
- Construction of the Colorado River Substation and Access road;
- Construction of the Genesis Solar Energy Project; and
- Construction of the Colorado Aqueduct.

The collector ditches associated with I-10 limit the depositional area of the Chuckwalla Mountains bajada to the south (upstream) of I-10 and concentrate the flows into three discrete channels, where historically numerous small channels fanned out over large areas contributing to fluvial sediment to the aeolian system. The downstream effects of these diversions are striking, severe, and very apparent throughout the I-10 corridor to the north, and in comparisons of current and historical photos. The perimeter stormwater conveyance channels proposed with nearly every solar project would closely mimic these effects to the fluvial transport systems. Some of the more apparent edge effects of the past and present stressors itemized above include the severe dune infestations of Russian thistle, which have effectively replaced native plant diversity with a monoculture of Russian thistle. More recently, Sahara mustard has invaded the valley and spread explosively since it was introduced some decades ago. Invasive plants increase fire frequency and are correlated with population declines of milk-vetch and fringe-toed lizard in Coachella Valley (Barrows and Allen 2007).

Reasonably foreseeable future actions that would further contribute to the loss of habitat, or to the fragmentation and degradation of dunes and habitat for fringe-toed lizard and dune-dependent rare plant species include:

- Palen Solar Electric Generating System (3,001 acres)
- Chuckwalla Solar 1 (4,091 acres)
- enXco 2 (Solar Energy Project, 1,325 acres)

- First Solar – Desert Sunlight (5,119 acres)

On the dunes south of I-10:

- LightSource Renewables – Mule Mountain II (not available) ;
- Altera - Mule Mountain (6,618 acres).

In Coachella Valley, blocked sand/wind corridors have been shown to lead to sand compaction and premature stabilization of the dunes, increased mean grain size (which reduces habitat suitability for fringe-toed lizards), and aeolian habitat loss (Turner et al. 1984). Stabilization of the dunes is also aggravated by an increase in non-native invasive plants, introduced through soil disturbance and an increase in vectors (vehicles). Invasive plants are correlated with decreases in the rare dune-endemic species of milk-vetch, fringe-toed lizard, and endemic sand treader cricket in Coachella Valley (Barrows and Allen 2007).

Road construction associated with new solar projects and their related transmission corridors further degrade and fragment the habitat, and lead to an increase in vehicle traffic and encroachment in previously undisturbed areas. Unpaved roads into the valley interior and historical grazing have led to a dramatic increase in noxious weed invasion over large areas of dunes and surrounding habitat, and an increase in vehicle-related mortality and habitat destruction. Human encroachment, agriculture, and development around Desert Center are also accompanied by an increase in predators, such as ravens. These indirect cumulative effects on dune-dependent species are particularly acute in isolated, fragmented habitats that lack the buffering effects of connectivity to larger populations. All of these stressor and effects are documented to have led to the decline of dune ecosystems in Coachella Valley and can reasonably be expected to occur in Chuckwalla Valley with future development.

CONCLUSION

Construction and operation of the PSEGS Project would have cumulatively considerable effects in nearly every biological resource area analyzed. The most significant cumulative impacts of the Project to biological resources are the cumulative effects within the geographic scope of the Chuckwalla Valley, which contains an isolated system of dunes and population of Mojave fringe-toed lizards. The direct loss of stabilized and partially stabilized dunes, and loss of habitat for Mojave fringe-toed lizard and other dune dependent species, is a significant direct impact of the Project. Combined with the threat of similar effects from other renewable energy projects within the valley, and historic impacts from agriculture and the spread of invasive plants, the cumulative effect is substantial and the Project is a major contributor to this effect.

Staff concluded that the direct and cumulative impacts to Mojave fringe-toed lizard habitat resulting from the PSEGS project could be mitigated to less-than-significant levels with implementation of proposed Condition of Certification **BIO-20.** This condition calls for acquisition and preservation of habitat within the Chuckwalla Valley dune system, at a ratio of 3:1, and would reduce the Project's contributions to cumulative impacts to less than cumulatively considerable. The acquisition of these lands would minimize fragmentation of the sand dune system by protecting them from future development. In addition, measures incorporated **in BIO-6** and **BIO-8** would reduce the impacts from vehicle strikes along project access roads to less-than-significant levels with implementation. Indirect impacts from the new project configuration and components as well as vegetation management will be addressed in the Final Staff Assessment.

The projects contribution to significant cumulative effects to migratory birds and golden eagles is cumulatively considerable when combined with the anticipated indirect effects to remaining habitat and populations. Staff considers the cumulative effects stemming from the loss of golden eagle and migratory birds that may occur due to operation of the project to be cumulatively considerable even with the implementation of proposed Conditions of Certification. Staff identified a number of other direct and indirect effects to biological resources that may be individually minor but are cumulatively considerable when combined with similar effects from other past-present, and foreseeable future projects. Staff created conditions specifically to address these effect, and added measures to other conditions to minimize the Project's contribution to these cumulatively considerable effects to a level less than significant. With the exception described above for golden eagles, resident and migratory birds, staff concluded that with the implementation of staff's proposed conditions of certification, the Project's contribution to cumulative effects would be minimized to a level less than cumulatively considerable. These effects, and the mitigation designed to minimize these effects, are summarized below.

Desert Washes: The project's contribution to significant cumulative effects to desert washes is not cumulatively considerable after the implementation of conditions of certification intended to minimize those impacts. The following impact avoidance, minimization, and mitigation Conditions would address the project's contribution to many of the significant cumulative impacts described above: **BIO-21**, which requires compensation in local watersheds to minimize future development and fragmentation of washes; and **BIO-14** (Weed Management Plan).

Desert Tortoise: The project's contribution to significant cumulative effects to desert tortoise are not cumulatively considerable after the implementation of conditions of certification intended to minimize or fully mitigate those impacts. For desert tortoise these include: Mitigation: **BIO-13** (Raven Management Plan); Designated Biologist/Monitor (**BIO-1** through **BIO-5**); Worker Environmental Awareness Program with emphasis on desert tortoise (**BIO-6**); Avoidance & Minimization Measures (**BIO-8**) for construction and operation; desert tortoise clearance surveys and fencing (**BIO-9**); Relocation /Translocation Plan (**BIO-11)**; **(BIO-12**) compensation lands to be acquired within the Colorado Desert Recovery Unit; compliance verification **(BIO-11)**; **BIO-14** (Weed Management Plan); and fire prevention measures **(BIO-6).**

Movement & Connectivity: The Project's contribution to cumulative impacts to connectivity and wildlife movement are minor and are not cumulatively considerable after the implementation of conditions of certification intended to minimize those impacts. **Mitigation: BIO- 21** requires compensation for desert washes, riparian and associated upland habitat must occur in local watersheds. Impacts to desert tortoise connectivity would be minimized with desert tortoise fencing and maintenance of undercrossings under I-10 south of the Project area (**BIO-9**) and with acquisition of desert tortoise habitat (**BIO-12**) in identified connectivity corridors. Disturbance from noise and lighting would be minimized by implementing staff's proposed Condition of Certification **BIO-8**.

Golden Eagle: The Project would contribute a small but cumulatively considerable amount to the loss of foraging habitat for this species. Similarly, the risk to golden eagles from exposure to solar flux presents a risk during the lifetime of the project. Anticipated indirect effects remain cumulatively considerable even with the application of proposed mitigation. These include: collisions & electrocutions, mortality or morbidity from exposure to elevated levels of solar flux; fragmentation of remaining habitat, spread of Sahara mustard and increased risk of fire. **Mitigation:** Compensation lands for loss of Sonoran creosote bush scrub **(BIO-12**); golden eagle inventory & monitoring (**BIO-25**); avoidance measures (**BIO-8**) monitoring for offsite nesting, collisions, and adaptive management (**BIO-16 b**), and **BIO-16a**, funding for power line retrofits and habitat enhancement and restoration actions throughout the life of the project.

Burrowing Owl: The project's contribution to significant cumulative effects from habitat loss to burrowing owl are not cumulatively considerable after the implementation of conditions of certification intended to minimize or fully mitigate those impacts. However, indirect effects to burrowing owl are cumulatively considerable even with the application of proposed mitigation. These include: collisions & electrocutions, mortality or morbidity from exposure to elevated levels of solar flux; fragmentation of remaining habitat, spread of Sahara mustard and increased risk of fire. Mitigation: Burrowing owl-specific avoidance & minimization measures **(BIO-18**); general avoidance and minimization measures for noise, lighting, road kills, etc. in **BIO-8**; raven management **(BIO-13); BIO-14** (Weed Management Plan),; fire prevention measures in **BIO-6**. Monitoring during project operation and adaptive management (**BIO-16 b**), and **BIO-16a**, funding for habitat enhancement and restoration actions throughout the life of the project.

American Badger & Desert Kit Fox: The project's contribution to American badger and desert kit fox and Nelsons bighorn sheep are cumulatively considerable but mitigated by the implementation of conditions of certification. **Mitigation:** Badger & kit fox-specific avoidance & minimization measures (**BIO-17**); general avoidance and minimization measures for noise, lighting, road kills, etc. in **BIO-8**; fire prevention measures (**BIO-6).**

Special Status and Migratory Birds: The projects contribution to significant cumulative effects to resident and migratory birds is cumulatively considerable when combined with the anticipated indirect effects to remaining habitat and populations. Anticipated indirect effects remain cumulatively considerable even with the application of proposed mitigation. **Mitigation**: Pre-construction nesting bird surveys **(BIO-15)** will ensure that nesting birds are not impacted. Compensation lands for loss of Sonoran creosote bush scrub **(BIO-12**); avoidance measures **(BIO-8).** Monitoring during project operation and adaptive management (**BIO-16b**), and **BIO-16a**, funding for habitat enhancement and restoration actions throughout the life of the project. Condition of Certification **BIO-15**, preconstruction nest surveys; raven management **(BIO-13**); annual funding over the life of the project toward habitat restoration and enhancement measures and power line retrofits (**BIO-16a**), monitoring for bird collisions, electrocutions, golden eagle inventory & monitoring and monitoring of project operations for golden eagle and all other bird and bat species, with a framework for adaptive management **(BIO-b**); evaporation pond netting & monitoring (**BIO-26**).

Natural Communities: The projects contributions to significant cumulative effects to natural communities are not cumulatively considerable after the implementation of conditions of certification intended to minimize or fully mitigate those impacts. **Mitigation:** Acquisition of desert washes in local watersheds to minimize future development and fragmentation of washes (**BIO-21**), and **BIO-20** requires dune compensation in Chuckwalla or Palen wind sand transport corridor; **BIO-12** compensation for creosote bush scrub prevents future development of same habitat on alluvial fans/bajadas; **BIO-14** (Weed Management Plan); **BIO-27** (Revegetation of Temporarily Disturbed Soils).potential indirect impacts to groundwater-dependent ecosystems around the playa margins avoided/minimized through vegetation, groundwater and soil monitoring to detect impending changes from groundwater drawdown (**BIO-23**); triggers for remedial action and compensation requirements if impacts detected (**BIO-24**).

Chuckwalla Valley Dune System: The Projects contribution to cumulatively considerable indirect effects to the loss of dunes will be minimized to a level less than cumulatively considerable through implementation of Conditions of Certification. **Mitigation: BIO-20** requires compensation in the Chuckwalla or Palen wind sand transport corridor to minimize future development and fragmentation of dunes.

Groundwater-Dependent Ecosystems (GDEs): Water Resources staff concluded that Project's contribution to groundwater impacts in Chuckwalla basin is less than cumulatively considerable due to size and reservoir of aquifer. Staff expects that impacts to GDEs, and the wildlife they support, across all groundwater basins in NECO are significant. Project contribution to impacts to GDEs is cumulatively considerable. **Mitigation:** Vegetation, groundwater and soil monitoring to detect impending changes from groundwater drawdown (**BIO-23**); triggers for remedial action and compensation requirements if impacts detected (**BIO-24**).

Special-Status Plants: Staff concludes that the Project's contribution to cumulatively considerable impacts to all special-status plants in the Project area, including the four late-season species analyzed, will be minimized to a level less than cumulatively considerable through implementation of conditions of certification. **Mitigation:** Avoidance & minimization measures during construction, operation & closure (**Section A, BIO-19**); **BIO-14** (Weed Management Plan); **BIO-27** (Revegetation of Temporarily Disturbed Soils); compensation must occur on occupied lands or adjacent buffer lands to minimize fragmentation & edge effects, restoration must achieve a rescue of a population threatened by invasive weeds, ORV, grazing, or hydrologic/geomorphic alterations. Requirement for local compensation for dunes (**BIO-20**) and desert washes (**BIO-21**) minimizes future fragmentation of remaining habitat through preservation and protection of the wind sand transport corridor.

Impacts to Biotic Soil Crusts and Carbon Sequestration Benefits of Native Vegetation and Soils: The PSEGS project is expected to contribute to a cumulative reduction in greenhouse gases. However, the benefits gained by the Project's reduction in greenhouse gases must also be weighed against the potential loss of carbon sequestration benefits from the desert vegetation and biological soil crusts. New evidence suggests that alkaline desert soils may confer even greater sequestration benefits than soil crusts. In order to build the facility, these plants and biotic soil crusts are damaged and destroyed, and construction-related soil disturbance releases the sequestered carbon back into the atmosphere. Presently, there is still dispute among scientists as to how to accurately measure the benefits and the loss (Campbell et al. 2009).

Until the dispute is resolved, staff concluded that these impacts of the PSEGS project may be cumulatively considerable. Staff concluded that the following mitigation measures would reduce the Project's contribution to the cumulative loss of sequestration benefits to a level less than significant: Minimizing the area of soil disturbed along the linears through avoidance and minimization measures in **BIO-8** and **BIO-19**; and preventing the future loss of habitat by placing permanent conservation easements on private lands that could otherwise be developed under the habitat acquisition requirements in **BIO-12**, **BIO-20**, and **BIO-21**; restoring degraded portions of compensatory mitigation lands, as required in **BIO-12**, **BIO-20**, and **BIO-21**; and revegetating the solar facility after Project closure and decommissioning (**BIO-22)**.

Determining the feasible mitigation measures for a cumulative impact can be difficult. In many cases, a cumulative impact results from the combined actions of numerous agencies and private entities. The requirement to implement a potential mitigation measure to address a cumulative impact is often beyond the jurisdiction of a lead agency or its CEQA and NEPA cooperating agencies. For example, successful mitigation measures for cumulative effects often require numerous local communities to modify their area or regional plans to reduce the amount of planned development (e.g., within planned energy study areas) or combine forces or jurisdictional authority to create critical connectivity corridors. The Energy Commission and its sister agencies *alone* do not have the authority to implement the necessary planning decisions, obtain local legislative approvals, or change the regional distribution of future development. Therefore, disclosure of mitigation for cumulative impacts is not based on or limited to specific mitigation measures that can be implemented by the lead agency (CalTrans 2005)[8]. "When it is not always possible to identify a mitigation measure, the discussion may consist of listing the agencies that have regulatory authority over the resource and recommending actions those agencies could take to influence the sustainability of the resource. By doing so, the needed mitigation would be disclosed to the public and reviewing agencies even though it could not be implemented by the Lead Agency. Once disclosed, the information could be used to influence future decisions or to help identify opportunities for avoidance and minimization when other projects are proposed."

The potential for significant adverse cumulative impacts from renewable energy development have presented opportunities for important and innovative cumulative impacts solutions. These solutions would be achieved through regional and coordinated planning efforts aimed at preserving and enhancing large, intact expanses of wildlife habitat and linkages, including maintaining connections between wildlife management areas and other movement corridors, and identifying and preserving important refugia to

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[8] California Department of Transportation (CalTrans). 2005. *Guidance for Preparers of Cumulative Impact Analysis: Approach and Guidance*.

facilitate species dispersal and maintain biodiversity in the face of climate change. The DRECP, is one forum for addressing the larger solutions that cannot be addressed piecemeal through the mitigation measures of individual projects, even when those impacts are minimized to a level less than cumulatively considerable. The purpose of the DRECP is to protect desert wildlife and wild lands while expediting renewable energy production. Implicit to the success of the DRECP is the preservation of the ecological needs of desert plant species and vegetation communities.

COMPLIANCE WITH LORS

The PSEGS project must comply with state and federal laws, ordinances, regulations, and standards (LORS) that address state and federally listed species, as well as other sensitive species and their habitats.

STATE LORS

Under the Warren-Alquist Act (Pub. Resources Code § 25500) the Energy Commission's certificate for thermal power plants 50 MW and more is "in lieu of" other state, local, and regional permits (*ibid*.). Staff has incorporated all required terms and conditions that might otherwise be included in state permits into the Energy Commission's certification process. When conditions of certification are finalized they would satisfy the following state LORS and take the place of terms and conditions that, but for the Commission's exclusive authority, would have been included in the following state permits:

- **Incidental Take Permit: California Endangered Species Act (Fish and Game Code §§ 2050 et seq.)** The California Endangered Species Act (CESA) prohibits the "take" (defined as "to hunt, pursue, catch, capture, or kill") of state-listed species except as otherwise provided in state law. Construction and operation of the PSEGS project could result in the take of desert tortoise, listed as threatened under CESA. Staff's proposed Condition of Certification **BIO-12** specifies compensatory mitigation for desert tortoise habitat loss at a 5:1 ratio for all areas that occur within Critical Habitat and a 1:1 ratio for all other lands. Avoidance and minimization measures described in Conditions of Certification **BIO-6** through **BIO-11** and **BIO-13** would also mitigate for potential impacts to desert tortoise. Staff have concluded that implementation of these conditions of certification would ensure compliance with CESA and ensure that impacts to desert tortoise are fully mitigated.
- **Streambed Alteration Agreement: California Fish and Game Code §§ 1600 1607.** Pursuant to these sections, CDFW typically regulates all changes to the natural flow, bed, or bank, of any river, stream, or lake that supports fish or wildlife resources. Construction and operation of the Project would result in direct impacts to at least 358 waters of the state. The project may also result in minor indirect impacts to approximately 32 acres of state waters located downstream of the site. Staff's proposed Condition of Certification **BIO-21** would minimize and offset direct and indirect impacts to state waters and would assure compliance with CDFW codes that provide protection to these waters.
- **Protected furbearing mammals (California Code of Regulations, Title 14, Section 460).** This regulation specifies that fisher, marten, river otter, desert kit fox and red fox may not be taken at any time. Condition of Certification **BIO 17**

(American Badger and Kit Fox Avoidance Measures) requires the development of a management plan to safely exclude animals from the project site and ensure compliance with the California Fish and Game Code that provides protection to these species.

- **Fully Protected Species (Fish and Game Code, sections 3511, 4700, 5050, and 5515).** Designates certain species as fully protected and prohibits the take of such species or their habitat unless for scientific purposes (see also California Code of Regulations Title 14, section 670.7). Golden eagles are a fully protected species that occurs in the project area. Proposed conditions of certification **BIO-15** (Pre-construction Nesting Bird Surveys) will avoid direct take of this species during construction. Staff notes that these conditions will not ensure full protection of golden eagles during project operations. **BIO-16a and BIO-16b**, while still under development in consultation with the REAT agencies, will require monitoring of the project site and impacts, and will implement a suite of recovery actions such as habitat enhancement, trash removal, power line retrofits, and other actions as determined to be beneficial across the range of species potentially impacted by construction and operation of the project. However, take of golden eagles even if mitigated as required under CEQA, could violate the state Fish and Game Code. Loss of habitat would be off-set through (**BIO-12**) Compensation lands for loss of Sonoran creosote bush scrub.
- **Nest or Eggs (Fish and Game Code section 3503, 3503.5, and 3513).** These regulations protect California's birds by making it unlawful to take, possess, or needlessly destroy the nest or eggs of any bird and by providing a nexus to the federal migratory bird treaty act. Implementation of conditions of certification **BIO-1** through **BIO-8** (Impact Avoidance and Best Management Practices) and **BIO-15** (Pre-construction Nest Surveys) would ensure the project complies with regulations that protect nesting birds and their nests.

FEDERAL LORS

The Project is located on federal land under BLM's jurisdiction and is therefore subject to the provisions of BLM's California Desert Conservation Area (CDCA) Plan (Revised 1999). As an amendment to the CDCA Plan, BLM produced the Northern and Eastern Colorado Coordinated Management Plan (NECO) (BLM CDD 2002). This document consists of proposed management actions and alternatives for public lands in the NECO planning area. The Project is within the central portion of the NECO planning area.

The BLM has worked with the USFWS and CDFW to develop a variety of land designations as tools to protect sensitive biological resources, including the desert tortoise. The siting of the PSEGS Project considered the management direction of these designations, as described below:

- **Desert Wildlife Management Areas** (DWMA) are general areas recommended by the Desert Tortoise Recovery Plan (USFWS 1994a) within which recovery efforts for the desert tortoise would be concentrated. DWMAs had no specific legal boundaries in the 1994 Recovery Plan. The BLM formalized the general DWMAs from the 1994 Recovery Plan through its planning process and administers them as Areas of Critical Environmental Concern (see below). The Project site is immediately north of the Chuckwalla DWMA and approximately 1,400 feet of the proposed generation tie-line is located within the Chuckwalla DWMA. Construction in a DWMA is restricted to no more than one percent of the surface area. Because PSEGS falls within a specially-designated solar energy zone, no CDCA plan amendment is required. Typically the BLM requires increased mitigation ratios to off-set habitat loss when constructing in a DWMA.

- **Area of Critical Environmental Concern** (ACEC) are specific, legally defined, BLM designations where special management is needed to protect and prevent irreparable damage to important historical, cultural, scenic values, fish and wildlife, and natural resources or to protect life and safety from natural hazards. The project is not included within any designated ACEC.
- **Critical Habitat** consists of specific areas defined by the USFWS as areas essential for the conservation of the listed species, which support physical and biological features essential for survival and that may require special management considerations or protection. Critical habitat for the desert tortoise was designated in 1994, largely based on proposed DWMAs in the draft Recovery Plan. The southwestern portion of the project site, natural gas line corridor, and proposed generation tie-line corridor overlaps with 229 acres of the Chuckwalla Desert Tortoise Critical Habitat Unit.
- **Wildlife Habitat Management Areas** (WHMAs) address other special-status species and habitat management in the NECO planning area, and include two kinds: one for bighorn sheep, one for all other special status species and habitats. Bighorn sheep WHMAs overlay the entire range of their occurrence and movement corridors. Multi-species WHMAs are complementary to existing restricted areas and DWMAs, which also cover other special status species and habitats. The entire PSEGS project is within a multi-species WHMA. Because PSEGS falls within a specially-designated solar energy zone, no CDCA plan amendment is required. Typically the BLM requires increased mitigation ratios to off-set habitat loss when constructing in a DWMA.
- **Endangered Species Act (ESA; 16 USC Section 1531 et seq.).** Potential take of the desert tortoise, listed as threatened by the USFWS, requires compliance with the federal Endangered Species Act (ESA) (16 USC §§ 1531 et seq.). “Take” of a federally listed species is prohibited without an Incidental Take Permit, which would be obtained through a Section 7 consultation between BLM and the USFWS. The project owner will submit a Revised Draft Biological Assessment (BA) for the project to BLM, and when BLM has reviewed and made appropriate revisions to the draft BA it will be submitted to the USFWS so that the formal Section 7 consultation process can be reinitiated.
- **Bald and Golden Eagle Protection Act (Title 16, United States Code, Sections 668-668c)** A recently issued Final Rule (September 2009) provides for a regulatory mechanism under the Bald and Golden Eagle Protection Act (Eagle Act) to permit take of bald or golden eagles comparable to incidental take permits under the ESA. This rule adds a new section at 50 CFR 22.26 to authorize the issuance of permits to take bald eagles and golden eagles on a limited basis. The PSEGS project could potentially result in “take” of the golden eagle from disturbance to nesting pairs, loss of foraging habitat. Operation of the project could also result in injury or death of bald and golden eagles that encounter concentrated solar flux over the heliostat field,

potential collisions with project features such as power towers and heliostats, or electrocution via contact with power lines. While the risk of injury or death to bald or golden is unpredictable, staff believes there is the potential for take to occur over the 30-year life of the project. Implementation of Condition of Certification **BIO-16b** would avoid of golden eagles by monitoring eagle nests during construction and implementing adaptive management measures, and **BIO-16a** would benefit bald and golden eagles by requiring project monitoring and providing funds for various habitat conservation and enhancement measures that would benefit both bald and golden eagles by improving habitat and lessening the risk of electrocution by contacting powerlines. Staff's proposed conditions of certification **BIO-12** and **BIO-21** would provide suitable bald and golden eagle foraging habitat by requiring the acquisition of desert tortoise habitat similar to that lost at the project site, as well as acquisition and permanent protection of desert dry wash habitat. While acquisition does not address the net loss of foraging habitat in the immediate future, it would prevent future losses of habitat by placing a permanent conservation easement and deed restrictions on private lands.

NOTEWORTHY PUBLIC BENEFITS

Energy Commission staff considers the analysis of noteworthy public benefits unchanged since the 2010 Decision for the PSPP was released. The PSEGS Project and its alternatives would still result in significant impacts to sensitive biological resources, and would permanently diminish the extent and value of native plant and animal communities in the region. Staff has therefore concluded that the PSEGS Project would not provide any noteworthy public benefits related to biological resources, despite the contributions the Project would make to meeting federal and state mandates for development of renewable energy resources.

RESPONSE TO PUBLIC AND AGENCY COMMENTS

Staff has received the following 6 comment letters during preparation of the PSA for the PSPP project. While project analysis will continue up to and through development of the FSA, staff has provided preliminary responses to these comments. For issues that are still under development, such as avian data collection, final analysis will be available in the FSA, and staff provides the below responses, representing the current state of understanding.

LA CUNA DE AZTLAN SACRED SITES PROTECTION CIRCLE, LETTER DATED JANUARY 21, 2013

La Cuna Comment: The Palen Solar Power Project will destroy hibernating sites for the Nuttall's poorwill, as well as pristine desert, and has provided information on the occurrence of Nuttall's poorwill in Riverside County.

Staff Response: The common poorwill (*Phalaenoptilus nuttallii*), or Nuttall's poorwill, occurs throughout the western United States, and year round in southern California. This species is covered under the Migratory Bird Treaty Act as well as Fish and Game Code as a migrant, but has no other special protections afforded it by either state or federal regulatory agencies. Habitat consists of dry, open, grassy or shrubby areas in arid lands, and it feeds on night-flying insects. Suitable foraging habitat for this species occurs onsite, and in the general project vicinity. During the months of November to February, consistent with cool weather, this bird enters into “torpor”, a state of diminished physical activity and reduced metabolism, similar to hibernation, although not as deep. When the common poorwill enters into torpor, it chooses rocky crevices above the grounds' surface, for security. Additionally, birds may enter a daily torpor during spring or fall months, when food is unavailable or in short supply (Brigham 1992). Individuals in short-term daily torpor may be on the ground, and at risk of crushing from construction vehicles and ground disturbing activities. Staff is unaware of rocky crevices onsite that could support birds in a state of long-term torpor while overwintering. Night-foraging poorwills may be confused by heliostat reflections and be at an unknown risk of collision with heliostats or other project features.

Conditions of certification **BIO-12** would require 4,834 acres of upland habitat offsets, and mitigation for loss of desert dry wash woodland, which would benefit the common poorwill through preservation of foraging habitat. Additionally, nesting bird surveys would be completed under **BIO-15**, whereas conditions of certification **BIO-16a** and **BIO-16b** provide for ongoing project monitoring, would implement a framework of adaptive management, and provide funding on an annual basis, over the life of the project, for a suite of habitat restoration and enhancement measures that would benefit the common poorwill. Staff believes that implementation of these conditions would avoid, minimize, and mitigate any impacts to common poorwill.

CENTER FOR BIOLOGICAL DIVERSITY (CBD) STATUS REPORT, DATED MARCH 29, 2013

CBD Comment #1: CBD comments that new desert tortoise surveys are needed because the surveys relied on for the original application are now more than five years out of date.

Staff Response: Staff considered a number of factors regarding the age of the surveys conducted to support the PSEGS project. These included the number of tortoises found during the initial surveys; the current understanding of desert tortoise density in the region (specifically north of I-10); existing habitat conditions; and the supplemental surveys conducted in 2010 and 2013 on portions of the PSPP and PSEGS project footprints. Staff also took into consideration that the project owner had obtained all appropriate permits and theoretically could have fenced and cleared the project site of any desert tortoise, if compensatory mitigation was provided.

Staff is aware that surveys represent a “snapshot” in time and that conditions on the site may have changed (i.e., more tortoises could be there in 2013 compared to 2010). However, the project area has been subject to some levels of disturbance and desert tortoise densities are generally considered to be low in this region. Staff did not believe that conditions on the site have changed appreciably since the previous surveys and that requiring the project owner to resurvey would not provide meaningful data at this time. Performance of pre-construction surveys (**BIO-9**) and development of a translocation plan (**BIO-10**), will allow for desert tortoise and burrows to be documented and properly managed before commencement of ground-disturbing activities.

CBD Comment #2: CBD comments that additional analysis is needed regarding impacts to desert tortoise and other species connectivity in light of the new information available regarding this issue over the last four years, including but not limited to the U.S. Fish and Wildlife Service's Priority Desert Tortoise Connectivity Habitat, the Linkage Network for the California Deserts, and the BLM's Final Solar PEIS. They also note as part of the Final Solar PEIS, two north-south wildlife connectivity corridors are to be established through the Riverside East Solar Energy Zone (Solar PEIS at 9.4-50). They also note that based on the need to identify the location of these corridors, CBD comments that an analysis must be done of the potential impact from this project to these crucial wildlife corridors.

Staff Response: Staff has reviewed the BLM solar PEIS and it appears the project site is not located in a proposed corridor. The sites' location, abutting the Palen dunes likely reduces tortoise movement in portions of the Valley near the PSEGS site. Desert tortoise would have some access through existing culverts under I-10. Staff considers the analysis identified in the PSA to adequately address potential barriers to desert tortoise that may occur as a result of the PSEGS project.

CBD Comment #3: CBD comments that additional appropriate avian species surveys are needed due to the change in technology (power tower) which will have much greater impacts to avian species than the approved project. They also note that these types of impacts were not addressed in the earlier environmental review.

Staff Response: Staff has requested and received a series of supplemental data on avian use in the project region including winter 2012 and spring of 2013 golden eagle surveys. The project owner has also committed to the continuation of avian surveys during 2013. While data collection is ongoing, staff has reviewed and considered this data in the PSA.

In regards to the changing technology, the PSA provides a robust analysis of the potential impacts of this technology to desert and migratory birds and bats. In the absence of robust survey data, staff compiled a database of bird species based on personal observations, published reports, and peer-reviewed database entries including from list serves and bulletin boards such as "Inland County Birds" and the web-based "eBird". The PSA identifies risk to various groups of birds and identifies how their natural history traits could put them at risk from exposure to elevated levels of solar flux. Some of these factors are time of migration-daytime or nighttime, known flight characteristics (e.g., whether they soar; use thermal air currents, or move in slow and steady or fast flight), social patterns (e.g., whether the species typically moves within a flock, within an amorphous stream, or as individuals), and whether feeding occurs during stopovers or in flight

CBD Comment #4: CBD comments that new Mojave fringe toed lizard surveys are needed because the surveys relied on for the original application are 5 years out of date. They also state that in order to adequately assess the current distribution and density of Mojave fringe-toed lizards on the project site and assess direct, indirect, and cumulative impacts to the local population and its habitat, updated surveys are necessary, and must also consider potential impacts from construction and operation activities in the up wind areas of the sand transport corridor which include several large solar projects. CBD also notes that the Center has been informed and is investigating reports that construction activities for the Colorado River substation and use of the access road has had a very high impact on Mojave fringe-toed lizards—the potential for roads near and in sand habitat to become population sinks must be considered in this review.

Staff Response: As noted in the PSA, nearly half of the Project Disturbance Area for the PSPP contained suitable habitat for the Mojave fringe-toed lizard including stabilized and partially stabilized sand dunes, some wash habitat, and other areas within Sonoran creosote scrub bush habitat with appropriate soils. Numerous Mojave fringe-toed lizards were found in the dune areas and in buffer locations during surveys conducted to support the PSPP. A total of 95 Mojave fringe-toed lizards were detected from 2009 and 2010 surveys within the PSPP Project Disturbance Area. This species or its sign was not reported to be observed during spring 2013 surveys for the PSEGS along the proposed generation tie-line or the natural gasline route.

Staff acknowledges this species is present on portions of the PSEGS site and in adjacent dune area, but considers additional surveys of the project site are not required at this time for a number of reasons. The PSEGS has been designed to eliminate the PSPP project's 30 foot tall wind fences that contributed to disruption of the sand transport system associated with the PSPP project. Although the PSEGS project footprint is still within the sand transport corridor, this effect is expected to be less than significant with the implementation of proposed Conditions of Certification. Conditions prescribed for the PSPP project are now conservative, given the reduction in impacts stemming from the PSEGS project design. Additional surveys, while providing useful data, would not be expected to alter the significance conclusions for the PSEGS at this time.

Staff is aware of the recent and ongoing mortality to MFTL at the Colorado River substation. Staff is considering this and other project related effects to this species in the PSA and will provide mitigation to reduce those effects where possible.

CBD Comment #5: CBD requests that alternatives that could avoid impacts to the Mojave fringe-toed lizard and its rare sand dune and stabilized sand habitats, soils and surface waters, desert tortoise movement, avian impacts from solar flux and heliostat collision and other resources must be re-considered in light of the new power tower proposal which the applicant has in the past stated has more flexibility in site design as compared with the solar trough project originally approved.

Staff Response: Staff is preparing an alternatives analysis for publication in the final staff assessment (FSA) that includes these three alternatives to the proposed PSEGS:

- Solar Photovoltaic Alternative with Single-Axis Tracking Technology
- Parabolic Trough Alternative
- Reduced Acreage Alternative

As required by the California Environmental Quality Act, a No-Project Alternative is included to allow a comparison of the impacts of approving the PSEGS with the impacts of not approving the proposed modified project.

The PV Alternative would involve construction and operation of a utility-scale PV project using single-axis tracking technology at the PSEGS site with no change to the site boundary. Similarly, the alternative using parabolic trough technology would be constructed and operated at the PSEGS site with no change to the site boundary. Both of these alternatives would avoid the solar flux impacts of the solar power tower technology. Impacts on avian species from potential collisions with PV panels and parabolic mirrors will be addressed in the alternatives analysis.

The Reduced Acreage Alternative would retain the solar tower unit and heliostat array from PSEGS Unit 1 (the western solar field). This alternative preliminarily includes approximately 40 acres from PSEGS Unit 2 (the eastern solar field). The additional acreage would allow a small expansion of the Unit 1 solar field while avoiding an extensive area of desert dry wash woodland habitat in the PSEGS eastern solar field. With the addition of acreage from Unit 2, the Reduced Acreage Alternative would cover approximately 1,711 acres. The 218-acre common area and construction lay down area adjacent to PSEGS Unit 1 would be retained. The Reduced Acreage Alternative would reduce impacts on terrestrial species and sensitive habitats to varying degrees, which will be evaluated in the alternatives analysis in the PSEGS FSA.

<u>CBD Comment #6</u>: CBD comments that new detailed surveys of kit fox on the site are also needed. CBD further comments that due to the unfortunate outbreak of canine distemper in the state protected desert kit fox in the vicinity of the Palen project, additional analysis of project impacts to this species is required.

<u>Staff Response</u>: Staff is aware of the recent outbreaks of disease in this species in the Chuckwalla Valley. Staff has provided additional analysis for this species in the PSA, and conducted significant coordination with REAT agencies' biologists during preparation of the PSA. Further, staff proposes revised Condition of Certification **BIO-17** which requires pre-construction surveys for badger and kit fox dens in and near the project area, and requires implementation of passive relocation measures to protect them from direct construction impacts. The revised **BIO-17** incorporates knowledge gained from other solar projects in the region, and clarifies how to manage kit fox burrows located during pre-construction surveys. Staff has not requested additional surveys for this species on the project site as this species is already known to occur, and the given the high mobility of the species, does not see a benefit in performance of further surveys, outside of preconstruction surveys.

<u>CBD Comment #7</u>: CBD comments that additional analysis of all cumulative impacts is needed in light of additional projects that have been proposed and approved in this area subsequent to the original decision, including Desert Harvest and McCoy solar projects as well as the adoption of the BLM Solar PEIS after that time and any new information learned from the construction of Desert Sunlight and Genesis projects and updating any new information on the Eagle Mountain Pumped Storage Project.

<u>Staff Response:</u> Where available, staff presents monitoring data gathered from solar projects in the vicinity of the PSEGS, and routinely conferences with REAT agency biologists to receive anecdotal and new information. Staff has revised the cumulative analysis in the PSA to reflect the changes in approved and proposed projects. This information will be finalized in the FSA if additional projects are identified.

CENTER FOR BIOLOGICAL DIVERSITY (CBD) STATUS REPORT, DATED MAY 21, 2013

CBD Comment #8: CBD reiterated its comments from March 29, 2013 above, (CBD Comment #1). CBD also stated that to date, it is the Center's understanding that the Applicant has not undertaken these needed surveys and the spring survey window is rapidly drawing to a close. CBD further states that the earliest time that these necessary surveys could be conducted is the fall of 2013—the PSA schedule must be delayed until after these surveys have been conducted and the data provided to all parties for analysis.

Staff Response: Please see staff's response to comment CBD Comment #1, above. Please refer to the PSA "Summary of Conclusions", as well as staff's monthly Status Reports for updates on the project owner's data collection and checklist of outstanding data.

CBD Comment #9: CBD reiterated its comments from March 29, 2013 above, (CBD Comment #2). CBD also states that to date, the Center is unaware of any information indicating that Staff or the applicant has undertaken this critical analysis.

Staff Response: Please see staff's response to comment CBD Comment #2 (responses to CBD March 29, 2013 Status Report) from the section above.

CBD Comment #10: CBD reiterated its comments from March 29, 2013 above, (CBD Comment #3). CBD also states that at recent workshops the Applicant indicated that they have begun some avian surveys but there remain questions regarding the appropriateness of the methodology used, appropriate seasons and scope of the surveys. The Applicant also indicated that they may not be undertaking needed bat surveys and monitoring at this time. Moreover, as far as the Center is aware, none of the avian data, other than the Winter 2013 Golden Eagle Survey Results, collected to date by the Applicant have yet been provided to all parties and therefore would not be available for inclusion in the PSA if it is issued on the current, rushed, schedule.

Staff Response: Please see staff's response to comment CBD Comment s#3 and #8, above.

CBD Comment #11: CBD reiterated its comments from March 29, 2013 above, (CBD Comment #4). CBD also states that to date the Center is unaware of any new data or updated survey information regarding sand habitat and Mojave fringe-toed lizards being collected by the Applicant or provided by the Applicant to all parties. CBD also comments that Alternatives must be considered that avoid sand dune habitat impacts on the proposed site and avoid, minimize and mitigate any remaining impacts to the sand dunes natural communities and Mojave fringe-toed lizard.

Staff Response: Please see staff's response to comment CBD Comment #4 and #8 (responses to CBD March 29, 2013 Status Report) from the section above.

CBD Comment #12: CBD reiterated its comments from March 29, 2013 above, (CBD Comment #5). CBD also states that this information should be included in the PSA when issued but cannot be included without the needed additional data on avian species and other resources.

Staff Response: Please see staff's response to comment CBD Comments #3 and #8, above.

CBD Comment #13: CBD reiterated its comments from March 29, 2013 above, (CBD Comment #6). CBD also states that to date the Center is unaware of any new data or surveys for desert kit fox being collected by the Applicant or provided by the Applicant to all parties.

Staff Response: Please see staff's response to comment CBD Comment #6, above.

CBD Comment #14: CBD reiterated its comments from March 29, 2013 above, (CBD Comment #7). CBD also states that this analysis should be included in the PSA when issued but cannot be included without the needed additional data on avian species and other resources.

Staff Response: Please see staff's response to comment CBD Comment #7(responses to CBD March 29, 2013 Status Report) from the section above.

BASIN AND RANGE WATCH STATUS REPORT NO. 1, DATED MARCH 29, 2013

Basin and Range Watch (BRW) Comment #15: The California Energy Commission should also examine a photovoltaic alternative for the Palen Site. While a PV alternative in the same location would still have some of the same impacts, it would reduce the visual, hydrologic and avian impacts.

Staff Response: Thank you for your comment; please refer to staff's Response to the Center for Biological Diversity's Comment #5.

BRW Comment #16: Regarding Mojave fringe-toed lizard (MFL), BRW points out that the new project design and footprint does not eliminate all impacts to the aeolian corridor, nor does it completely eliminate impacts to MFL. BRW further recommends that a regional management plan be developed for the MFL.

Staff Response: The PSEGS project would directly affect 1,480 acres of Mojave fringe-toed lizard habitat. The project would have significant but mitigatable impacts to Mojave fringe-toed lizards, and would generally avoid interference with the sand transport corridor. Staff has requested additional information from the project owner regarding the extent of indirect impacts on sand transport resulting from the PSEGS facility design and footprint (CEC 2013F). The project owner assumed 39.7 acres of indirect impacts for the private parcel adjacent to project site surrounded on three sides by project fencing. The project owner assumed with removal of the 30 foot tall wind fence required for the PSPP that all sand would flow through site unrestricted. Staff has not accepted these assumptions, however, and is currently performing an independent assessment of indirect impacts. This assessment includes additional sand transport modeling, and will be available in the Final Staff Assessment. If necessary, staff will propose revised conditions of certification.

Staff agrees that development of coordinated regional plans can often be beneficial to both special status species and resources, and supports these efforts. However, the authorities and responsibilities encumbent upon the California Energy Commission do not extend to formulation of management plans for either species or habitats. The BLM and the CDFW have state constitutional authority to manage MFL.

BRW Comment #17: BRW states concern that the issue of a take permit for golden eagle has not been resolved, and notes that take of an eagle may be a violation of Federal law, as well as a violation of state laws.

Staff Response: The PSA contains a full description of all applicable laws, ordinances, regulations, and standards (LORS) relative to the golden eagle, and staff agrees that take of fully protected species, such as golden eagle, bald eagle, or peregrine falcon, would not be in conformance with existing LORS. Staff has also recommended that the project owner undertake preparation of avian management plans (**BIO-16b**), including an eagle protection plan, to aid in characterizing, monitoring, and avoiding project effects. **BIO-16a** would require power line retrofits, as well as annual funding for avian mitigation, over the life of the project. Staff recommends the project owner continue to work with the REAT agencies to determine appropriate management of this and any other species potentially at risk of exposure to concentrated solar flux within the project airspace.

BRW Comment #18: BRW has requested species lists for bats and birds that might occur on or over the project site.

Staff Response: Please refer to the PSA, Tables 3 and 4, for this information, which has been updated as possible from the PSEGS project analysis, based on staff's site visits, agency coordination, and literature searches. Based on ongoing data collection at the site, the FSA may contain updated species list. The PSA provides an analysis of the groups of birds considered to most at risk of adverse effects, based behavioral characteristics.

BRW Comment #19: BRW has mentioned the distemper disease outbreaks in kit fox from the Genesis Electric Solar Generating Project, as well as the Colorado substation, and notes that Condition of Certification **BIO-17**, which was developed for the PSEGS project, may not provide enough protection.

Staff Response: Please refer to staff's response to Center for Biological Diversity's comment #6, above.

BRW Comment #20: BRW states that phreatophytic vegetation, such as desert ironwood, palo verde, and mesquite, present on and off the project site, could be impacted by groundwater pumping, and has further asked if staff and the project owner would agree to a "stop pumping trigger" of groundwater drawdown if negative impacts are detected in microphyll woodland. BRW has also asked what monitoring will be undertaken to detect the effects of groundwater drawdown on sensitive communities.

Staff Response: The PSPP project proposes a substantial reduction in use of groundwater, as compared to the PSEGS project. The analysis of effects to groundwater dependent ecosystems, or GDEs, for the PSEGS project, along with subsequent conditions of certification (**BIO-23** and **BIO-24**) therefore was developed to address greater impacts than the PSEGS project would have. Staff feels that these measures, kept intact from the PSPP project, will now be conservative for the

PSEGS project. No new analysis of GDEs has been performed by staff, or requested from the project owner.

BASIN AND RANGE WATCH STATUS REPORT NO. 2, DATED MAY 8, 2013

BRW Comment #21: BRW requests that staff consider alternatives to the proposed PSPP project, including distributed generation, brownfields, or the Westlands Solar Park, to reduce impacts to biological resources.

Staff's Response: Please refer to staff's response to CBD comment #5, above.

BRW Comment #22: BRW asks for updated MFL survey data, and recommends development of a regional management plan for the MFL.

Staff's Response: Please refer to staff's responses to CBD comment #4 and BRW comment #16, above.

BRW Comment #23: Confirms BRW's position that the project should be halted until operational impacts are understood, pending receipt of data from another concentrating solar power tower project, the Ivanpah Solar Electric Generating System, and requests lists of avian and bat species likely to be adversely affected by the project.

Staff's Response: Please refer to the staff's response to BRW comments #17, and #18, regarding potential adverse effects of the proposed project and species lists. Staff cautions that while data collected from operating power towers certainly is applicable to projects employing similar technology, differences in habitat, avian and bat assemblages, and basic topography between the PSEGS and ISEGS project sites will result in impacts unique to each site. Uncertainty regarding the level of these impacts (that is, not only of what outcomes may result but also the numbers of individuals that might be affected) require site-specific studies to augment the knowledge base. Please review the PSA section titled "Operation Impacts to Flighted Species" for more information regarding bird and bat species accounts, and how behavioral and physical attributes may influence risk of adverse effects.

To gain site-specific avian and bat information, staff, in conjunction with the REAT agency biologists, has developed a survey protocol specifically for the PSEGS project site, with data collection recommended throughout the permitting process (CEC 2013i), to help inform monitoring plans implemented via staff's conditions Avian Enhancement and Conservation Plan (**BIO-16a**), and Avian and Bat Protection Plan (**BIO-16b**). Staff will continue to refine these measures, and will workshop following publication of the PSA.

BRW Comment #24: BRW requests new surveys for kit fox as well as a baseline census, and further requests staff address issues of canine distemper and other health relevant to the species.

Staff's Response: Please refer to staff's response to CBD comment #6.

EMAIL FROM ALTOS VISTA VILLAGIO (SIGNED, VEENA DOIJODE), DATED APRIL 24, 2013

Comment #25: The commenter has requested that staff assess impacts to a private parcel, where an agricultural crop of palm dates is being considered.

Staff Response: The private parcel referenced in the comment is located 5.3 miles southeast of the PSEGS project site, midway between the PSEGS and the Genesis Solar Electric Generating Project. Because the PSEGS project is being processed as an amendment, staff is analyzing baseline conditions from the time the original PSPP project was filed, in 2009. While staff does consider all past, present, and probable future impacts to biological resources in the context of cumulative impacts (CEQA Section 15130), without specific information as to the size of project and other details, staff is unable to provide an analysis of impacts of a palm date farm cumulative to the proposed PSEGS project. For the purposes of CEQA, staff has performed a comprehensive analysis of potential project impacts to biological resources such as desert dry washes, sand transport corridors, native habitat, and special status plant and wildlife species, as well as special habitat designations such as desert tortoise critical habitat, both on the project site and off. In some instances, staff's analysis includes resources as far as 140 miles from the PSEGS project. Staff has recommended 27 conditions of certification to preserve the health and function of these biological resources, as well as the function of the broader, regional landscape, including the commenter's parcel.

CONCLUSIONS

Overview of Impacts to Biological Resources: The Palen Solar Electric Generating System (PSEGS or Project) would have significant impacts to biological resources that occur on the project site. Implementation of the PSEGS, including site grading, mowing of vegetation and fencing of the site would result in the functional loss of all of the Sonoran creosote bush scrub, sand dunes, desert washes and other native plant and wildlife communities within the approximately 3,794 acre site. The PSEGS project may also result in significant indirect effects to dunes and dune-dependent species downwind of the facility. The direct impacts of the PSPP to sand dune habitat would have been considered significant but would have been mitigated to less-than-significant levels. The impacts of the PSEGS to sand dune habitat would also be considered significant but would be mitigated to less-than-significant levels. The PSEGS would also eliminate habitat for desert tortoise and other special status species, but these impacts can likely be mitigated to less-than-significant levels. The project wner has submitted summaries of biological resource surveys. However, complete reports documenting results of all biological resource surveys the have not yet been submitted by the project owner. Staff will work with the project owner to resolve any outstanding information needs prior to publication of the Final Staff Assessment (FSA). Any new or revised conditions of certification will be incorporated into the FSA. Outstanding information includes:

1. Results of bird and bat surveys conducted during 2013;
2. Results of spring 2013 avian point count surveys and spring 2013 raptor surveys;
3. Results of rare plant surveys conducted in spring 2013;
4. Results of cacti, yucca and trees protected by the California Desert Native Plan Act surveys should also be included, including species list and maps;

5. Results of vegetation and special habitat mapping, including calculations of acreages of permanent and temporary disturbance by vegetation type ;

6. A complete report of all spring wildlife survey efforts on the linears, including desert tortoise surveys, burrowing owl, other special status wildlife, include a full wildlife inventory as is noted in summary (TN 70897);

7. Amended Lake and Streambed Alteration Notification Application (LSAA) ;

8. Amended 2081 Permit Application (Incidental Take Permit) ;

9. Bat survey methods write-up covering the work efforts performed during the week of May 6th, and discussed at Staff's May 6, 2013 workshop;

10. Final complete sand transport study;

11. Results of supplemental burrowing owl surveys conducted to support the linear facilities; and

12. Results of all NECO plan required surveys, including Couch's spadefoot toad surveys per the protocol included in Data Response 1-5.

Without mitigation, the PSEGS project would contribute to cumulatively significant impacts to many biological resources within the Chuckwalla Valley and the Northern and Eastern Colorado Desert Coordinated Management Plan (NECO) area. Staff proposed avoidance, minimization and compensatory mitigation in conditions of certification to compensate for the direct and indirect loss of habitat for several species or natural communities and to offset the PSPP Project's contribution to cumulative effects. Impacts to the sand transport corridor and sand dunes and all other biological resources could likely be mitigated to less-than-significant levels with implementation of staff's proposed conditions of certification.

<u>Mitigation for Desert Tortoise:</u> Most of the Project site provides low to moderate quality habitat for desert tortoise, a species listed as threatened under the federal and state endangered species acts. The Project would impact 3,947 acres of desert tortoise habitat, including 229 acres within the Chuckwalla Desert Critical Habitat Unit. Construction and operation of the Project would therefore require state and federal endangered species "take" authorization. In addition to direct loss of habitat and impacts to connectivity among desert tortoise populations, the PSEGS Project would fragment and degrade adjacent native plant and wildlife communities, and could promote the spread of invasive non-native plants and desert tortoise predators such as ravens.

The measures in staff's proposed Conditions of Certification **BIO-9** through **BIO-11** would avoid and minimize potential take of desert tortoise during Project construction and operation. To offset the loss of 3,947 acres of desert tortoise habitat, staff's proposed Condition of Certification **BIO-12** recommends habitat compensation at a 1:1 ratio for desert tortoise (i.e., acquisition and preservation of one acre of compensation lands for every acre lost) for disturbance to lands that are not located in Critical Habitat. For Project impacts to 229 acres of Chuckwalla Desert Critical Habitat Unit, staff recommends a mitigation ratio of 5:1. This compensatory mitigation is consistent with

BLM guidance in the NECO, and with recommendations from the California Department of Fish and Wildlife (CDFW) and U.S. Fish and Wildlife Service (USFWS). Staff's proposed Condition of Certification **BIO-12** requires that the land acquisitions be within the Colorado Desert Recovery Unit, and have potential to contribute to desert tortoise habitat connectivity and build linkages between desert tortoise populations and designated critical habitat. These conditions satisfy the CDFW's requirements under Section 2081 of the California Fish and Game Code.

Staff's proposed Condition of Certification **BIO-13** requires implementation of a Raven Management and Monitoring Plan to address Project-related increases in ravens, a desert tortoise predator, as well as contributions to help fund a USFWS regional raven management program.

<u>Ephemeral Streams:</u> The Project would directly impact 359 acres of state jurisdictional waters, eliminating the hydrological, biogeochemical, and habitat functions of this network of ephemeral streams. As many as 32 acres of ephemeral streams downstream of the Project area could also be indirectly impacted to some degree Staff considers the direct, indirect, and cumulative impacts to ephemeral streams to be significant. Staff's proposed Condition of Certification **BIO-21** would minimize and offset direct and indirect impacts to state waters to less-than-significant levels and would assure compliance with CDFW codes that provide protection to these waters. **BIO-21** specifies acquisition of state waters within the Palen watershed, or adjacent watersheds within the Chuckwalla Valley basin at a 1:1 ratio for unvegetated ephemeral dry wash and at a 3:1 ratio for desert dry wash woodland.

<u>Impacts to Groundwater-Dependent Ecosystems</u>: The PSEGS would use 1,130acre feet/year (afy) of groundwater for the 39-month construction period and 201 afy for the 30 years of operation. Groundwater pumping during construction and operation for the approved PSPP project would have resulted in a drawdown of the water table between 0.1 and 5 feet in an area that contains groundwater-dependent ecosystems such as mesquite groves and desert sink scrubs. The affected area would extend approximately 2 miles out from each well during construction, and includes the sensitive habitats along the southwestern margins of Palen Lake. By the end of operation the affected area would have extended to a 4-mile radius, to the Chuckwalla Valley Dune Thicket Area of Critical Environmental Concern on the southeastern side of Palen Lake; however, the drawdown at that distance would be minor, even under a worst-case analysis assuming no basin recharge. However, the PSEGS would use substantially less water during construction (i.e., 1,130 afy for PSEGS vs. 5,750 afy for PSPP) and operation (i.e., 201 afy for PSEGS vs. 300 afy for PSPP). As a result for the PSEGS staff expects the drawdown of ground water to be lower.

Staff anticipates that groundwater-dependent vegetation could experience significant adverse effects if the spring baseline water table drops below the effective rooting depth of the plants. It is uncertain what the maximum rooting depth is and the extent to which these plants depend on groundwater (versus surface flows or precipitation). Consequently, staff is requiring monitoring of groundwater levels and of groundwater-dependent vegetation in proposed Condition of Certification **BIO-23.** If the monitoring detects adverse effects as described in **BIO-23**, remedial action and compensatory mitigation would be implemented as described in proposed Condition of Certification

BIO-24. With implementation of these mitigation measures the Project impacts to groundwater-dependent plant communities would be reduced to less-than-significant levels.

Special-Status Plants: No federal- or state-listed plant species occur within the Project Disturbance Area, but three unlisted species of special-status plants were detected within the disturbance area during the spring 2010 surveys: Harwood's milk-vetch, a California Rare Plant Rank (RPR) List 2 species, California ditaxis (RPR 3), and ribbed cryptantha (RPR 4 "watch list" species). Harwood's milk-vetch and California ditaxis are also CNDDB State Rank 2, meaning that they are documented from fewer than 20 viable occurrences statewide. Impacts to Harwood's milk-vetch were considered less than significant due to the small numbers of plants impacted by the PSEGS project. Staff considers impacts to California ditaxis and ribbed cryptantha to be significant absent mitigation. Staff's proposed Condition of Certification **BIO-19** describes measures for avoiding and minimizing effects to avoided occurrences of California ditaxis, ribbed cryptantha, and other special-status plants occurring within 100 feet of the project boundary, and guidelines for minimizing direct effects along Project linears. **BIO-19** also contains guidelines for conducting fall 2013 botanical surveys, triggers for mitigation, and detailed specifications and performance standards to ensure that any additional special-status plants that would have been missed during the previous spring and fall surveys would be mitigated to a less-than-significant level.

Migratory Birds: Implementation of the proposed PSEGS project will result in the direct loss of foraging habitat for resident and migratory birds. Desert dry wash woodland, Sonoran creosote bush scrub and other habitat within the Project Area provides foraging, cover, and/or breeding habitat for migratory birds, including a number of state and federally listed bird species potentially occurring at the site (Swainson's hawk, Yuma clapper rail, bald and golden eagle, gilded flicker, gila woodpecker), as well as various species of special concern (western burrowing owl, short-eared owl, Prairie falcon, yellow warbler, Leconte's thrasher). Operation of the facility is expected to result in the mortality or morbidity of birds from collisions and exposure to elevated levels of solar flux. Migratory birds and their eggs and young are protected by the federal Migratory Bird Treaty Act and Fish and Game Code section 3503. Construction and operation of the Project or its alternatives could result death or injury of these birds. Staff's proposed Conditions of Certification **BIO-8** (Impact Avoidance and Best Management Practices), **BIO-15** (Pre-construction Nest Surveys), and **BIO-16b** (Avian Protection Plan) would avoid these potentially significant impacts to migratory birds. Potential impacts to burrowing owls would be mitigated by implementation of staff's proposed Condition of Certification **BIO-18.** This condition involves passive relocation of burrowing owls, as well as acquisition of 78 acres of off-site compensatory mitigation lands suitable for burrowing owl. **BIO-16b** requires surveys for nesting golden eagles within one mile of project boundaries, as well as monitoring of the project site for sublethal injury or mortality, and requires funding for a menu of habitat restoration and enhancement measures that would benefit migratory birds. Additionally, **BIO-16b** requires implementation of power line retrofits that would lessen the risk of electrocution for large raptors such as bald and golden eagles, and Swainson's hawk (**BIO-16a**). Conditions of certification **BIO-12** and **BIO-21** would mitigate for the loss of foraging habitat at the project site by requiring the acquisition of desert tortoise habitat and desert dry washes, which would provide forage and potential migratory stopover resting and shelter sites for birds.

Staff has adopted portions of the recommended mitigation approach provided by the project owner to off-set potential impact to birds from operation of the facility. The approach includes funding the retrofit and enhancement of existing utility lines and the dedication of funds to provide for migratory bird conservation. Staff recommends the project owner increase the amount of the endowment from $500,000.00 to $1,500,000.00. Dedication of this amount would provide an annual stipend that would be used to fund conservation activities during the operational life of the facility. At the conclusion of operation, these funds would be returned to the project owner, provided they complied with applicable decommission activities.

Staff believes significant residual impacts to avian species would remain even after the implementation of the proposed Conditions of Certification.

<u>Burrowing Mammals</u> American badgers and desert kit fox occur throughout the Project area, and construction of the PSEGS is expected to result in direct effects to badgers and kit fox. Because of the large size of the project, badgers or kit foxes may be confined within the desert tortoise exclusion fence and subject to mortality from road kill, loss or alteration of foraging habitat, overlapping territories or barriers to dispersal. In order to construct the PSEGS, the project owner will passively relocate badgers and kit foxes form the site. State regulations (Fish and Game code) currently prohibit trapping of these species. Staff's revised proposed Condition of Certification **BIO-17,** which requires pre-construction surveys and avoidance measures to protect badgers and kit fox, would reduce project impacts to less than significant levels.

<u>Impacts to Sand Dunes/Mojave Fringe-toed Lizards:</u> The PSPP (Reconfigured Alternatives 2 and 3) would have had significant but mitigatable impacts to Mojave fringe-toed lizards, and would have generally avoided interference with the sand transport corridor. The PSEGS would directly affect 1,480 acres of Mojave fringe-toed lizard habitat. The majority of the direct impacts for the PSEGS would be in the less sensitive Zone 3 sand transport corridor. Indirect impacts would occur from increased vehicle traffic and the spread of invasive non-native species.

The Mojave fringe-toed lizards in the Chuckwalla Valley are at the southernmost portion of their range and the direct and indirect impacts of the PSEGS project would significantly increase the risk of local extirpation of already fragmented and isolated populations. Staff's proposed Condition of Certification **BIO-20** recommends acquisition, protection and enhancement of core populations of Mojave fringe-toed lizard habitat elsewhere in the Chuckwalla Valley. This compensatory mitigation would likely offset impacts of the PSEGS to less-than-significant levels.

<u>Cumulative Effects:</u> Construction and operation of the PSEGS Project would have cumulatively considerable impacts to many biological resources within the Chuckwalla Valley and NECO planning area, including: desert washes; Mojave fringe-toed lizard; desert tortoise habitat, movement and connectivity; golden eagle; burrowing owl; American badger and desert kit fox; LeConte's thrasher and other desert and migratory

birds; the Chuckwalla Valley dune system, desert wash woodland, groundwater-dependent ecosystems, and other natural communities, and special-status plants.

For all impacts except the migratory birds and golden eagles, the project's contribution to these effects would be minimized to a level less than cumulatively considerable with implementation of staff's proposed conditions of certification. These conditions include general and species-specific measures for avoidance, minimization, and compensation, detailed monitoring and reporting requirements, and mitigation security and verification to ensure implementation. Staff's proposed conditions address individually minor but cumulatively considerable effects and include measures to minimize the spread of invasive non-native plants, fragmentation, an increase in raven predation, increased roadkills, bird collisions, electrocutions, exposure to solar flux, increased disturbance from noise and lighting, fugitive dust, chemical drift, unauthorized ORV use of temporary access roads, and accidental impacts during construction and operation.

PROPOSED CONDITIONS OF CERTIFICATION

Staff has proposed modifications to the **(enter tech area)** conditions of certification as shown below. (**Note:** Deleted text is in ~~strikethrough~~, new text is **<u>bold and underlined</u>**).

The conditions of certification below are generally the same as those in the Commission Final Decision published in March 2010. However, staff has revised some of the conditions to reflect suggested changes and additional information from the project owner and other parties, .changes from the approved project to the PSEGS project, and from new information available since the publication of the RSA in 2010 **Biological Resources Table 11** summarizes the changes to conditions of certification from the Commission Final Decision.

Biological Resources Table 11
Summary of Changes to Conditions of Certification

Condition of Certification	Changes from RSA to PSPP Commission Final Decision
BIO-1 Designated Biologist Selection and Qualifications	Changed the timing of verification for the submittal of Designated Biologist resume from 30 days to 90 days to allow approval prior submittal of plans which require Designated Biologist review; clarified the verification timing to prior to pre-construction site mobilization.
BIO-2 Designated Biologist Duties	Clarified timing of performance of Designated Biologist monitoring activities to include operations; revised duties to address recent guidance regarding desert kit fox mortality reporting in response to outbreak of canine distemper in the region; revised duties regarding addressing standing water in response to lessons learned on other solar projects in region.
BIO-3 Biological Monitor Selection and Qualifications	Clarified the Designated Biologist must be approved prior to submitting Biological Monitor resumes; changed the timing of verification for the submittal of Biological Monitor resume from 30 days to 60 days to allow approval prior to performance of required pre-construction surveys; clarified the verification timing to prior to pre-construction site mobilization.
BIO-4 Biological Monitor Duties	Clarified timing of performance of Biological Monitor monitoring activities to include operation and closure activities.
BIO-5 Designated Biologist and Biological Monitor Authority	No change.

Condition of Certification	Changes from RSA to PSPP Commission Final Decision
BIO-6 Worker Environmental Awareness Program	Clarified role of party responsible for developing WEAP; clarified training requirements to address providing more pertinent information regarding special-status species; modified content of training to address solar flux impacts during operations; clarified reporting of WEAP training; updated name of California Department of Fish and Game (CDFG) to California Department of Fish and Wildlife (CDFW); changed the timing of verification for the submittal of WEAP from 30 days to 60 days to allow approval prior to performance of required pre-construction surveys; clarified the verification timing to prior to pre-construction site mobilization.
BIO-7 Biological Resources Mitigation Implementation & Monitoring Plan	Added the American Badger and Kit Fox Management Plan to list of plans to be included in BRMIMP; added requirements to address canine distemper outbreak in regional desert kit fox population and issues with standing water on other solar projects in construction; added standard requirement to provide aerial photographs prior to disturbance and post-construction; changed the timing of verification for the submittal of draft BRMIMP from 30 days to 60 days and final BRMIMP from 7 days to 30 days to allow approval prior to performance of required pre-construction surveys; clarified the verification timing to prior to pre-construction site mobilization; updated name of CDFG to CDFW;
BIO-8 Impact Avoidance and Minimization Measures	Clarified drivers during project construction and operation shall abide posted speed limits on paved roads; clarified wildlife salvage requirements to address canine distemper outbreak in regional desert kit fox populations; added additional requirements regarding use of toxic substances; clarified guidance in most recent USFWS Desert Tortoise Field Manual will be followed; added reporting and handling requirements for desert kit fox in response to recent canine distemper outbreak in regional population; add requirements to address noxious weeds to address impacts from leaving vegetation on site during project development and operations; added requirements to address impacts related to fugitive dust;
BIO-9 Desert Tortoise Clearance Surveys and Fencing	Clarified proposed alignments for permanent or temporary fencing shall be flagged; clarified guidance in most recent USFWS Desert Tortoise Field Manual will be followed; updated name of CDFG to CDFW.
BIO-10 Desert Tortoise Relocation/Translocation Plan	Revised to include requirement to submit revised draft plan based to incorporate changes to the project from the PSPP.
BIO-11 Desert Tortoise Compliance Verification	Updated CDFG to CDFW.
BIO-12 Desert Tortoise Compensatory Mitigation	Clarified that ground disturbance includes pre-construction site mobilization
BIO-13 Raven Management Plan	Revised to include requirement to submit revised draft plan based to incorporate changes to the project from the PSPP. Clarified that ground disturbance includes pre-construction site mobilization
BIO-14 Weed Management Plan	No change.
BIO-15 Pre-Construction Nest Surveys	No change.
BIO-16 Avian Protection Plan	Now revised into two parts, **BIO-16a** and **BIO-16b**. Now titled Avian Enhancement and Conservation Plan
BIO-16b	Avian and Bat Protection Plan
BIO-17 Badger and Kit Fox Avoidance and Minimization Measures-	Approved language deleted in its entirety. Extensively revised and expanded to address recent issues with canine distemper outbreak in desert kit fox populations in region of project.
BIO-18 Burrowing Owl Impact Avoidance and Minimization Measures	Incorporated project owner proposed edits. Incorporated CDFW Staff Report on Burrowing Owl (2012) requirements.

Condition of Certification	Changes from RSA to PSPP Commission Final Decision
BIO-19 Special-Status Plant Impact Avoidance and Minimization	Updated fall plant survey requirements from 2010 to 2013
BIO-20 Sand Dune Community/Mojave Fringe-Toed Lizard Mitigation	No change
BIO-21 Mitigation for Impacts to State Waters	No change
BIO-22 Decommissioning Plan	No change.
BIO-23 Groundwater Dependent Vegetation Monitoring	Removed language referencing 2010 start date of construction
BIO-24 Remedial Action for Adverse Effects to Groundwater-dependent Biological Resources	No change
BIO-25 Golden Eagle Inventory and Monitoring	Staff has adapted the tenets of the Golden Eagle Inventory and Monitoring Plan within the revised Condition of Certification **BIO-16**, Avian and Bat Protection Plan; and therefore has deleted this condition.
BIO-26 Evaporation Pond Netting and Monitoring	No change.
BIO-27 Revegetation of Temporarily Disturbed Areas	**BIO-27** deleted as part PSPP based on the revised **BIO-8** and **BIO-14** included in the Final Commission Decision for PSPP
BIO-28 In-Lieu Fee Mitigation Option	No change.
BIO-29 Phasing	Updated Tables 1-3 to include new impacts acreages and costs.

Compensatory mitigation securities, based on the REAT Biological Resources Mitigation/Compensation Cost Estimate Calculation Table dated July 23, 2010 (REAT 2010) (**Biological Resources Table 6b**) are included in **Biological Resources Table 22. Biological Resources Tables 23 and 24** include impacts and securities estimates based on a phased construction approach. Securities are subject to change based on updates to the REAT Biological Resources Table, and mitigation amounts are subject to change based on changes to the Project Disturbance Area impacts.

Biological Resources Table 12[1]
Compensatory Mitigation Securities

COC	Description	Security		
		PSEGS (proposed modified project)	PSPP Reconfigured Alternative 2 (approved project)	PSPP Reconfigured Alternative 3 (approved project)
BIO-12	Loss of desert tortoise habitat	$15,016,944	$16,169,290	$15,962,857
BIO-13	One-time USFWS Regional Raven Management Program fee[2]	$414,414	$458,430	$454,650
BIO-18	Impacts to burrowing owls	$250,089	$255,330	$255,330
BIO-20	Loss of Mojave fringe-toed lizards and habitat	$5,725,152	$5,765,569	$6,002,358
BIO-21	Impacts to state waters	$2,337,616	$2,580,835	$2,433,275

1– Securities (aside from Raven fees) based on REAT Biological Resources Mitigation/Compensation Cost Estimate Calculation Table - July 23, 2010 (REAT 2010) but assuming 160-acre parcels. Security amounts may change based on final Project footprint. The final amount shall be determined by an updated appraisal conducted as described in **BIO-12.**
2 – Based on U.S. Fish and Wildlife Service Cost Allocation Methodology for Implementation of the Regional Raven Management Plan, dated July 9, 2010 (USFWS 2010b). Fee calculated at $105/acre for direct project impacts.

Biological Resources Table 13[1]
Compensatory Mitigation Acreage – Phased Approach

COC	Description	Compensatory Acreage		
		PSEGS (proposed modified project)	PSPP (approved project) Reconfigured Alternative 2	PSPP (approved project) Reconfigured Alternative 3
Phase 1				
BIO-12	Loss of desert tortoise habitat[2]		3263	3120
BIO-13	Acres subject to the one-time USFWS Regional Raven Management Program fee		2398	2271
BIO-18	Impacts to 4 burrowing owls		78	78
BIO-20	Loss of Mojave fringe-toed lizards and habitat		827	827
BIO-21	Impacts to state waters		713	680
Phase 2				
BIO-12	Loss of desert tortoise habitat[2]		1854	1929
BIO-13	One-time USFWS Regional Raven Management Program fee		1968	2059
BIO-18	Impacts to 4 burrowing owls		0	0
BIO-20	Loss of Mojave fringe-toed lizards and habitat		1060	1138
BIO-21	Impacts to state waters		101	91

1 – Sources: PSEGS project – estimate prepared by staff based on GIS files provide by Palen Solar Holdings (Palen 2013a)); Reconfigured Alternatives 2 and 3 - Solar Millennium 2010l.
2 – Impacts to desert tortoise critical habitat are assumed to be wholly within the Phase 1 Project Disturbance Area.
3 – Phase 1 impacts include some impacts that are indirect impacts of Phase 1, but direct impacts of Phase 2. Phase 2 impact acreages are adjusted to credit acreages already captured in Phase 1.

Biological Resources Table 14[1]
Compensatory Mitigation Securities – Phased Approach

COC	Description	Security: PSEGS (proposed modified project)	Security: PSPP (approved project) Reconfigured Alternative 2	Security: PSPP (approved project) Reconfigured Alternative 3
Phase 1				
BIO-12	Loss of desert tortoise habitat[2]	$5,144,608.00	$10,337,345	$9,884,387
BIO-13	One-time USFWS Regional Raven Management Program fee[3]	$100,390.50	$251,805	$238,430
BIO-18	Impacts to 4 burrowing owls [4]	$250,089.00	$255,330	$255,330
BIO-20	Loss of Mojave fringe-toed lizards and habitat[2]	$104,992.00	$2,529,118	$2,529,118
BIO-21	Impacts to state waters	$111,168.00	$2,257,200	$2,158,204
BIO-24	Remedial action for adverse effects to groundwater-dependent plants	Pending	Pending	Pending
Phase 2				
BIO-12	Loss of desert tortoise habitat[2]	$9,872,335.90	$5,892,485	$6,139,011
BIO-13	One-time USFWS Regional Raven Management Program fee[3]	$314,023.50	$206,625	$216,220
BIO-18	Impacts to 4 burrowing owls (78 acres of compensatory mitigation) [4]	0	0	0
BIO-20	Loss of Mojave fringe-toed lizards and habitat[2]	$5,620,160.00	$3,236,451	$3,473,241
BIO-21	Impacts to state waters	$2,226,448.00	$325,213	$293,641

1– Securities (aside from Raven fees) based on REAT Biological Resources Mitigation/Compensation Cost Estimate Calculation Table - July 23, 2010 (REAT 2010) but assuming 160-acre parcels. Security amounts may change based on final Project footprint. The final amount shall be determined by an updated appraisal conducted as described in **BIO-12.** Total securities for desert tortoise and state water mitigation under the phased approach may be higher than the lump sum total described in **Biological Resources Table 12**; some fees included in the REAT (2010) table are based on the number of transactions, which would be higher under the phased approach.
2 – Impacts to desert tortoise critical habitat are assumed to be wholly within the Phase 1 Project Disturbance Area.
3 – Based on U.S. Fish and Wildlife Service Cost Allocation Methodology for Implementation of the Regional Raven Management Plan, dated July 9, 2010 (USFWS 2010b). Fee calculated at $105/acre for direct project impacts.
4 –Phase 1 securities include some securities for impacts that are indirect impacts in Phase 1, but direct impacts of Phase 2. Phase 2 securities are adjusted to credit securities already captured in Phase 1.

DESIGNATED BIOLOGIST SELECTION AND QUALIFICATIONS[9]

BIO-1 The Project owner shall assign at least one Designated Biologist to the Project. The Project owner shall submit the resume of the proposed Designated Biologist(s), with at least three references and contact information, to the Energy Commission Compliance Project Manager (CPM) for approval in consultation with CDFG and USFWS.

The Designated Biologist must meet the following minimum qualifications:

1. Bachelor's degree in biological sciences, zoology, botany, ecology, or a closely related field;

2. Three years of experience in field biology or current certification of a nationally recognized biological society, such as The Ecological Society of America or The Wildlife Society;

3. Have at least one year of field experience with biological resources found in or near the Project area;

4. Meet the current USFWS Authorized Biologist qualifications criteria (www.fws.gov/ventura/speciesinfo/protocols_guidelines), demonstrate familiarity with protocols and guidelines for the desert tortoise, and be approved by the USFWS; and

5. Possess a California ESA Memorandum of Understanding pursuant to Section 2081(a) for desert tortoise.

In lieu of the above requirements, the resume shall demonstrate to the satisfaction of the CPM, in consultation with CDFG and USFWS, that the proposed Designated Biologist or alternate has the appropriate training and background to effectively implement the Conditions of Certification.

Verification: At least ~~30~~ **90** days prior to ~~construction-related ground disturbance~~ **pre-construction site mobilization**, the Project owner shall submit the resumes of the Designated Biologists(s) along with the completed USFWS Desert Tortoise Authorized Biologist Request Form (www.fws.gov/ventura/speciesinfo/protocols_guidelines) and submit it to the USFWS and the CPM for review and final approval.

No pre-construction site mobilization or construction-related ground disturbance, grading, boring, or trenching shall commence until an approved Designated Biologist is available to be on site.

If a Designated Biologist needs to be replaced, the specified information of the proposed replacement must be submitted to the CPM at least 10 working days prior to

[9] USFWS <www.fws.gov/ventura/speciesinfo/protocols_guidelines/docs/dt> designates biologists who are approved to handle tortoises as "Authorized Biologists." Such biologists have demonstrated to the USFWS that they possess sufficient desert tortoise knowledge and experience to handle and move tortoises appropriately, and have received USFWS approval. Authorized Biologists are permitted to then approve specific monitors to handle tortoises, at their discretion. The California Department of Fish and Game (CDFG) must also approve such biologists, potentially including individual approvals for monitors approved by the Authorized Biologist. **Designated Biologists are the equivalent of Authorized Biologists.** Only Designated Biologists and certain Biological Monitors who have been approved by the Designated Biologist would be allowed to handle desert tortoises

the termination or release of the preceding Designated Biologist. In an emergency, the Project owner shall immediately notify the CPM to discuss the qualifications and approval of a short-term replacement while a permanent Designated Biologist is proposed to the CPM for consideration.

DESIGNATED BIOLOGIST DUTIES

BIO-2 The Project owner shall ensure that the Designated Biologist performs the activities described below during any **pre-construction** site mobilization activities, construction-related ground disturbance, grading, boring, or trenching activities, **operation, or other activities**. The Designated Biologist may be assisted by the approved Biological Monitor(s) but remains the contact for the Project owner and the CPM. The Designated Biologist Duties shall include the following:

1. Advise the Project owner's Construction and Operation Managers on the implementation of the biological resources conditions of certification;
2. ~~Consult on the preparation of~~ **Approve and submit** the Biological Resources Mitigation Implementation and Monitoring Plan (BRMIMP) to be submitted by the Project owner;
3. Be available to supervise, conduct and coordinate mitigation, monitoring, and other biological resources compliance efforts, particularly in areas requiring avoidance or containing sensitive biological resources, such as special-status species or their habitat;
4. Clearly mark sensitive biological resource areas and inspect these areas at appropriate intervals for compliance with regulatory terms and conditions;
5. Inspect active construction areas where animals may have become trapped prior to construction commencing each day. At the end of the day, inspect for the installation of structures that prevent entrapment or allow escape during periods of construction inactivity. Periodically inspect areas with high vehicle activity (e.g., parking lots) for animals in harm’s way;
6. Notify the Project owner and the CPM of any non-compliance with any biological resources condition of certification;
7. Respond directly to inquiries of the CPM regarding biological resource issues;
8. **Determine and oversee implementation of remedial actions any time water has been observed standing onsite for 24 hours. The Designated Biologist shall initiate remedial methods no later than 24 hours after standing water has been observed on the project site. Remedial methods may include grading, pumping spraying, tilling, or any other means to disperse or ensure evaporation and/or absorption of standing water. Other remedial efforts may be determined in conjunction with CPM review and approval.**

Descriptions of remedial efforts, including photo documentation, and discussion of results of remedial efforts must be included in the Monthly Compliance Report;

9. **Respond immediately to reports of onsite kit fox mortality or injury, and to the extent possible, reports of dead or injured kit fox offsite and immediately adjacent the project boundaries or on access roads, notify the CDFW and CPM within 24 hours, and undertake restorative and/or disease prevention actions as specified within the American Badger and Kit Fox Management Plan, or as directed by the CDFW, with copies of all CDFW guidance provided to the CPM within 24 hours of receipt;**

10. Maintain written records of the tasks specified above and those included in the BRMIMP. Summaries of these records shall be submitted in the Monthly Compliance Report and the Annual Compliance Report;

11. Train the Biological Monitors as appropriate, and ensure their familiarity with the BRMIMP, Worker Environmental Awareness Program (WEAP) training, and USFWS guidelines on desert tortoise surveys and handling procedures <www.fws.gov/ventura/speciesinfo/protocols_guidelines>; and

12. Maintain the ability to be in regular, direct communication with representatives of CDFG, USFWS, and the CPM, including notifying these agencies of dead or injured listed species and reporting special-status species observations to the California Natural Diversity Database (CNDDB).

Verification: The Designated Biologist shall provide copies of all written reports and summaries that document biological resources compliance activities in the Monthly Compliance Reports submitted to the CPM. If actions may affect biological resources during operation a Designated Biologist shall be available for monitoring and reporting. During Project operation, the Designated Biologist shall submit record summaries in the Annual Compliance Report unless his or her duties cease, as approved by the CPM.

BIOLOGICAL MONITOR SELECTION AND QUALIFICATIONS

BIO-3 The **project owner's approved** Designated Biologist shall submit the resume, at least three references, and contact information of the proposed Biological Monitors to the CPM. The resume shall demonstrate, to the satisfaction of the CPM, the appropriate education and experience to accomplish the assigned biological resource tasks. The Biological Monitor is the equivalent of the USFWS designated Desert Tortoise Monitor (USFWS 2008).

Biological Monitor(s) training by the Designated Biologist shall include familiarity with the conditions of certification, BRMIMP, WEAP, and USFWS guidelines on desert tortoise surveys and handling procedures <www.fws.gov/ventura/speciesinfo/protocols_guidelines>.

Verification: The Project owner shall submit the specified information to the CPM for approval at least ~~30~~ **45** days prior to the start of any **pre-construction** site mobilization or construction-related ground disturbance, grading, boring, and trenching. The Designated Biologist shall submit a written statement to the CPM confirming that individual Biological Monitor(s) has been trained including the date when training was completed. If additional biological monitors are needed during construction the specified information shall be submitted to the CPM for approval at least 10 days prior to their first day of monitoring activities.

BIOLOGICAL MONITOR DUTIES

BIO-4 The Biological Monitors shall assist the Designated Biologist in conducting surveys and in monitoring of site mobilization activities, construction-related ground disturbance, fencing, grading, boring, trenching, **operation, and closure activities,** or reporting. The Designated Biologist shall remain the contact for the Project owner and the CPM.

Verification: The Designated Biologist shall submit in the Monthly Compliance Report to the CPM copies of all written reports and summaries that document biological resources compliance activities, including those conducted by Biological Monitors. If actions may affect biological resources during operation a Biological Monitor, under the supervision of the Designated Biologist, shall be available for monitoring and reporting.

DESIGNATED BIOLOGIST AND BIOLOGICAL MONITOR AUTHORITY

BIO-5 The Project owner's construction/operation manager shall act on the advice of the Designated Biologist and Biological Monitor(s) to ensure conformance with the biological resources conditions of certification. The Project owner shall provide Energy Commission staff with reasonable access to the Project site under the control of the Project owner and shall otherwise fully cooperate with the Energy Commission's efforts to verify the Project owner's compliance with, or the effectiveness of, mitigation measures set forth in the conditions of certification. The Designated Biologist shall have the authority to immediately stop any activity that is not in compliance with these conditions and/or order any reasonable measure to avoid take of an individual of a listed species. If required by the Designated Biologist and Biological Monitor(s) the Project owner's construction/operation manager shall halt all site mobilization, ground disturbance, grading, boring, trenching, and operation activities in areas specified by the Designated Biologist. The Designated Biologist shall:

1. Require a halt to all activities in any area when determined that there would be an unauthorized adverse impact to biological resources if the activities continued;

2. Inform the Project owner and the construction/operation manager when to resume activities; and

3. Notify the CPM if there is a halt of any activities and advise them of any corrective actions that have been taken or would be instituted as a result of the work stoppage. If the work stoppage relates to desert tortoise or any

other federal- or state-listed species, the Carlsbad Office of the USFWS and the Ontario Office of the CDFG shall also be notified.

If the Designated Biologist is unavailable for direct consultation, the Biological Monitor shall act on behalf of the Designated Biologist.

Verification: The Project owner shall ensure that the Designated Biologist or Biological Monitor notifies the CPM and BLM immediately (and no later than the morning following the incident, or Monday morning in the case of a weekend) of any non-compliance or a halt of any site mobilization, ground disturbance, grading, construction, or operation activities. If the non-compliance or halt to construction or operation relates to desert tortoise or any other federal- or state-listed species, the Project owner shall also notify Carlsbad Office of the USFWS and the Ontario Office of the CDFG at the same time. The Project owner shall notify the CPM of the circumstances and actions being taken to resolve the problem.

Whenever corrective action is taken by the Project owner, a determination of success or failure will be made by the CPM in consultation with BLM, USFWS and CDFG within 5 working days after receipt of notice that corrective action is completed, or the Project owner would be notified by the CPM that coordination with other agencies would require additional time before a determination can be made.

WORKER ENVIRONMENTAL AWARENESS PROGRAM (WEAP)

BIO-6 The ~~Project owner~~ **Designated Biologist** shall develop and implement a Project-specific Worker Environmental Awareness Program (WEAP) and shall secure approval for the WEAP from the CPM. The Project owner shall also provide the USFWS and CDFG a copy of all portions of the WEAP relating to desert tortoise and any other federal or state-listed species for review and comment. The WEAP shall be administered to all onsite personnel including surveyors, construction engineers, employees, contractors, contractor's employees, supervisors, inspectors, subcontractors, and delivery personnel. The WEAP shall be implemented during site preconstruction, construction, operation, and closure. The WEAP shall:

1. Be developed by or in consultation with the Designated Biologist and consist of an on-site or training center presentation in which supporting written material and electronic media, including photographs of protected species, is made available to all participants;

2. Discuss the locations and types of sensitive biological resources on the Project site and adjacent areas, and explain the reasons for protecting these resources; provide information to participants that no snakes or other wildlife shall be **intentionally** harmed **(unless posing a reasonable and immediate threat to humans)**;

3. Place special emphasis on desert tortoise, including information on physical characteristics, distribution, behavior, ecology, sensitivity to human activities, legal protection, penalties for violations, reporting requirements, and protection measures;

4. **Provide pictures of desert tortoise, golden eagles, American badger, kit fox, Mojave fringe-toed lizard, and burrowing owl, provide information on sensitivity to human activities, legal protection, reporting requirements, and how to identify construction avoidance zones for these species as marked by flagging, staking, or other means, also describe the protections for bird nests and provide information as described above;**

5. **Provide overview for staff of potential impacts to reptiles and amphibians from vehicle strikes on paved roads during construction operation phases, reporting requirements, and protection measures;**

6. **Provide overview [for operational staff] of potential impacts to avian species from concentrated solar flux created during operations phase, reporting requirements, and protection measures;**

7. Include a discussion of fire prevention measures to be implemented by workers during Project activities and request workers to: a) dispose of cigarettes and cigars appropriately and not leave them on the ground or buried, b) keep vehicles on graveled or well-maintained roads at all times to prevent vehicle exhaust systems from coming in contact with roadside weeds, c) use and maintain approved spark arresters on all power equipment, and d) keep a fire extinguisher on hand at all times

8. Describe the temporary and permanent habitat protection measures to be implemented at the Project site;

9. Identify whom to contact if there are further comments and questions about the material discussed in the program; and

10. Include a training acknowledgment form to be signed by each worker indicating that they received training and shall abide by the guidelines.

The specific program can be administered by a competent individual(s) acceptable to the Designated Biologist, **and documented within the Monthly Compliance Report.**

Verification: At least ~~30~~ **60** days prior to start of construction-related ground disturbance, the Project owner shall provide to the CPM for review and approval and to BLM, USFWS and **CDFW~~G~~CDFW~~G~~** a copy of the ~~final~~ WEAP and all supporting written materials and electronic media prepared or reviewed by the Designated Biologist and a resume of the person(s) administering the program.

The project owner shall provide in the Monthly Compliance Report the number of persons who have completed the training in the prior month and a running total of all persons who have completed the training to date. At least 10 days prior to **pre-construction site mobilization** ~~construction-related ground disturbance activities~~ the project owner shall submit two copies of the approved final WEAP **and implement the training for all workers**.

Training acknowledgement forms signed during construction shall be kept on file by the project owner for at least 6 months after the start of commercial operation.

Throughout the life of the project, the WEAP shall be repeated annually for permanent employees, and shall be routinely administered within 1 week of arrival to any new construction personnel, foremen, contractors, subcontractors, and other personnel potentially working within the project area. Upon completion of the orientation, employees shall sign a form stating that they attended the program and understand all protection measures. These forms shall be maintained by the project owner and shall be made available to the CPM, BLM, USFWS and **CDFW** and upon request. Workers shall receive and be required to visibly display a hardhat sticker or certificate that they have completed the training.

During Project operation, signed statements for operational personnel shall be kept on file for 6 months following the termination of an individual's employment.

BIOLOGICAL RESOURCES MITIGATION IMPLEMENTATION AND MONITORING PLAN

BIO-7 The Project owner shall develop a Biological Resources Mitigation Implementation and Monitoring Plan (BRMIMP), and shall submit two copies of the proposed BRMIMP to the CPM and BLM for review and approval and USFWS and CDFG for review. The Project owner shall implement the measures identified in the approved BRMIMP. The BRMIMP shall incorporate avoidance and minimization measures described in final versions of the Desert Tortoise Translocation Plan, the Raven Management Plan, the Closure, Conceptual Restoration Plan, **the American Badger and Kit Fox Management Plan,** the Burrowing Owl Mitigation and Monitoring Plan, the Weed Management Plan, and all other individual biological mitigation and/or monitoring plans associated with the Project. The Project owner shall provide to CDFG and USFWS a copy of all portions of the BRMIMP relating to desert tortoise and any other federal or state-listed species for review and comment.

The BRMIMP shall be prepared in consultation with the Designated Biologist and shall include accurate and up-to-date maps depicting the location of sensitive biological resources that require temporary or permanent protection during construction and operation. The BRMIMP shall include complete and detailed descriptions of the following:

1. All biological resources mitigation, monitoring, and compliance measures proposed and agreed to by the Project owner;

2. All biological resources conditions of certification identified as necessary to avoid or mitigate impacts;

3. All biological resource mitigation, monitoring, and compliance measures required in federal agency terms and conditions, such as those provided in the USFWS Biological Opinion;

4. All sensitive biological resources to be impacted, avoided, or mitigated by Project construction, operation, and closure;

5. All required mitigation measures for each sensitive biological resource, **including remedial actions for standing water onsite and known or suspected disease outbreaks on the project site**;

6. **Aerial photographs, at an approved scale, of all areas to be disturbed during project construction activities; include one set prior to any site or related facilities mobilization disturbance and one set subsequent to completion of project construction. Provide planned timing of aerial photography and a description of why times were chosen. Provide a final accounting of the before/after acreages and a determination of whether additional habitat compensation is necessary in the Construction Termination Report;**

7. All measures that shall be taken to avoid or mitigate temporary disturbances from construction activities;

8. Duration for each type of monitoring and a description of monitoring methodologies and frequency;

9. Performance standards to be used to help decide if/when proposed mitigation is or is not successful;

10. All performance standards and remedial measures to be implemented if performance standards are not met;

11. Biological resources-related facility closure measures including a description of funding mechanism(s);

12. A process for proposing plan modifications to the CPM and appropriate agencies for review and approval; and

13. A requirement to submit any sightings of any special-status species that are observed on or in proximity to the Project site, or during Project surveys, to the CNDDB per CDFG and BLM requirements.

Verification: The Project owner shall submit the draft BRMIMP to the CPM and BLM at least ~~30~~ **60** days prior to start of any preconstruction site mobilization and construction-related ground disturbance, grading, boring, and trenching. At the same time the Project owner shall provide to CDFG and USFWS a copy of all portions of the draft BRMIMP relating to desert tortoise and any other federal or state-listed species. The Project owner shall provide final BRMIMP to the CPM, BLM, CDFG and USFWS at least ~~7~~ **30** days prior to start of any **preconstruction site mobilization and** construction-related ground disturbance, grading, boring, and trenching. The BRMIMP shall contain all of the required measures included in all biological conditions of certification. No **preconstruction site mobilization or**~~-~~construction-related ground disturbance, grading, boring, or trenching may occur prior to approval of the final BRMIMP by the CPM and BLM.

If any permits have not yet been received when the final BRMIMP is submitted, these permits shall be submitted to the CPM within 5 days of their receipt, and the BRMIMP shall be revised or supplemented to reflect the permit condition(s). The Project owner shall submit to the CPM and BLM the revised or supplemented BRMIMP within 10 days following the Project owner's receipt of any additional permits. Under no circumstances shall ground disturbance proceed without implementation of all permit conditions.

To verify that the extent of construction disturbance does not exceed that described in these conditions, the Project owner shall submit aerial photographs, at an approved scale, taken before and after construction to the CPM, BLM, USFWS and CDFG. The first set of aerial photographs shall reflect site conditions prior to any preconstruction site mobilization and construction-related ground disturbance, grading, boring, and trenching, and shall be submitted prior to initiation of such activities. The second set of aerial photographs shall be taken subsequent to completion of construction, and shall be submitted to the CPM, BLM, USFWS and CDFG no later than 90 days after completion of construction. The Project owner shall also provide a final accounting in whole acres of vegetation communities/cover types present before and after construction. Construction acreages shall be rounded to the nearest acre.

Any changes to the approved BRMIMP must be approved by the CPM and BLM in consultation with CDFG and USFWS.

Implementation of BRMIMP measures (for example, construction activities that were monitored, species observed) shall be reported in the Monthly Compliance Reports by the Designated Biologist. Within 30 days after completion of Project construction, the Project owner shall provide to the CPM, for review and approval, a written construction termination report identifying which items of the BRMIMP have been completed, a summary of all modifications to mitigation measures made during the Project's preconstruction site mobilization and construction-related ground disturbance, grading, boring, and trenching, and which mitigation and monitoring items are still outstanding.

IMPACT AVOIDANCE AND MINIMIZATION MEASURES

BIO-8 The Project owner shall undertake the following measures to manage the Project site and related facilities during construction, operation and maintenance in a manner to avoid or minimize impacts to biological resources:

1. Limit Disturbance Areas. Minimize soil disturbance by locating staging areas, laydowns, and temporary parking or storage for linears in existing disturbed areas. Equipment maintenance and refueling shall not be conducted within 100 feet of any sensitive resource (for example, waters of the state, desert dry wash woodland, dune habitats and rare plant populations). Limit the width of the work area near sensitive resources. Avoid blading temporary access roads where feasible and instead drive over and crush the vegetation to preserve the seed bank and biotic soil crusts. The boundaries of all areas to be disturbed (including staging areas, access roads, and sites for temporary placement of spoils) shall be delineated with stakes and flagging prior to construction activities in consultation with the Designated Biologist. Spoils and topsoil shall be

stockpiled in disturbed areas lacking native vegetation and which do not provide habitat for special-status species. Parking areas, staging and disposal site locations shall similarly be located in areas without native vegetation or special-status species habitat. All disturbances, Project vehicles and equipment shall be confined to the flagged areas.

2. Minimize Road Impacts. New and existing roads that are planned for construction, widening, or other improvements shall not extend beyond the flagged impact area as described above. All vehicles passing or turning around would do so within the planned impact area or in previously disturbed areas. Where new access is required outside of existing roads or the construction zone, the route shall be clearly marked (i.e., flagged and/or staked) prior to the onset of construction.

3. Minimize Traffic Impacts. Vehicular traffic during Project construction and operation shall be confined to existing routes of travel to and from the Project site, and cross country vehicle and equipment use outside designated work areas shall be prohibited. The speed limit shall not exceed 25 miles per hour within the Project area, on maintenance roads for linear facilities, or on access roads to the Project site. **Vehicles shall abide by posted speed limits on paved roads.** Monitor During Construction. ~~In areas that have not been fenced with desert tortoise exclusion fencing and cleared, the~~ **The** Designated Biologist shall be present at the construction site during all Project activities that have potential to disturb soil, vegetation, and wildlife. The Designated Biologist or Biological Monitor shall clear ahead of equipment during brushing and grading activities. If desert tortoises are found during construction monitoring, procedures outlined in **BIO-9** shall be implemented.

4. **Salvage Wildlife during Clearing and Grubbing. The Designated Biologist or Biological Monitor shall salvage and relocate sensitive wildlife during clearing and grading operations. The species shall be salvaged when conditions will not jeopardize the health and safety of the monitor and relocated off-site habitat.**

5. Minimize Impacts of Transmission/Pipeline Alignments, Roads, and Staging Areas. Staging areas for construction on the plant site shall be within the area that has been fenced with desert tortoise exclusion fencing and cleared. For construction activities outside of the plant site (transmission line, pipeline alignments) access roads, pulling sites, and storage and parking areas shall be designed, installed, and maintained with the goal of minimizing impacts to native plant communities and sensitive biological resources. Transmission lines and all electrical components shall be designed, installed, and maintained in accordance with the Avian Power Line Interaction Committee's (APLIC's) *Suggested Practices for Avian Protection on Power Lines* (APLIC 2006) and *Mitigating Bird Collisions with Power Lines* (APLIC 1994) to reduce the likelihood of large bird electrocutions and collisions. Where feasible avoid impacts to desert washes and special-status plants by adjusting the

locations of poles and laydown areas, and the alignment of the roads and pipelines. Construction drawings and grading plans shall depict the locations of sensitive resources and demonstrate where temporary impacts to sensitive resources can be avoided and where they cannot.

6. Avoid Use of Toxic Substances. Soil bonding and weighting agents used on unpaved surfaces shall be non-toxic to wildlife and plants. **Anticoagulants shall not be used for rodent control. Pre-emergents and other herbicides with documented residual toxicity shall not be used. Herbicides shall be applied in conformance with federal, State, and local laws and according to the guidelines for wildlife-safe use of herbicides in BIO-14 (Weed Management Plan).**

7. Minimize Lighting Impacts. Facility lighting shall be designed, installed, and maintained to prevent side casting of light towards wildlife habitat.

8. Minimize Noise Impacts. A continuous low-pressure technique shall be used for steam blows, to the extent possible, in order to reduce noise levels in sensitive habitat proximate to the Project site. Loud construction activities (e.g., unsilenced high pressure steam blowing, pile driving, or other) shall be avoided from February 15 to April 15, when it would result in noise levels over 65 dBA in nesting habitat (excluding noise from passing vehicles). Loud construction activities may be permitted from February 15 to April 15 only if:

   a. The Designated Biologist provides documentation (i.e., nesting bird data collected using methods described in **BIO-15** and maps depicting location of the nest survey area in relation to noisy construction) to the CPM indicating that no active nests would be subject to 65 dBA noise, OR

   b. The Designated Biologist or Biological Monitor monitors active nests within the range of construction-related noise exceeding 65 dBA. The monitoring shall be conducted in accordance with Nesting Bird Monitoring and Management Plan approved by the CPM. The Plan shall include adaptive management measures to prevent disturbance to nesting birds from construction related noise. Triggers for adaptive management shall be evidence of Project-related disturbance to nesting birds such as: agitation behavior (displacement, avoidance, and defense); increased vigilance behavior at nest sites; changes in foraging and feeding behavior, or nest site abandonment. The Nesting Bird Monitoring and Management Plan shall include a description of adaptive management actions, which shall include, but not be limited to, cessation of construction activities that are deemed by the Designated Biologist to be the source of disturbance to the nesting bird.

9. Avoid Vehicle Impacts to Desert Tortoise. Parking and storage shall occur within the area enclosed by desert tortoise exclusion fencing to the extent feasible. No vehicles or construction equipment parked outside the fenced

area shall be moved prior to an inspection of the ground beneath the vehicle for the presence of desert tortoise. If a desert tortoise is observed outside the areas fenced with desert tortoise exclusion fencing it shall be left to move on its own. If it does not move within 15 minutes, a Designated Biologist or Biological Monitor under the Designated Biologist's direct supervision may move it out of harms way as described in the USFWS Desert Tortoise Field Manual (USFWS 2009a)

10. Install Box Culvert. To provide for connectivity for desert tortoise and other wildlife, the Project owner shall install a box culvert suitable for passage by desert tortoise and other wildlife under the Project Site Access Road. The box culvert shall be a concrete structure no less than 4 feet high and 6 feet wide with 3:1 side slopes and shall maintain a minimum of 18 inches of native material on the floor of the culvert at all times to facilitate tortoise movement.

11. Avoid Wildlife Pitfalls. To avoid trapping desert tortoise and other wildlife in trenches, pipes or culverts, the following measures shall be implemented:

    a. Backfill Trenches. At the end of each work day, the Designated Biologist shall ensure that all potential wildlife pitfalls (trenches, bores, and other excavations) outside the area fenced with desert tortoise exclusion fencing have been backfilled. If backfilling is not feasible, all trenches, bores, and other excavations shall be sloped at a 3:1 ratio at the ends to provide wildlife escape ramps, or covered completely to prevent wildlife access, or fully enclosed with desert tortoise-exclusion fencing. All trenches, bores, and other excavations outside the areas permanently fenced with desert tortoise exclusion fencing shall be inspected periodically throughout the day, at the end of each workday, and at the beginning of each day by the Designated Biologist or a Biological Monitor. Should a tortoise or other wildlife become trapped, the Designated Biologist or Biological Monitor shall move the tortoise out of harm's way as described in the **most recent** USFWS Desert Tortoise Field Manual (**currently** USFWS 2009a). Any wildlife encountered during the course of construction shall be allowed to leave the construction area unharmed.

    b. Avoid Entrapment of Desert Tortoise. Any construction pipe, culvert, or similar structure with a diameter greater than 3 inches, stored less than 8 inches aboveground and within desert tortoise habitat (i.e., outside the permanently fenced area) for one or more nights, shall be inspected for tortoises before the material is moved, buried or capped. As an alternative, all such structures may be capped before being stored outside the fenced area, or placed on elevated pipe racks. These materials would not need to be inspected or capped if they are stored within the permanently fenced area after the clearance surveys have been completed.

12. Minimize Standing Water. Water applied to dirt roads and construction areas (trenches or spoil piles) for dust abatement shall use the minimal

amount needed to meet safety and air quality standards in an effort to prevent the formation of puddles, which could attract desert tortoises and common ravens to construction sites. A Biological Monitor shall patrol these areas to ensure water does not puddle and shall take appropriate action to reduce water application where necessary.

13. Dispose of Road-killed Animals. Road killed animals or other carcasses detected by personnel on roads associated with the Project area will be reported immediately to a Biological Monitor or Designated Biologist (or Project Environmental Compliance Monitor, during Project operations), who will promptly remove the roadkill. For special-status species road-kill, the Biological Monitor or Designated Biologist (or Project Environmental Compliance Monitor, during Project operations) shall contact CDFG and USFWS within 1 working day of detection **(immediately in the case of a desert kit fox)** of the carcass for guidance on disposal or storage of the carcass; all other road kill shall be disposed of promptly. **Handling of desert kit fox carcasses shall follow handling requirements included in the BIO-18 American Badger and Kit Fox Management Plan.** The Biological Monitor shall provide the special-status species record as described in **BIO-11** below.

14. Minimize Spills of Hazardous Materials. All vehicles and equipment shall be maintained in proper working condition to minimize the potential for fugitive emissions of motor oil, antifreeze, hydraulic fluid, grease, or other hazardous materials. The Designated Biologist shall be informed of any hazardous spills immediately as directed in the Project Hazardous Materials Plan. Hazardous spills shall be immediately cleaned up and the contaminated soil properly disposed of at a licensed facility. Servicing of construction equipment shall take place only at a designated area. Service/maintenance vehicles shall carry a bucket and pads to absorb leaks or spills.

15. Worker Guidelines. During construction all trash and food-related waste shall be placed in self-closing containers and removed daily from the site. Workers shall not feed wildlife or bring pets to the Project site. Except for law enforcement personnel, no workers or visitors to the site shall bring firearms or weapons. ~~Vehicular traffic shall be confined to existing routes of travel to and from the Project site, and cross country vehicle and equipment use outside designated work areas shall be prohibited. The speed limit when traveling on dirt access routes within desert tortoise habitat shall not exceed 25 miles per hour.~~

16. Avoid Spread of Noxious Weeds. The project owner shall implement the following Best Management Practices during construction and operation, and all other measures as required in the final approved Weed Management Plan (BIO-14) to prevent the spread and propagation of noxious weeds and other invasive plants:

a. Limit the size of any vegetation and/or ground disturbance to the absolute minimum and limit ingress and egress to defined routes;

b. **Prevent spread of non-native plants via vehicular sources by implementing Trackclean™ or other methods of vehicle cleaning for vehicles coming and going from construction sites. Earth-moving equipment shall be cleaned prior to transport to the construction site; and**

c. **Use only weed-free straw, hay bales, and seed for erosion control and sediment barrier installations.**

17. Implement Sediment Control Measures Near Desert Washes. Standard erosion control measures shall be implemented for all phases of construction and operation where sediment run-off from exposed slopes threatens to enter waters of the state. Sediment and other flow-restricting materials shall be moved to a location where they shall not be washed back into the stream. Areas of disturbed soils (access and staging areas) which slope toward drainages shall be stabilized to reduce erosion potential.

18. Monitor Ground Disturbing Activities Prior to Pre-Construction Site Mobilization. If pre-construction site mobilization requires ground-disturbing activities such as for geotechnical borings or hazardous waste evaluations, a Designated Biologist or Biological Monitor shall be present to monitor any actions that could disturb soil, vegetation, or wildlife.

19. **Control and Regulate Fugitive Dust. To reduce the potential for the transmission of fugitive dust the owner shall implement dust control measures. These shall include**:

    a. **The owner shall apply non-toxic soil binders, equivalent or better in efficiencies than the CARB- approved soil binders, to active unpaved roadways, unpaved staging areas, and unpaved parking area(s) throughout construction to reduce fugitive dust emissions.**

    b. **Water the disturbed areas of the active construction if uncontrolled fugitive dust is noted.**

    c. **Increase the frequency of watering, if water is used as a soil binder for disturbed surfaces, or implement other additional fugitive dust mitigation measures, to all active disturbed fugitive dust emission sources when wind speeds (as instantaneous wind gusts) exceed 25 mph.**

~~20. Control Unauthorized Use of the Project Access Roads. The secondary access road shall be gated at both ends and restricted to emergency response personnel as per proposed~~ ~~**COC WORKER SAFETY-6**~~~~. The Project owner shall also monitor and control any unauthorized use of the Project roads with gates, signage, and fencing as necessary to minimize traffic-related roadkills and ORV disturbance off-roads.~~

21. Implement Erosion Control Measures. All disturbed soils and roads within the Project site shall be stabilized to reduce erosion potential, both during and following construction. All areas subject to temporary disturbance shall be restored to pre-project grade and stabilized to prevent erosion and promote natural revegetation. Temporarily disturbed areas within the Project area include, but are not limited to: linear facilities, temporary access roads, temporary lay-down and staging areas. If erosion control measures include the use of seed, only locally native plant species from a local seed source shall be used. Local seed includes seeds from plants within the Chuckwalla Valley or Colorado River Hydrologic Units.

22. Avoid Spreading Weeds. Prior to the start of construction, flag and avoid dense populations of highly invasive noxious weeds. If these areas cannot be avoided, they shall be pre-treated by the methods described in **BIO-14** (Weed Management Plan). Noxious weeds and other invasive non-native plants in the temporarily disturbed areas shall be managed according to the requirements in BIO-14.

21. Salvage Topsoil. Topsoil from the Project site shall be salvaged, preserved and re-used for restoration of temporarily disturbed areas. Salvaged topsoil shall be collected, stored and applied in a way that maintains the viability of seed and soil crusts. The Project owner shall excavate and collect the upper soil layer (the top 1 to 2 inches that includes the seed bank and biotic soil crust) as well as the lower soil layer up to a depth of 6 to 8 inches. The upper and lower soil layers shall be stockpiled separately in areas that will not be impacted by other grading, flooding, erosion, or pollutants. If the soil is to be stored more than 2 weeks it shall be spread out to a depth of no more than 6 inches to maintain the seed and soil crust viability. The Project owner shall install temporary construction fencing around stockpiled topsoil, and signage that indicates whether the pile is the upper layer seed bank, or the lower layer, and clearly indicates that the piles are for use only in erosion control. After construction, the Project owner shall replace the topsoil in the temporarily disturbed areas in the reverse order of stockpiling, starting with the 6-8 inch layer of subsoil, and then the seed-containing upper layer using a harrow or similar equipment to thinly distribute the layer to depths no greater than 1 to 2 inches.

22. Decommission Temporary Access Roads with Vertical Mulching. Discourage ORV use of temporary construction roads by installing vertical mulching at the head of the road to a distance necessary to obscure the road from view. Boulder barricades and gates shall not be used unless the remainder of the site is fenced to prevent driving around the gate or barricade. Designated ORV routes and roads shall not be closed.

Verification: All mitigation measures and their implementation methods shall be included in the BRMIMP and implemented. Implementation of the measures shall be reported in the Monthly Compliance Reports by the Designated Biologist. Within 30 days after completion of Project construction, the Project owner shall provide to the CPM, for review and approval, a written construction termination report identifying how measures have been completed. As part of the Annual Compliance Report, each year following construction the Designated Biologist shall provide a report to the CPM that describes compliance with avoidance and minimization measures to be implemented during operation (for example, a summary of the incidence of roadkilled animals during the year, implementation of measures to avoid toxic spills, erosion and sedimentation, efforts to enforce worker guidelines, etc.).

No less than 30 days prior to construction-related ground disturbance the Project owner shall provide the CPM, USFWS and CDFG with plans showing the design of a culvert under the Project Site Access Road that would provide access for desert tortoise and other wildlife. No less than 30 days after of completion of construction of the Project site access road the Project owner shall provide as-built drawings of the culvert.

If loud construction activities are proposed between February 15 to April 15 which would result in noise levels over 65 dBA in nesting habitat, the Project owner shall submit nest survey results (as described in 8a) to the CPM no more than 7 days before initiating such construction. If an active nest is detected within this survey area the Project owner shall submit a Nesting Bird Monitoring and Management Plan to the CPM for review and approval no more than 7 days before initiating noisy construction.

DESERT TORTOISE CLEARANCE SURVEYS AND FENCING

BIO-9 The project owner shall undertake appropriate measures to manage the project site and related facilities in a manner to avoid or minimize impacts to desert tortoise**.** Methods for clearance surveys, fence specification and installation, tortoise handling, artificial burrow construction, egg handling and other procedures shall be consistent with those described in the USFWS' Desert Tortoise Field Manual (USFWS 2009) http://www.fws.gov/ventura/speciesinfo/protocols_guidelines or more current guidance provided by CDFw and USFWS. The project owner shall also implement all terms and conditions described in the Biological Opinion prepared by USFWS. The project owner shall implement the following measures:

1. Desert Tortoise Fencing along Interstate 10. To avoid increases in vehicular-related mortality from disruption of local movement patterns along the existing ephemeral wash systems, permanent desert tortoise-proof fencing shall be installed along the existing freeway right-of-way fencing, on both sides of Interstate 10 (I-10) between the wash on the westernmost end of the proposed Project site and the easternmost wash associated with the proposed Project site (labeled as #10 and #12 in Wildlife Movement and Desert Tortoise Habitat [tn56755], AECOM 2010f). The project owner shall secure approval from California Department of Transportation (Caltrans) for the installation and maintenance of desert tortoise exclusion fencing prior to construction or repair. If either Reconfigured Alternative 2 or Reconfigured Alternative 3 is selected, the fence shall extend from the westernmost wash (#10) to the wash immediately east of the alternative disturbance area (#13). The tortoise fencing shall be designed to direct tortoises to existing undercrossing to provide safe passage under the freeway, and shall be inspected per 2.d. and maintained for the life of the Project.

2. Desert Tortoise Exclusion Fence Installation. To avoid impacts to desert tortoises, permanent exclusion fencing shall be installed along the permanent perimeter security fence (boundaries) as phases are constructed. Temporary fencing shall be installed along any subset of the plant site phasing that does not correspond to permanent perimeter fencing. Temporary fencing shall be installed along linear features unless a Biological Monitor is present in the immediate vicinity of construction activities for the linear facility. All **proposed alignments for permanent or temporary** fencing shall be flagged and surveyed within 24 hours prior to the initiation of fence construction. Clearance surveys of the desert tortoise exclusionary fence and utility rights-of-way alignments shall be conducted by the Designated Biologist(s) using techniques outlined in the Desert Tortoise Field Manual (USFWS 2009), or more recent guidance approved by the CPM, and may be conducted in any season with USFWS and CDFW approval. Biological Monitors may assist the Designated Biologist under his or her supervision. These fence clearance surveys shall provide 100-percent coverage of all areas to be disturbed and an additional transect along both sides of the fence line. Disturbance associated with desert tortoise exclusionary fence construction shall not exceed 30 feet on either side of the proposed fence alignment. Prior to the surveys the project owner shall provide to the CPM, CDFW and USFWS a figure clearly depicting the limits of construction disturbance for the proposed fence installation. The fence line survey area shall be 90 feet wide centered on the fence alignment. Where construction disturbance for fence line installation can be limited to 15 feet on either side of the fence line, this fence line survey area may be reduced to an area approximately 60 feet wide centered on the fence alignment. Transects shall be no greater than 15 feet apart. For the I-10 desert tortoise exclusion fence, the Project Owner may have a Designated Biologist present to clear ahead of fence construction and be present in the immediate vicinity of fence installation activities. Desert tortoise located within the utility ROW alignments shall be moved out of harm's way in accordance with the USFWS Desert Tortoise Field Manual (USFWS 2009), or more recent guidance approved by the CPM. Any desert tortoise detected during clearance surveys for fencing within the plant site and along the perimeter fence alignment shall be translocated and monitored in accordance with the Desert Tortoise Relocation/Translocation Plan (BIO-10). Tortoise shall be handled by the Designated Biologist(s) in accordance with the USFWS' Desert Tortoise Field Manual (USFWS 2009).

    a. Timing and Supervision of Fence Installation. The exclusion fencing shall be installed in any area subject to disturbance prior to the onset of site clearing and grubbing in that area. The fence installation shall be supervised by the Designated Biologist and monitored by the Biological Monitors to ensure the safety of any tortoise present.

    b. Fence Material and Installation. All desert tortoise exclusionary fencing shall be constructed in accordance with the USFWS' Desert Tortoise Field Manual (USFWS 2009) (Chapter 8 – Desert Tortoise Exclusion

Fence)) **or the most recent agency guidance with the approval of the CPM**.

c. Security Gates. Security gates shall be designed with minimal ground clearance to deter ingress by tortoises. The gates may be electronically activated to open and close immediately after the vehicle(s) have entered or exited to prevent the gates from being kept open for long periods of time.

d. Fence Inspections. Following installation of the desert tortoise exclusion fencing for both the permanent and temporary fencing, the fencing shall be regularly inspected. If tortoise were moved out of harm's way during fence construction, permanent and temporary fencing shall be inspected at least two times a day for the first 7 days to ensure a recently moved tortoise has not been trapped within the fence. Thereafter, permanent fencing shall be inspected monthly and within 24 hours following all major rainfall events or after notification of an accident. A major rainfall event is defined as one for which flow is detectable within the fenced drainage. Any damage to the fencing shall be temporarily repaired immediately to keep tortoises out of the site, and permanently repaired within 48 hours of observing damage. Repairs on I-10 fencing shall occur after any required authorization from Caltrans for work within their Right-of-Way. Inspections of permanent site fencing shall occur for the life of the project. Temporary fencing shall be inspected weekly and, where drainages intersect the fencing, during and within 24 hours following major rainfall events. All temporary fencing shall be repaired immediately upon discovery and, if the fence may have permitted tortoise entry while damaged, the Designated Biologist shall inspect the area for tortoise.

3. Desert Tortoise Clearance Surveys within the Plant Site. Clearance surveys shall be conducted in accordance with the USFWS Desert Tortoise Field Manual (USFWS 2009) (Chapter 6 – Clearance Survey Protocol for the Desert Tortoise – Mojave Population) **or the most recent agency guidance with the approval of the CPM** and shall consist of two surveys covering 100 percent the project area by walking transects no more than 15-feet apart. If a desert tortoise is located on the second survey, a third survey shall be conducted. Each separate survey shall be walked in a different direction to allow opposing angles of observation. Clearance surveys of the plant site may only be conducted when tortoises are most active (April through May or September through October) unless the project receives approval from CDFW and USFWS. Clearance surveys of linear features may be conducted during anytime of the year. Any tortoise located during clearance surveys of the power plant site and linear features shall be translocated or relocated and monitored in accordance with the Desert Tortoise Relocation/Translocation Plan:

a. Burrow Searches. During clearance surveys all desert tortoise burrows, and burrows constructed by other species that might be used by desert tortoises, shall be examined by the Designated Biologist, who may be assisted by the Biological Monitors, to assess occupancy of each burrow by desert tortoises and handled in accordance with the USFWS Desert Tortoise Field Manual (USFWS 2009). To prevent reentry by a tortoise or other wildlife, all burrows shall be collapsed once absence has been determined in accordance with the Desert Tortoise Relocation/Translocation Plan. Tortoises taken from burrows and from elsewhere on the power plant site shall be relocated or translocated as described in the Desert Tortoise Relocation/Translocation Plan.

b. Burrow Excavation/Handling. All potential desert tortoise burrows located during clearance surveys would be excavated by hand, tortoises removed, and collapsed or blocked to prevent occupation by desert tortoises in accordance with the Desert Tortoise Relocation/Translocation Plan. All desert tortoise handling, and removal, and burrow excavations, including nests, would be conducted by the Designated Biologist, who may be assisted by a Biological Monitor in accordance with the USFWS Desert Tortoise Field Manual (USFWS 2009) or more recent guidance approved by the CPM.

4. Monitoring Following Clearing. Following the desert tortoise clearance and removal from the power plant site and utility corridors, workers and heavy equipment shall be allowed to enter the project site to perform clearing, grubbing, leveling, and trenching activities. A Designated Biologist or Biological Monitor shall be onsite for clearing and grading activities to move tortoises missed during the initial tortoise clearance survey. Should a tortoise be discovered, it shall be relocated or translocated as described in the Desert Tortoise Relocation/Translocation Plan.

5. Reporting. The Designated Biologist shall record the following information for any desert tortoises handled: a) the locations (narrative and maps) and dates of observation; b) general condition and health, including injuries, state of healing and whether desert tortoise voided their bladders; c) location moved from and location moved to (using GPS technology); d) gender, carapace length, and diagnostic markings (i.e., identification numbers or marked lateral scutes); e) ambient temperature when handled and released; and f) digital photograph of each handled desert. Desert tortoise moved from within project areas shall be marked and monitored in accordance with the Desert Tortoise Relocation/Translocation Plan.

Verification: All mitigation measures and their implementation methods shall be included in the BRMIMP and implemented. Implementation of the measures shall be reported in the Monthly Compliance Reports by the Designated Biologist. Within 30 days after completion of desert tortoise clearance surveys the Designated Biologist shall submit a report to BLM, the CPM, USFWS, and CDFW describing implementation of each of the mitigation measures listed above. The report shall include the desert tortoise survey results, capture and release locations of any relocated desert tortoises, and any other information needed to demonstrate compliance with the measures described above.

Within 6 months of completion of desert tortoise exclusion fence for Phase 1, I-10 desert tortoise exclusion fencing shall be installed. Within 3 months of completion of I-10 desert tortoise exclusion fence construction, the Project owner shall provide the CPM, BLM, USFWS, and CDFW with maps as well as photographic documentation showing the design and location of the fencing on both sides of I-10 south of the Project site.

The Project Owner shall provide evidence of approval from Caltrans for installation of desert tortoise fencing along I-10 within their right-of-way at least 30-days prior to construction of the fencing.

DESERT TORTOISE RELOCATION/TRANSLOCATION PLAN

BIO-10 The Project owner shall develop and implement a final Desert Tortoise Relocation/Translocation Plan (Plan) that is consistent with current USFWS approved guidelines, and meets the approval of the CPM. The Plan shall include guidance specific to each of the two phases of Project construction, as described in **BIO-29** (Phasing), and shall include measures to minimize the potential for repeated translocations of individual desert tortoises. The goals of the Desert Tortoise Relocation/Translocation Plan shall be to: relocate/translocate all desert tortoises from the project site to nearby suitable habitat; minimize impacts on resident desert tortoises outside the project site; minimize stress, disturbance, and injuries to relocated/translocated tortoises; and assess the success of the translocation effort through monitoring**.** The ~~final~~ **revised draft** Plan shall be based on the draft Desert Tortoise Relocation/Translocation Plan prepared by the Applicant (AECOM 2010a, DR-BIO-55) and shall include all revisions deemed necessary by BLM, USFWS, CDFW and the Energy Commission staff.

<u>**Verification:**</u> **At least 60 days prior to pre-construction site mobilization, the Project owner shall provide the CPM with a revised draft of a Plan to the CPM for review and approval in consultation with BLM, USFWS and CDFW.** At least 30 days prior to **pre-construction** site mobilization, the Project owner shall provide the CPM with the final version of a Plan that has been reviewed and approved by the CPM in consultation with BLM, USFWS and CDFG. All modifications to the approved Plan shall be made only after approval by the CPM, in consultation with BLM, USFWS and CDFG.

Within 30 days after initiation of relocation and/or translocation activities, the Designated Biologist shall provide to the CPM for review and approval, a written report identifying which items of the Plan have been completed, and a summary of all modifications to measures made during implementation of the Plan.

DESERT TORTOISE COMPLIANCE VERIFICATION

BIO-11 The Project owner shall provide Energy Commission, BLM, CDFW, and USFWS staff with reasonable access to the Project site and compensation lands under the control of the Project owner and shall otherwise fully cooperate with the Energy Commission's and BLM's efforts to verify the Project owner's compliance with, or the effectiveness of, mitigation measures set forth in the conditions of certification. The Designated Biologist shall do all of the following:

1. Notification. Notify the CPM at least 14 calendar days before initiating construction-related ground disturbance activities; immediately notify the CPM in writing if the Project owner is not in compliance with any conditions of certification, including but not limited to any actual or anticipated failure to implement mitigation measures within the time periods specified in the conditions of certification;

2. Monitoring During Grubbing and Grading. Remain onsite daily while vegetation salvage, grubbing, grading and other ground-disturbance construction activities are taking place to avoid or minimize take of listed species, and verify personally or use Biological Monitors to check for compliance with all impact avoidance and minimization measures, including checking all exclusion zones to ensure that signs, stakes, and fencing are intact and that human activities are restricted in these protective zones.

3. Monthly Compliance Inspections. Conduct compliance inspections at a minimum of once per month after clearing, grubbing, and grading are completed and submit a monthly compliance report to the CPM, BLM, USFWS and CDFW during construction

4. Notification of Injured or Dead Listed Species. If an injured or dead listed species is detected within or near the Project Disturbance Area the CPM, BLM, the Ontario Office of CDFW, and the Carlsbad Office of USFWS shall be notified immediately by phone. Notification shall occur no later than noon on the business day following the event if it occurs outside normal business hours so that the agencies can determine if further actions are required to protect listed species. Written follow-up notification via FAX or electronic communication shall be submitted to these agencies within two calendar days of the incident and include the following information as relevant:

    a. Injured Desert Tortoise. If a desert tortoise is injured as a result of Project-related activities during construction, the Designated Biologist or approved Biological Monitor shall immediately take it to a CDFW-approved wildlife rehabilitation and/or veterinarian clinic. Any veterinarian bills for such injured animals shall be paid by the Project owner. Following phone notification as required above, the CPM, CDFW, and USFWS shall determine the final disposition of the injured animal, if it recovers. Written notification shall include, at a minimum, the date, time, and location, circumstances of the incident, and the name of the facility where the animal was taken.

    b. Desert Tortoise Fatality. If a desert tortoise is killed by Project-related activities during construction or operation, a written report with the same information as an injury report shall be submitted to the CPM, BLM, the Ontario Office of CDFW, and the Carlsbad Office of USFWS.

These desert tortoises shall be salvaged according to guidelines described in *Salvaging Injured, Recently Dead, Ill, and Dying Wild, Free-Roaming Desert Tortoise* (Berry 2001). The Project owner shall pay to have the desert tortoises transported and necropsied. The report shall include the date and time of the finding or incident.

5. Final Listed Species Report. The Designated Biologist shall provide the CPM and BLM a Final Listed Species Mitigation Report that includes, at a minimum: 1) a copy of the table in the BRMIMP with notes showing when each of the mitigation measures was implemented; 2) all available information about Project-related incidental take of listed species; 3) information about other Project impacts on the listed species; 4) construction dates; 5) an assessment of the effectiveness of conditions of certification in minimizing and compensating for Project impacts; 6) recommendations on how mitigation measures might be changed to more effectively minimize and mitigate the impacts of future Projects on the listed species; and 7) any other pertinent information, including the level of take of the listed species associated with the Project.

6. Stop Work Order. The CPM may issue the Project owner a written stop work order to suspend any activity related to the construction or operation of the Project to prevent or remedy a violation of one or more conditions of certification (including but not limited to failure to comply with reporting, monitoring, or habitat acquisition obligations) or to prevent the illegal take of an endangered, threatened, or candidate species. The Project owner shall comply with the stop work order immediately upon receipt thereof.

Verification: No later than 2 days following the above required notification of a sighting, injury, kill, or relocation of a listed species, the Project owner shall deliver to the CPM, BLM, CDFW, and USFWS via FAX or electronic communication the written report from the Designated Biologist describing all reported incidents of injury, kill, or relocation of a listed species, identifying who was notified, and explaining when the incidents occurred. In the case of a sighting in an active construction area, the Project owner shall, at the same time, submit a map (e.g., using Geographic Information Systems) depicting both the limits of construction and sighting location to the CPM, BLM, CDFW and USFWS.

No later than 45 days after initiation of Project operation the Designated Biologist shall provide the CPM and BLM a Final Listed Species Mitigation Report.

Beginning with the first month after clearing, grubbing and grading are completed and continuing every month until construction is complete the Project owner shall submit a report describing the results of Monthly Compliance Inspections to the CPM, BLM, USFWS and CDFW.

DESERT TORTOISE COMPENSATORY MITIGATION

BIO-12 To fully mitigate for habitat loss and potential take of desert tortoise, the Project owner shall provide compensatory mitigation per **BIO-29** – Table 2, adjusted to reflect the final Project footprint. For purposes of this condition, the Project footprint means all lands disturbed in the construction and operation of the Palen Project, including all Project linears, as well as undeveloped areas inside the Project's boundaries that will no longer provide viable long-term habitat for the desert tortoise. To satisfy this condition, the Project owner shall acquire, protect and transfer 5 acres of desert tortoise habitat for every acre of habitat within critical habitat and within the final Project footprint, and 1 acre of desert tortoise habitat for every acre of habitat outside of critical habitat but within the final Project footprint, and provide associated funding for the acquired lands, as specified below. Condition **BIO-28** may provide the Project owner with another option for satisfying some or all of the requirements in this condition. In lieu of acquiring lands itself, the Project owner may satisfy the requirements of this condition by depositing funds into the Renewable Energy Action Team (REAT) Account established with the National Fish and Wildlife Foundation (NFWF), as provided below in section 3.i. of this condition.

The timing of the mitigation shall correspond with the timing of the site disturbance activities as stated in **BIO-29** (phasing). If compensation lands are acquired in fee title or in easement, the requirements for acquisition, initial improvement and long-term management of compensation lands include all of the following:

1. Selection Criteria for Compensation Lands. The compensation lands selected for acquisition in fee title or in easement shall:

   a. be within the Colorado Desert Recovery Unit, with potential to contribute to desert tortoise habitat connectivity and build linkages between desert tortoise designated critical habitat, known populations of desert tortoise, and/or other preserve lands;

   b. provide habitat for desert tortoise with capacity to regenerate naturally when disturbances are removed;

   c. be prioritized near larger blocks of lands that are either already protected or planned for protection, such as DWMAs within the Colorado Desert Recovery Unit (Chuckwalla DWMA as first priority, Chemehuevi DMWA as the second) or which could feasibly be protected long-term by a public resource agency or a non-governmental organization dedicated to habitat preservation;

   d. be connected to lands with desert tortoise habitat equal to or better quality than the Project Site, ideally with populations that are stable, recovering, or likely to recover;

   e. not have a history of intensive recreational use or other disturbance that does not have the capacity to regenerate naturally when disturbances are removed or might make habitat recovery and restoration infeasible;

f. not be characterized by high densities of invasive species, either on or immediately adjacent to the parcels under consideration, that might jeopardize habitat recovery and restoration;

g. not contain hazardous wastes that cannot be removed to the extent that the site could not provide suitable habitat; and

h. have water and mineral rights included as part of the acquisition, unless the CPM, in consultation with CDFW, BLM and USFWS, agrees in writing to the acceptability of the land.

2. Review and Approval of Compensation Lands Prior to Acquisition. The Project owner shall submit a formal acquisition proposal to the CPM, CDFW, USFWS, and BLM describing the parcel(s) intended for purchase. This acquisition proposal shall discuss the suitability of the proposed parcel(s) as compensation lands for desert tortoise in relation to the criteria listed above. Approval from the CPM and CDFW, in consultation with BLM and the USFWS, shall be required for acquisition of all compensatory mitigation parcels.

3. Compensation Lands Acquisition Requirements. The Project owner shall comply with the following requirements relating to acquisition of the compensation lands after the CPM and CDFW, in consultation with BLM and the USFWS, have approved the proposed compensation lands:

   a. Preliminary Report. The Project owner, or approved third party, shall provide a recent preliminary title report, initial hazardous materials survey report, biological analysis, and other necessary or requested documents for the proposed compensation land to the CPM and CDFW. All documents conveying or conserving compensation lands and all conditions of title are subject to review and approval by the CPM and CDFW, in consultation with BLM and the USFWS. For conveyances to the State, approval may also be required from the California Department of General Services, the Fish and Game Commission and the Wildlife Conservation Board.

   b. Title/Conveyance. The Project owner shall transfer fee title to the compensation lands, a conservation easement over the lands, or both fee title and conservation easement as required by the CPM and CDFW. Transfer of either fee title or an approved conservation easement will usually be sufficient, but some situations, e.g., the donation of lands burdened by a conservation easement to BLM, will require that both types of transfers be completed. Any transfer of a conservation easement or fee title must be to CDFW, a non-profit organization qualified to hold title to and manage compensation lands (pursuant to California Government Code section 65965), or to BLM under terms approved by the CPM and CDFW. If an approved non-profit organization holds title to the compensation lands, a conservation easement shall be recorded in favor of CDFW in a form approved by CDFW. If an approved non-profit holds a conservation easement, CDFW shall be named a third party beneficiary. **If a Security is provided, the project owner or an approved third party shall complete the proposed compensation lands acquisition within 18 months of the start of project ground-disturbing activities.**

c. Initial Habitat Improvement Fund. The Project owner shall fund the initial protection and habitat improvement of the compensation lands. Alternatively, a non-profit organization may hold the habitat improvement funds if it is qualified to manage the compensation lands (pursuant to California Government Code section 65965) and if it meets the approval of CDFW and the CPM. If CDFW takes fee title to the compensation lands, the habitat improvement fund must be paid to CDFW or its designee.

d. Property Analysis Record. Upon identification of the compensation lands, the Project owner shall conduct a Property Analysis Record (PAR) or PAR-like analysis to establish the appropriate long-term maintenance and management fee to fund the in-perpetuity management of the acquired mitigation lands.

e. Long-term Maintenance and Management Fund. In accordance with **BIO-29** (phasing), the Project owner shall deposit in NFWF's REAT Account a capital long-term maintenance and management fee in the amount determined through the Property Analysis Record (PAR) or PAR-like analysis conducted for the compensation lands.

   The CPM, in consultation with CDFW, may designate another non-profit organization to hold the long-term maintenance and management fee if the organization is qualified to manage the compensation lands in perpetuity. If CDFW takes fee title to the compensation lands, CDFW shall determine whether it will hold the long-term management fee in the special deposit fund, leave the money in the REAT Account, or designate another entity to manage the long-term maintenance and management fee for CDFW and with CDFW supervision.

f. Interest, Principal, and Pooling of Funds. The Project owner, the CPM and CDFW shall ensure that an agreement is in place with the long-term maintenance and management fee holder/manager to ensure the following conditions:

   i. Interest. Interest generated from the initial capital long-term maintenance and management fee shall be available for reinvestment into the principal and for the long-term operation, management, and protection of the approved compensation lands, including reasonable administrative overhead, biological monitoring, improvements to carrying capacity, law enforcement measures, and any other action approved by CDFW designed to protect or improve the habitat values of the compensation lands.

ii. Withdrawal of Principal. The long-term maintenance and management fee principal shall not be drawn upon unless such withdrawal is deemed necessary by the CDFW or the approved third-party long-term maintenance and management fee manager to ensure the continued viability of the species on the compensation lands. If CDFW takes fee title to the compensation lands, monies received by CDFW pursuant to this provision shall be deposited in a special deposit fund established solely for the purpose to manage lands in perpetuity unless CDFW designates NFWF or another entity to manage the long-term maintenance and management fee for CDFW.

iii. Pooling Long-Term Maintenance and Management Fee Funds. CDFW, or a CPM-and CDFW-approved non-profit organization qualified to hold long-term maintenance and management fees solely for the purpose to manage lands in perpetuity, may pool the endowment with other endowments for the operation, management, and protection of the compensation lands for local populations of desert tortoise. However, for reporting purposes, the long-term maintenance and management fee fund must be tracked and reported individually to the CDFW and CPM.

g. Other expenses. In addition to the costs listed above, the Project owner shall be responsible for all other costs related to acquisition of compensation lands and conservation easements, including but not limited to title and document review costs, expenses incurred from other state agency reviews, and overhead related to providing compensation lands to CDFW or an approved third party; escrow fees or costs; environmental contaminants clearance; and other site cleanup measures.

h. Mitigation Security. The Project owner shall provide financial assurances in accordance with **BIO-29** (phasing) to the CPM and CDFW with copies of the document(s) to BLM and the USFWS, to guarantee that an adequate level of funding is available to implement the mitigation measures described in this condition. These funds shall be used solely for implementation of the measures associated with the Project in the event the Project owner fails to comply with the requirements specified in this condition, or shall be returned to the Project owner upon successful compliance with the requirements in this condition. The CPM's or CDFW's use of the security to implement measures in this condition may not fully satisfy the Project owner's obligations under this condition. Financial assurance can be provided to the CPM and CDFW in the form of an irrevocable letter of credit, a pledged savings account or another form of security ("Security"). Prior to submitting the Security to the CPM, the Project owner shall obtain the CPM's approval in consultation with CDFW. BLM and the USFWS, of the form of the Security. Security shall be provided as described in **BIO-29 – Table 3** and the beginning of the conditions of certification subsection. The actual costs to comply with this condition will vary depending on the final footprint of the Project and its two phases, and the actual costs of acquiring, improving and managing the compensation lands.

i. NFWF REAT Account. The Project owner may elect to fund the acquisition and initial improvement of compensation lands through NFWF by depositing funds for that purpose into NFWF's REAT Account. Initial deposits for this purpose must be made in the same amounts as the security required in section 3.h., above, and may be provided in lieu of security. If this option is used for the acquisition and initial improvement, the Project owner shall make an additional deposit into the REAT Account if necessary to cover the actual acquisition costs and administrative costs and fees of the compensation land purchase once land is identified and the actual costs are known. If the actual costs for acquisition and administrative costs and fees are less than described in **Biological Resources Table 6b**, the excess money deposited in the REAT Account shall be returned to the Project owner. Money deposited for the initial protection and improvement of the compensation lands shall not be returned to the Project owner.

   The responsibility for acquisition of compensation lands may be delegated to a third party other than NFWF, such as a non-governmental organization supportive of desert habitat conservation, by written agreement of the Energy Commission and CDFW. Such delegation shall be subject to approval by the CPM and CDFW, in consultation with BLM and USFWS, prior to land acquisition, initial protection or maintenance and management activities. Agreements to delegate land acquisition to an approved third party, or to manage compensation lands, shall be implemented with 18 months of the Energy Commission's approval.

Verification: If the mitigation actions required under this condition are not completed prior to the start of ground-disturbing activities, the Project owner shall provide the CPM and CDFW with an approved form of Security in accordance with this condition of certification no later than 30 days prior to beginning Project ground-disturbing activities**, including pre-construction site mobilization**. Actual Security shall be provided no later than 7 days prior to the beginning of Project ground-disturbing activities. If Security is provided, the Project owner, or an approved third party, shall complete and provide written verification to the CPM, CDFW, BLM and USFWS of the compensation lands acquisition and transfer within 18 months of the start of Project ground-disturbing activities.

The Project owner may elect to fund the acquisition and initial improvement of compensation lands through NFWF or other approved third party by depositing funds for that purpose into NFWF's REAT Account. Initial deposits for this purpose must be made in the same amounts as the Security required in section 3.h. of this condition. Payment of the initial funds for acquisition and initial improvement must be made at least 30 days prior to the start of ground-disturbing activities.

No fewer than 90 days prior to acquisition of the property, the Project owner shall submit a formal acquisition proposal to the CPM, CDFW, USFWS, and BLM describing the parcels intended for purchase and shall obtain approval from the CPM and CDFW prior to the acquisition.

No fewer than 30 days after acquisition of the property the Project owner shall deposit the funds required by Section 3e above (long term management and maintenance fee) and provide proof of the deposit to the CPM.

The Project owner, or an approved third party, shall provide the CPM, CDFW, BLM, and USFWS with a management plan for the compensation lands within180 days of the land or easement purchase, as determined by the date on the title. The CPM shall review and approve the management plan for the compensatory mitigation lands, in consultation with CDFW, BLM and the USFWS.

Within 90 days after completion of all project related ground disturbance, the Project owner shall provide to the CPM, CDFW, BLM and USFWS an analysis, based on aerial photography, with the final accounting of the amount of habitat disturbed during Project construction. This shall be the basis for the final number of acres required to be acquired.

RAVEN MANAGEMENT PLAN AND FEE

BIO-13 The Project owner shall implement a Raven Monitoring, Management, and Control Plan (Raven Plan) that is consistent with the most current USFWS-approved raven management guidelines, and which meets the approval of the ~~CMP~~ **CPM**, in consultation with USFWS and CDFW. The draft Common Raven Monitoring, Management, and Control Plan submitted by the Applicant (AECOM 2010a, Attachment DR-BIO-57) shall provide the basis for the final Raven Plan, subject to review, revisions and approval from the CPM, CDFW and USFWS. The Raven Plan shall include but not be limited to a program to monitor raven presence in the Project vicinity, determine if raven numbers are increasing, and to implement raven control measures as needed based on that monitoring. The purpose of the plan is to avoid any Project-related increases in raven numbers during construction, operation, and decommissioning. In addition, the Project owner shall also provide funding for implementation of the USFWS Regional Raven Management Program, as described below.

1. The Raven Plan shall:
   a. Identify conditions associated with the Project that might provide raven subsidies or attractants;
   b. Describe management practices to avoid or minimize conditions that might increase raven numbers and predatory activities;
   c. Describe control practices for ravens;
   d. Establish thresholds that would trigger implementation of control practices;

e. Address monitoring and nest removal during construction and for the life of the Project, and;

f. Discuss reporting requirements.

2. USFWS Regional Raven Management Program. The Project owner shall submit payment to the project sub-account of the REAT Account held by the National Fish and Wildlife Foundation (NFWF) to support the USFWS Regional Raven Management Program. The one-time fee shall be as described by the USFWS in the *Renewable Energy Development and Common Raven Predation on the Desert Tortoise – Summary, dated May 2010* (USFWS 2010a) and the Cost Allocation Methodology for Implementation of the Regional Raven Management Plan, dated July 9, 2010) or more current guidance as provided by USFWS or CDFW (USFWS 2010b).

Verification: **At least 45 days prior to any project-related ground disturbance activities, the project owner shall submit the revised draft Raven Plan to the CPM for review and approval and CDFW and USFWS for review and comment.** No less than 10 days prior to the start of any Project-related ground disturbance activities, **including pre-construction site mobilization**, the Project owner shall provide the CPM, USFWS, and CDFW with the final version of a Raven Plan. All modifications to the approved Raven Plan shall be made only with approval of the CPM in consultation with USFWS and CDFW.

No less than 10 days prior to the start of any Project-related ground disturbance, **including pre-construction site mobilization**, activities for each phase of Project construction as described in **BIO-29**, the Project owner shall provide documentation to the CPM, CDFW and USFWS that the one-time fee for the USFWS Regional Raven Management Program of has been deposited to the REAT-NFWS subaccount for the Project. Payment of the fees may be phased as described in **BIO-29 – Table 3**.

Within 30 days after completion of Project construction, the Project owner shall provide to the CPM for review and approval, a written report identifying which items of the Raven Plan have been completed, a summary of all modifications to mitigation measures made during the Project's construction phase, and which items are still outstanding.

As part of the annual compliance report, each year following construction the Designated Biologist shall provide a report to the CPM that includes: a summary of the results of raven management and control activities for the year; a discussion of whether raven control and management goals for the year were met; and recommendations for raven management activities for the upcoming year.

WEED MANAGEMENT PLAN

BIO-14 The Project owner shall implement a Weed Management Plan (Plan) that meets the approval of the CPM. The objective of the Plan shall be to prevent the introduction of any new weeds and the spread of existing weeds as a result of Project construction, operation, and decommissioning. The Draft

Weed Management Plan, submitted by the Applicant (AECOM 2010a, Attachment DR-BIO-100), shall provide the basis for the final Plan, subject to review and revisions from the CPM. The Plan shall include the following:

1. **Weed Plan Requirements**. The Project owner shall provide a map to the CPM indicating the location of the Weed Management Area, which shall include all areas within 100 feet of the Project Disturbance Area, access roads, staging and laydown sites, and all other areas subject to temporary disturbance. The Project owner shall provide a Plan for the Weed Management Area includes at a minimum the following information: specific weed management objectives and measures for each target non-native weed species; baseline conditions; a map of the Weed Management Areas; map of existing populations of target weeds within 100 feet of the Project Disturbance Area and access roads; weed risk assessment; measures to prevent the introduction and spread of weeds; measures to minimize the risk of unintended harm to wildlife and other plants from weed control activities; monitoring and surveying methods; and reporting requirements. Weed control described in the Plan shall focus on prevention, early detection of new infestations, and early eradication for the life of the Project. Weed control along the Project linears shall be limited to the areas where soils were disturbed during construction. Weed monitoring shall occur a minimum of once per year during the early spring months (March-April) to detect seedlings before they set seed. The focus of the Plan shall be on avoiding the introduction of new invasive weeds or the spread of highly invasive species, such as Sahara mustard. Non-native species with low ecological risk, or that are very widespread, such as Mediterranean grass, shall be noted but control shall not be required. When detected, infestations of high priority species shall be eradicated immediately.

2. **Avoidance and Treatment of Dense Weed Populations**. The Plan shall include a requirement to flag and avoid dense populations of the most invasive non-native weeds during any Project-related construction operation in or adjacent to infestations. If these areas cannot be avoided, they shall be pre-treated by one of the following methods: a) treating the infested areas in the season prior to construction by removing and properly disposing of seed heads by hand, prior to maturity, or spraying the new crop of plants that emerge in early spring, the season prior to construction, to reduce the viable seed contained in the soil, or b) removing and disposing the upper 2 inches of soil and disposing it offsite at a sanitary landfill or other site approved by the County Agricultural Commissioner , or burying the infested soil, e.g., under the solar facility or in a pit, and covering the infested soil with at least three feet of uncontaminated soil.

3. **Cleaning Vehicles and Equipment**. The Plan shall include specifications and requirements for the cleaning and removal of weed seed and weed plant parts from vehicles and equipment involved in Project-related construction and operation. Vehicles and equipment working in weed-

infested areas (including previous job sites) shall be required to clean the equipment tires, tracks, and undercarriage *before* entering the Project area and before moving to infested areas of the Project Disturbance Area to uninfested areas. Cleaning shall be conducted on all track and bucket/blade components to adequately remove all visible dirt and plant debris. Cleaning using hand tools, such as brushes, brooms, rakes, or shovels, is preferred. If water must be used, the water/slurry shall be contained to prevent seeds and plant parts from washing into adjacent habitat.

4. **Safe Use of Herbicides**. The final Plan shall include detailed specifications for avoiding herbicide and soil stabilizer drift, and shall include a list of herbicides and soil stabilizers that will be used on the Project with manufacturer's guidance on appropriate use. The Plan shall indicate where the herbicides will be used, and what techniques will be used to avoid chemical drift or residual toxicity to special-status species and their pollinators, and consistent with the Nature Conservancy guidelines and the criteria under #2, below. Only weed control measures for target weeds with a demonstrated record of success shall be used, based on the best available information from sources such as The Nature Conservancy's The Global Invasive Species Team, California Invasive Plant Council: http://www.cal-ipc.org/ip/management/plant_profiles/index.php, and the California Department of Food & Agriculture Encycloweedia: http://www.cdfa.ca.gov/phpps/ipc/encycloweedia/encycloweedia_h p.htm.

5. The methods for weed control described in the final Plan shall meet the following criteria:

   a. Manual: Well-timed removal of plants or seed heads with hand tools; seed heads and plants must be disposed of in accordance with guidelines from the Riverside County Agricultural Commissioner.

   b. Chemical: Herbicides known to have residual toxicity, such as pre-emergents and pellets, shall not be used in natural areas or within the engineered channels. Only the following application methods may be used: wick (wiping onto leaves); inner bark injection; cut stump; frill or hack and squirt (into cuts in the trunk); basal bark girdling; foliar spot spraying with backpack sprayers or pump sprayers at low pressure or with a shield attachment to control drift, and only on windless days, or with a squeeze bottle for small infestations (see Nature Conservancy guidelines described above);

   c. Biological: Biological methods may be used subject to review and approval by CDFW and USFWS and only if approved for such use by CDFA, and are either locally native species or have no demonstrated threat of naturalizing or hybridizing with native species;

   d. Mechanical: Disking, tilling, and mechanical mowers or other heavy equipment shall not be employed in natural areas but hand weed trimmers (electric or gas-powered) may be used. Mechanical trimmers shall not be used during periods of high fire risk and shall only be used with implementation of fire prevention measures.

Verification: No less than 10 days prior to start of any Project-related ground disturbance activities, the Project owner shall provide the CPM with the final version of a Weed Management Plan that has been reviewed by BLM and Energy Commission staff. Modifications to the approved Weed Control Plan shall be made only with approval from the CPM in consultation with BLM.

Within 30 days after completion of Project construction, the Project owner shall provide to the CPM for review and approval, a written report identifying which items of the Weed Management Plan have been completed, a summary of all modifications to mitigation measures made during the Project's construction phase, and which items are still outstanding.

As part of the Annual Compliance Report, each year following construction the Designated Biologist shall provide a report to the CPM and BLM that includes: a summary of the results of noxious weeds surveys and management activities for the year; a discussion of whether weed management goals for the year were met; and recommendations for weed management activities for the upcoming year.

PRE-CONSTRUCTION NEST SURVEYS AND AVOIDANCE MEASURES

BIO-15 Pre-construction nest surveys shall be conducted if construction activities would occur from February 1 through July 31. The Designated Biologist or Biological Monitor conducting the surveys shall be experienced bird surveyors familiar with standard nest-locating techniques such as those described in Martin and Guepel (1993). The goal of the nesting surveys shall be to identify the general location of the nest sites, sufficient to establish a protective buffer zone around the potential nest site, and need not include identification of the precise nest locations. Surveyors performing nest surveys shall not concurrently be conducting desert tortoise surveys. The bird surveyors shall perform surveys in accordance with the following guidelines:

1. Surveys shall cover all potential nesting habitat in areas that could be disturbed by each phase of construction, as described in **BIO-29** (Phasing). Surveys shall also include areas within 500 feet of the boundaries of the active construction areas (including linear facilities);

2. At least two pre-construction surveys shall be conducted, separated by a minimum 10-day interval. One of the surveys shall be conducted within the 14-day period preceding initiation of construction activity. Additional follow-up surveys may be required if periods of construction inactivity exceed three weeks, an interval during which birds may establish a nesting territory and initiate egg laying and incubation;

3. If active nests or suspected active nests are detected during the survey, a buffer zone (protected area surrounding the nest, the size of which is to be determined by the Designated Biologist in consultation with CDFW) and

monitoring plan shall be developed. Nest locations shall be mapped and submitted, along with a report stating the survey results, to the CPM; and

4. The Designated Biologist or Biological Monitor shall monitor the nest until he or she determines that nestlings have fledged and dispersed; activities that might, in the opinion of the Designated Biologist, disturb nesting activities, shall be prohibited within the buffer zone until such a determination is made.

Verification: At least 10 days prior to the start of any Project-related ground disturbance activities during the nesting season, the Project owner shall provide the CPM a letter-report describing the findings of the pre-construction nest surveys, including the time, date, and duration of the survey; identity and qualifications of the surveyor (s); and a list of species observed. If active or suspected active nests are detected during the survey, the report shall include a map or aerial photo identifying the location or suspected location of the nest and shall depict the boundaries of the no-disturbance buffer zone around the nest(s) that would be avoided during Project construction.

Each year during construction as part of the annual compliance report a follow-up report shall be provided to the CPM, BLM, CDFW, and USFWS describing the success of the buffer zones in preventing disturbance to nesting activity and a brief description of the outcome of the nesting effort (for example, whether young were successfully fledged from the nest or if the nest failed).

~~AVIAN PROTECTION PLAN~~

~~**BIO-16**~~ ~~The Project owner shall prepare and implement an Avian Protection Plan to monitor the death and injury of birds from collisions with facility features such as transmission lines, reflective mirror-like surfaces and from heat, and bright light from concentrating sunlight. The monitoring data shall be used to inform an adaptive management program that would avoid and minimize Project-related avian impacts. The study design shall be approved by the CPM in consultation with BLM, CDFG and USFWS, and shall be consistent with guidance from the USFWS on development of avian and bat protection plans (USFWS 2010c). The monitoring and adaptive management measures described in the Avian Protection Plan shall be incorporated into the Project's BRMIMP and implemented. The Avian Protection Plan shall include detailed specifications on data and carcass collection protocol and a rationale justifying the proposed schedule of carcass searches. The plan shall also include seasonal trials to assess bias from carcass removal by scavengers as well as searcher bias.~~

~~**Verification:**~~ ~~At least 30 days prior to the start of commercial operation of any of the power plant units the Project owner shall submit to the CPM, USFWS, and CDFG a final Avian Protection Plan. Modifications to the Avian Protection Plan shall be made only after approval from the CPM.~~

~~For one year following the beginning of power plant operation the Designated Biologist shall submit quarterly reports to the CPM, BLM, CDFG, and USFWS describing the dates, durations, and results of monitoring. The quarterly reports shall provide a detailed~~

~~description of any Project-related bird deaths or injuries detected during the monitoring study or at any other time, and describe adaptive management measures implemented to avoid or minimize deaths or injuries. Following the completion of the fourth quarter of monitoring the Designated Biologist shall prepare an Annual Report that summarizes the year's data, analyzes any Project-related bird fatalities or injuries detected, and provides recommendations for future monitoring and any adaptive management actions needed.~~

~~The Annual Report shall be provided to the CPM, BLM, CDFG, and USFWS. Quarterly reporting shall continue until the CPM, in consultation with CDFG and USFWS determine whether more years of monitoring are needed, and whether mitigation and adaptive management measures are necessary.~~

AVIAN ENHANCEMENT AND CONSERVATION PLAN

BIO-16a **The Project owner shall implement the following measure to conserve and enhance avian populations in the vicinity of the project and throughout the region:**

1. **Regional Avian Electrocution Risk and Cable Collision Avoidance Measures. Consistent with the DRECP framework (DRECP 2012), the project owner shall, prior to the commencement of commercial operations at the facility, fund the retrofitting of non-compliant utility poles in the vicinity of the project to APLIC (2006) standards or fund the installation of bird diverters in the vicinity of the Project. A total amount of $300,000 will be provided for these enhancements. The funding shall be provided to an independent third party who will perform the actual retrofitting, pursuant to a Retrofit Plan approved by the CPM.**

   The Retrofit Plan will develop a tiered approach to minimizing electrocution and collision risk, wherein the first funding is applied to retrofit poles in areas where either mortalities are highest or area use is highest. The second tier of retrofitted poles would be areas of lesser importance. If funds remain available after first and second tier poles have been retrofitted, then the CPM may apply the remaining funds to other avian protection objectives outlined by the DRECP, in conjunction with BLM, USFWS, and CDFW. As an alternative to the Retrofitting Plan and the use of a CPM-approved third party, the total funding can be accomplished by making a payment in the amount of $300,000 to the National Fish and Wildlife Foundation's Bald and Golden Eagle Protection Act account.

2. **Additional Migratory Bird Conservation: The Project owner shall, prior to the commencement of commercial operation of the facility, pay $1,500,000.00 to fund the activities of a CPM-approved third party that will perform additional migratory bird conservation measures. Alternatively, the project owner may prepare a promissory note to deposit said funds at the onset of operations while at the same time providing funding of the initial year of**

mitigation in the non-refundable amount of $50,000.00 to a project fund as determined by CPM, in conjunction with BLM, CDFW, and USFWS, for the initial year of mitigation in the absence of accrued interest. Such measures shall be approved by the CPM and may include, but not be limited to: (i) restoration of degraded habitat with native vegetation; (ii) restoration of agricultural fields to bird habitat; (iii) management of agricultural fields to enhance bird populations; (iv) invasive plant species and artificial food or water source management; (v) control and cleanup of potential avian hazards, such as lead or microtrash; (vi) retrofitting of buildings to minimize collisions; (vii) retrofitting of conductors and above ground cables to minimize collisions; (viii) animal control programs; (ix) support for avian and bat research and/or management efforts conducted by entities approved by the CPM within the project's mitigation lands or other approved locations; (x) funding efforts to address avian diseases or depredation due to the expansion of predators in response to anthropomorphic subsidies that may adversely affect birds that use the mitigation lands or other approved locations; and (xi) contribute to the Migratory Bird Conservation Fund managed by the Migratory Bird Conservation Commission.

a. **Neither the principal of the fund nor its earned interest is redeemable by project owner during the life of the project; specifically, the investment instrument will be prepared such that an independent investment firm/management entity manages and distributes monies. When developing the fund instrument, criteria will be established that will trigger the release of the fund residual to the project owner only at the conclusion of the project, or, in the event that an alternative technology is implemented to replace the currently proposed solar energy generating facility.**

b. **The investment fund residual will be transferred to the project owner under specified conditions:**

    1. **At end of the project's life after infrastructure removal has been completed and permit-specified site reclamation criteria have been met;**

    2. **If the proposed project is converted to an alternative technology that does not impose a similar threat to migratory birds or to bats.**

<u>Verification:</u> **For power line retrofits:**

1. **At least 60 days prior to any generation of flux, the project owner shall submit the draft Retrofit Plan to the CPM for review and approval and CDFW and USFWS for review and comment. At least 30 days prior to start of any flux generation, the project owner shall provide the CPM the final version of the Retrofit Plan. Any modifications to the approved Retrofit Plan must be approved by the CPM in consultation with USFWS, BLM, and CDFW. The project owner shall notify the CPM no less than five working days before**

implementing any CPM approved modifications to the Retrofit Plan; alternately, the project owner may elect to deposit funds into the National Fish and Wildlife Foundation's Bald and Golden Eagle Protection Act account.

2. **If the project owner elects not to fund a third party to perform retrofits, then no less than 30 days prior to beginning project operations, the project owner shall provide written verification to the CPM that security has been established in the National Fish and Wildlife Foundation's Bald and Golden Eagle Protection Act account, in accordance with this condition of certification.**

3. **The project owner shall provide an annual summary of the actions taken, an accounting of money distributed, and a map of retrofitted powerlines as per the Retrofit Plan. If the project owner elects to fund the National Fish and Wildlife Foundation's Bald and Golden Eagle Protection Act account, then the project owner shall, within five (5) years of starting commercial operations, provide a summary specifying how the National Fish and Wildlife Foundation has or is using the funds.**

For non-wasting benefit fund:

1. **No later than 30 days prior to beginning of flux generation, the project owner shall provide the CPM written verification of selection of a non-wasting account held by an approved investment entity, in accordance with this condition of certification. The account shall be fully funded no later than 7 days prior to the beginning flux generation.**

2. **If the project owner elects to provide a promissory note for $1,500,00.00 the CPM must be provided the note within 30 days of starting operations, and must also fund $50,000 for the first year's benefit, within 7 days of starting operations.**

3. **The project owner, or the account's administrator (investment entity) shall submit to the CPM an annual report summarizing the performance of the fund and describing all restoration/enhancement actions taken.**

AVIAN AND BAT PROTECTION PLAN

BIO-16b The Project owner shall perform preconstruction baseline surveys prior to surface disturbance of avian and bat species for use in development of a Bird and Bat Conservation Strategy (BBCS). The Project owner shall prepare a BBCS and submit it to the CPM for review and approval, in conjunction with BLM, CDFW, and USFWS for review and comment. The BBCS shall provide for the following:

- **Survey and monitor onsite and offsite avian use and behavior to document species composition on and offsite, compare onsite and offsite rates of avian and bat use, document changes in avian and bat use over time, and evaluate the general behavior of birds in and near the facility.**

- **Implement an onsite and offsite avian and bat mortality and injury monitoring program to identify the extent of potential avian or bat mortality or injury from collisions with facility structures or from elevated levels of solar flux that may be encountered within the facility airspace, including:**
  - **assessing levels of collision-related mortality and injury with heliostats, perimeter fences and power tower structures;**
  - **calculating rates of solar flux-related avian mortality and injury, if any;**
  - **documenting seasonal, temporal, and weather-related patterns associated with collision- or solar flux-related mortality and injury, if any; and**
  - **documenting flight spatial patterns that may be associated with collision- or flux-related mortality and injury, if any.**
  - **documenting spatial patterns that may be associated with avoidance of the facility.**
- **Identify specific conservation measures and/or programs to minimize impacts and evaluate the effectiveness of those measures.**
- **Implement an adaptive management and decision-making framework for reviewing, characterizing, and responding to quantitative survey and monitoring results.**

BBCS Components

The project owner shall prepare and implement a Bird and Bat Conservation Strategy adopting all applicable guidelines recommended by the USFWS (2010e) or current guidelines. The BBCS shall include the following components:

1. **Preconstruction Baseline survey results. A description and summary of the baseline survey methods and results.**

2. **Avian and bat use and behavior surveys. Avian and bat site-use behavior surveys shall be conducted. The program will outline survey methodology and field documentation, identification of appropriate onsite and offsite survey locations, control sites, and the seasonal considerations. Prey abundance surveys will also be conducted to identify the locations and changes in the abundance of prey species. Bat acoustic sampling may be implemented depending on results of the baseline study.**

3. **Golden eagle nest surveys and monitoring. Results of annual pedestrian and/or helicopter surveys of golden eagle nesting sites within a 10-mile radius of the project site, including a summary of available information concerning golden eagle nesting activity in the project vicinity.**

4. Avian and bat mortality and injury monitoring: An avian and bat injury and mortality monitoring program shall be implemented, including:

(a) Onsite monitoring that will systematically survey representative locations within the facility sufficient to ensure that the estimated coefficient of variation (the ratio of standard deviation to the mean) of facility wide fatality estimates will be less than 25 percent over a reasonable range of potentially low, medium and high impact rates; account for potential spatial bias and allow for the extrapolation of survey results to unsurveyed areas and the survey interval based on scavenger and searcher efficiency trials and detection rates.

(b) Offsite monitoring, to the extent that access can be reasonably and feasibly obtained by the project owner, of one or more locations adjacent to the project facilities using the same or comparable methods as implemented for the onsite monitoring to identify which avian species potentially injured by collisions or solar flux within adjacent areas.

(c) Low-visibility and high-wind weather event monitoring to document potential weather-related collision risks that may be associated with the power towers at the facility, including foggy, highly overcast, or rainy night-time weather typically associated with an advancing frontal system, and high wind events (40 miles per hour winds) are sustained for period of greater than 4 hours. The monitoring report shall include survey frequency, locations and methods.

(d) Scavenger and searcher efficiency trials to document the extent to which avian or bat fatalities remain visible over time and can be detected within the project area and to adjust the survey timing and survey results to reflect scavenger and searcher efficiency rates.

(e) Statistical methods used to generate facility estimates of potential avian and bat impacts based on the observed number of detections during standardized searches during the monitoring season for which the cause of death can be determined and is determined to be facility-related.

(f) Field detection and mortality or injury identification, cause attribution, handling and reporting protocols consistent with applicable legal requirements.

5. Survey schedule and period. All surveys and monitoring studies included in the BBCS shall be conducted for three years following commercial operation and approval of the BBCS by the CPM. At the end of the three-year period, the project owner and the CPM shall

meet and confer to determine whether the survey program shall be continued for subsequent periods, up to a maximum of five years. The monitoring program may be modified with the approval of the CPM in response to survey results, identified scavenging efficiency rates, or other factors to increase monitoring accuracy and reliability or in accordance with the adaptive management decision-making framework included in the BBCS.

6. **Adaptive management. An adaptive management program shall be developed to identify and implement reasonable and feasible measures that would reduce any biologically significant levels of avian or bat mortality or injury attributable to project operations and facilities. Any such impact reduction measures must be commensurate (in terms of factors that include geographic scope, costs, and scale of effort) to the level of avian or bat mortality or injury that is specifically and clearly attributable to the project facilities. The adaptive management program shall include the following elements:**

   (a) Reasonable measures for characterizing the extent and significance of detected mortality and injuries clearly attributable to the project.

   (b) Measures that the project owner will implement to adaptively respond to detected mortality and injuries attributable to the project, including passive avian diverter installations along the perimeter or at other locations within the project to avoid site use, the use of sound, light or other means to discourage site use consistent with applicable legal requirements, onsite prey or habitat control measures consistent with applicable legal requirements, and additional perch and nest proofing of project facilities.

   (c) A decision-making framework that facilitates concurrent project owner, CPM, and state and federal wildlife agency review of seasonal and annual survey results, the effectiveness of the adaptive management measures implemented by the project owner, modification of the surveys in response to the results, if necessary, and the identification of additional mitigation responses that are commensurate with the extent of impacts that may be identified in the monitoring studies.

7. **Eagle Protection Plan (EPP): The project owner shall prepare and implement an Eagle Protection Plan adopting all applicable guidelines recommended by the USFWS (2011b) or most current guidelines that may be released. The EPP may be prepared as a stand-alone document or included as a chapter within the BBCS. The EPP shall describe all available baseline data on golden eagle occurrence, seasonality, activity, and behavior throughout the project area and vicinity. The EPP shall outline a study protocol to**

include annual pedestrian and/or helicopter surveys of golden eagle breeding sites within a 10 mile radius of the project site, to be reviewed and approved by the CPM, in consultation with the USFWS, BLM, and CDFW.

The EPP shall describe all proposed measures to minimize death and injury of eagles from (1) collisions with facility features including the heliostats, power towers, and gen-tie line towers or transmission lines, (2) electrocutions on transmission lines or other project components, and (3) concentrated solar flux created over the solar field. The EPP shall provide an inventory of existing electrical distribution lines within a 20-mile radius of the project site that do not conform to APLIC (2006) design standards to prevent golden eagle electrocution. The inventory shall identify the owner or operator and estimate the number of non-conforming poles for each distribution line.

The EPP shall also include any feasible modifications to proposed plant operation to avoid or minimize focusing heliostats at standby points and, instead, move heliostats into a stowed position or another alternative configuration when the power plant is in partial standby mode. The EPP shall provide a reporting schedule for all monitoring or other activities related to bird or bat conservation or protection during project construction or operation. The EPP shall be subject to review and approval by the CPM in consultation with CDFW, BLM, and USFWS, and shall be incorporated into the project's BRMIMP and BBCS, and implemented.

<u>Verification:</u> The BBCS shall be submitted to the CPM for review and approval and to CDFW, BLM, and USFWS for review and comment no less than 120 days prior to the commercial operation of the first unit. The project owner shall provide the CPM with copies of any written or electronic transmittal from the USFWS, BLM, or CDFW related to the BBCS within 30 days of receiving any such transmittal. Survey reports shall be submitted to the CPM after each season and in an annual summary report throughout the course of the three-year study period and as set forth in the approved monitoring study plan. The reports will include all monitoring data required as part of the monitoring program.

Methods and results of the Monitoring Study shall be submitted to the CPM in Monthly and Annual Compliance Reports throughout the course of the study and until the CPM, in consultation with CDFW, BLM, and USFWS, concludes that the cumulative monitoring data provide sufficient basis for estimating long-term bird mortality for the project. The reports will include all monitoring data required as part of the monitoring program.

The reports shall also summarize any additional wildlife mortality or injury documented on the project site during the year, regardless of cause, and assess any adaptive management measure implemented during the prior year as approved by the CPM. After the third year of the monitoring program, the CPM shall meet and confer with the project owner to determine if the study period shall be extended based on data quality and sufficiency of analysis, or if needed, to

document efficacy of any adaptive management measures undertaken by the project owner. The study period may be extended up to five years from the commencement of facility operations. If a carcass of a golden eagle or any state or federally listed threatened or endangered species is found at any time by the monitoring study or project operations staff, the project owner, Designated Biologist, or other qualified biologist that may be identified by the Designated Biologist shall contact the CPM, CDFW and USFWS by email, fax or other electronic means within one working day of any such detection.

<u>Verification:</u> **The BBCS shall be submitted to the CPM for review and approval and to CDFW and USFWS for review and comment no less than 120 days prior to the commercial operation of the first unit. The Project owner shall provide the CPM with copies of any written or electronic transmittal from the USFWS, BLM, or CDFW related to the BBCS within 30 days of receiving any such transmittal. Survey reports shall be submitted to the CPM after each season and in an annual summary report throughout the course of the three-year study period and as set forth in the approved monitoring study plan. The reports will include all monitoring data required as part of the monitoring program.**

Methods and results of the Monitoring Study shall be submitted to the CPM in Monthly and Annual Compliance Reports throughout the course of the study and until the CPM, in consultation with the other agencies, concludes that the cumulative monitoring data provide sufficient basis for estimating long-term bird mortality for the project. The Reports will include all monitoring data required as part of the monitoring program.

The reports also shall summarize any additional wildlife mortality or injury documented on the project site during the year, regardless of cause, and assess any adaptive management measure implemented during the prior year as approved by the CPM. After the third year of the monitoring program, the CPM shall meet and confer with the project owner to determine of the study period should be extended based on data quality and sufficiency of analysis or if needed to document efficacy of any adaptive management measures undertaken by the Project owner. The study period may be extended up to five years from the commencement of facility operations. If a carcass of a golden eagle or any state or federally listed threatened or endangered species is found at any time by the monitoring study or Project operations staff, the Project owner, Designated Biologist, or other qualified biologist that may be identified by the Designated Biologist shall contact the CPM, CDFW and USFWS by email, fax or other electronic means within one working day of any such detection.

~~AMERICAN BADGER AND DESERT KIT FOX IMPACT AVOIDANCE AND MINIMIZATION MEASURES~~

~~**BIO-17**~~ ~~To avoid direct impacts to American badgers and desert kit fox, pre-construction surveys shall be conducted for these species concurrent with the desert tortoise surveys to facilitate passive relocation. Surveys shall be conducted as described below:~~

1. ~~Biological Monitors shall perform pre-construction surveys for badger and kit fox dens in the Project disturbance area and a 20-foot buffer beyond the Project disturbance area, including utility corridors and access roads. If dens are detected each den shall be classified as inactive, potentially active, or definitely active. Surveys may be concurrent with desert tortoise surveys.~~

2. ~~Inactive dens that would be directly impacted by construction activities shall be excavated by hand and backfilled to prevent reuse by badgers or kit fox.~~

3. ~~Potentially and definitely active dens that would be directly impacted by construction activities shall be monitored by the Biological Monitor for three consecutive nights using a tracking medium (such as diatomaceous earth or fire clay) and/or infrared camera stations at the entrance.~~

4. ~~If no tracks are observed in the tracking medium or no photos of the target species are captured after three nights, the den shall be excavated and backfilled by hand.~~

5. ~~If tracks are observed, the den shall be progressively blocked with natural materials (rocks, dirt, sticks, and vegetation piled in front of the entrance) for the next three to five nights to discourage the badger or kit fox from continued use. After verification that the den is unoccupied it shall then be excavated and backfilled by hand to ensure that no badgers or kit fox are trapped in the den. BLM approval may be required prior to release of badgers on public lands.~~

~~**Verification:**~~ ~~The Project owner shall submit a report to the CPM, BLM and CDFG within 30 days of completion of badger and kit fox surveys. The report shall describe survey methods, results, impact avoidance and minimization measures implemented, and the results of those measures.~~

AMERICAN BADGER AND DESERT KIT FOX IMPACT AVOIDANCE AND MINIMIZATION MEASURES

BIO-17 The project owner shall develop and implement an American Badger and Desert Kit Fox Mitigation and Monitoring Plan (plan). The objective of the plan shall be to avoid direct impacts to the American badger and desert kit fox as a result of construction of the power plant and linear facilities, as well as during project operation and decommissioning. The final plan is subject to review and comment by (BLM) and revision and approval by the (CPM), in consultation with California Department of Fish and Wildlife (CDFW). The final plan shall include, but is not limited to, the following procedures and impact avoidance measures:

1. Describe pre-construction survey and clearance field protocol, to determine the number and locations of single or paired kit foxes or badgers on the project site that would need to be avoided or passively relocated and the number and locations of desert kit fox or badger

burrows or burrow complexes that would need to be collapsed to prevent re-occupancy by the animals.

a. Pre-Construction Surveys. Biological Monitors shall conduct pre-construction surveys for desert kit fox and American badger no more than 30 days prior to initiation of construction activities, including pre-construction site mobilization. Surveys shall also address the potential presence of active dens within 100 feet of the project boundary (including utility corridors and access roads) and shall be performed for each phase of construction. If dens are detected, each den shall be classified as inactive, potentially active, or definitely active den.

b. Monitoring and Protection Measures, Passive Hazing, and Den Excavation: The plan will include details on monitoring requirements, types and methods of passive hazing, and methods and timing of den excavation, including, but not limited to the following:

   i. Inactive dens. Inactive dens (e.g. inactive dens are dens that are mostly or entirely silted in and ones in which the back of the den can clearly be seen (e.g., the den isn't deep and doesn't curve) that would be directly impacted by construction activities shall be excavated by hand and backfilled to prevent reuse by badger or kit fox.

   ii. Potentially and definitely active dens. Potentially and definitely active dens that would be directly impacted by construction activities shall be monitored by the Biological Monitor for three consecutive nights using a tracking medium (such as diatomaceous earth or fire clay) and/or infrared camera stations at the entrance. If no tracks are observed in the tracking medium or no photos of the target species are captured after three nights, the den shall be excavated and backfilled by hand. If tracks are observed, the den shall be progressively blocked with natural materials (rocks, dirt, sticks, and vegetation piled in front of the entrance) for the next three to five nights to discourage the badger or kit fox from continued use. After verification that the den is unoccupied it shall then be excavated and backfilled by hand to ensure that no badgers or kit fox are trapped in the den. If the den is proven inactive then den may be collapsed during whelping season. BLM approval may be required prior to release of badgers on public lands.

   iii. Active natal/pupping dens. If an active natal den (a den with pups) is detected on the site, the BLM CEC and CDFW shall be contacted within 24 hours to determine the appropriate course of action to minimize the potential for animal harm or mortality. The course of action would depend on the age of the pups, location of the den on the site (e.g. is the den in a central area or in a perimeter location), status of the perimeter site fence (completed or not), and the pending construction activities proposed near the den. A 500-foot no-disturbance buffer shall be maintained around all active dens. The denning season for American badger is approximately March to August, and for desert kit fox the denning season is approximately Mid-January to pup independence (typically by June). If the den is active during the whelping season, even if pups are not seen, disturbance is not allowed. Active natal/pupping dens will not be excavated or passively relocated.

c. <u>Exception for American badger.</u> In the event that passive relocation techniques fail for badgers, outside the denning season, or during the denning season if individual badgers can be verified to not have a litter, then live-trapping by a CDFW and CPM approved trapper is an option that may be employed to safely perform active removal with approval on a case by case basis by the CPM, BLM, and CDFW. In the event live-trapping would be employed as a last resort, a live-trapping plan would be submitted to the CPM for review and approval in consultation with BLM and CDFW. The plan would at a minimum include timing, trapping methods, and location of release of the individual badger as well as the name and resume, including documentation of relevant handling permits of the proposed trapper.

2. Address other factors and procedures that may affect the success of kit fox and American badger relocation offsite, such as:

   a. Qualitative discussion of availability of suitable habitat on off-site surrounding lands within 10 miles of the project boundary, and quantitative evaluation of unoccupied desert kit fox burrows available on surrounding lands within 1 mile of the project boundary (e.g., by inventorying burrow numbers in selected representative sample areas);

   b. Estimates of the distances kit foxes would need to travel across the project site and across adjacent lands to safely access suitable habitat (including burrows) off-site;

   c. Proposed scheduling of the passive relocation effort;

   d. Methods to minimize likelihood that the animals will return to the project site;

   e. Descriptions of any proposed or potential ground disturbing activities related to kit fox relocation, and locations of those activities (e.g., artificial burrow construction);

   f. A monitoring and reporting plan to evaluate success of the relocation efforts and any subsequent re-occupation of the project site; and

   g. A plan to subsequently relocate any animals that may return to the site (e.g., by digging beneath fences).

3. Address notification procedures for notifying the CPM, BLM and CDFW if injured, sick, or dead badger or kit fox are detected. Notify the CPM, BLM and CDFW if injured, sick, or dead American badger and desert kit fox are found. If an injured, sick, or dead animal is detected on any area associated with the solar project site or associated linear facilities, the CPM, BLM Palm Springs/ South Coast Field Office and the Ontario CDFW Office shall be notified immediately by phone. Written follow-up notification via FAX or electronic communication shall be submitted to the CPM, BLM and CDFW within 24 hours of the incident and shall include the following information as appropriate:

   a. Injured animals. If an American badger or desert kit fox is injured because of any project-related activities, the Designated Biologist or approved Biological Monitor shall immediately notify the CPM, BLM and CDFW personnel regarding the capture and transport of the animal to CDFW-approved wildlife rehabilitation and/or veterinarian clinic. Following the phone notification, the CPM and CDFW shall determine the final disposition of the injured animal, if it recovers. A written notification of the incident shall be sent to the CPM, BLM and CDFW containing, at a minimum, the date, time, location, and circumstances of the incident.

   b. Sick animals. If an American badger or desert kit fox is found sick and incapacitated on any area associated with the project site or associated linear facilities, the Designated Biologist or approved Biological Monitor shall immediately notify the CPM, BLM and CDFW personnel for immediate capture and transport of the animal to a CDFW-approved wildlife rehabilitation and/or veterinarian clinic. Following the phone notification, the CPM and CDFW shall determine the final disposition of the sick animal, if it recovers. If the animal dies, a necropsy shall be performed by a CDFW-approved facility to determine the cause of death. The project owner shall pay to have the animal transported and a necropsy performed. A written notification of the incident shall be sent to the CPM, BLM and CDFW and contain, at a minimum, the date, time, location, and circumstances of the incident.

   c. Fatalities. If an American badger or desert kit fox is killed because of any project-related activities during construction, operation, and decommissioning or is found dead on the project site or along associated linear facilities, the Designated Biologist or approved Biological Monitor shall immediately refrigerate the carcass and notify the CPM, BLM and CDFW personnel within 24 hours of the discovery to receive further instructions on the handling of the animal. Handling of a dead kit fox shall follow the Guidelines for Handling a Desert Kit Fox Carcass (CDFW WIL) or most recent guidance. If the animal is suspected of dying of unknown causes, a necropsy shall be performed by a CDFW-approved facility to determine the cause of death. The project owner shall pay to have the animal transported and a necropsy performed.

4. Additional protection measures to be included in the plan and implemented:

   a. All pipes within the project disturbance area must be capped and/or covered every evening or when not in use to prevent desert kit foxes or other animals from accessing the pipes.

   b. All water sources shall be covered and secured when not in use to prevent drowning.

   c. The project owner shall coordinate with CDFW to identify any additional fence design features to maximize the effectiveness of the fence to exclude kit foxes from the project.

   d. Incorporate and implement the CDFW Veterinarian's guidance regarding impact avoidance measures including measures to prevent disease spread among desert kit foxes.

   e. Include measures to reduce traffic impacts to wildlife if the project owner anticipates night-time construction. The plan must also include a discussion of what information will be provided to all night-time workers, including truck drivers, to educate them about the threats to kit fox, what they need to do to avoid impacts to kit fox, and what to report if they see a live, injured, or dead kit fox.

   f. In order to reduce the likelihood of distemper transmission:

      i. No pets shall be allowed on the site prior to or during construction, operation, and decommissioning, with the possible exception of vaccinated kit fox scat detection dogs during preconstruction surveys, and then only with prior CPM and CDFW approval;

      ii. Any hazing activities that include the use of chemical or other repellents (e.g. ultrasonic noise makers, or non-animal-based chemical repellents) must be cleared through the CPM and CDFW prior to use. The use of animal tissue or excretion based repellents (e.g. coyote urine, anal gland products) shall not be permitted.

      iii. Any sick or diseased kit fox, or documented kit fox mortality shall be reported to the CPM, CDFW, and the BLM within 8 hours of identification. If a dead kit fox is observed, it shall be collected and stored according to established protocols distributed by CDFW WIL, and the WIL shall be contacted to determine carcass suitability for necropsy.

Verification: No fewer than 90 days prior to the start of any pre-construction site mobilization, the project owner shall provide the CPM with a draft American Badger and Desert Kit Fox Mitigation and Monitoring Plan for review and comment, in conjunction with BLM and CDFW.

No fewer than 45 days prior to start of any pre-construction site mobilization, the project owner shall provide an electronic copy of the CPM-approved final plan to the CPM, BLM and CDFW and implement the plan.

The project owner shall submit a report to the CPM, BLM and CDFW within 30 days of completion of any badger and kit fox surveys. The report shall describe survey methods, results, impact avoidance and minimization measures implemented, and the results of those measures.

No later than 2 days following a phone notification of an injured, sick, or dead American badger or desert kit fox, the project owner shall provide to the CPM, BLM and CDFW, via FAX or electronic communication, a written report from the Designated Biologist describing the incident of sickness, injury, or death of an American badger or desert kit fox, when the incident occurred, and who was notified.

Beginning with the first month after start of construction and continuing every month until construction is completed, the Designated Biologist shall include a summary of events regarding the American badger and desert kit fox in each Monthly Compliance Report (MCR).

No later than 45 days after initiation of project operation, the Designated Biologist shall provide the CPM and BLM a final American Badger and Desert Kit Fox Mitigation and Monitoring Plan Report that includes: 1) a discussion of all mitigation measures that were and currently are being implemented; 2) all information about project-related kit fox and badger injuries and/or deaths; 3) all information regarding sick kit fox and badger found within the project site and along related linear facilities; and 4) recommendations on how mitigation measures might be changed to more effectively minimize and mitigate the impacts of future projects on the American badger and desert kit fox.

BURROWING OWL IMPACT AVOIDANCE, MINIMIZATION, AND COMPENSATION MEASURES

BIO-18 The Project owner shall implement the following measures to avoid, minimize and offset impacts to burrowing owls:

1. Pre-Construction Surveys. The Designated Biologist or Biological Monitor shall conduct pre-construction surveys for burrowing owls no more than 30 days prior to initiation of construction activities **in accordance with CDFW guidelines (CDFW 2012).**. Surveys shall be focused exclusively on detecting burrowing owls, and shall be conducted from two hours before sunset to 1 hour after or from 1 hour before to 2 hours after sunrise. The survey area shall include the Project Disturbance Area and surrounding 500 foot survey buffer for each phase of construction in accordance with **BIO-29** (phasing).

2. Implement Burrowing Owl Mitigation Plan. The Project owner shall implement measures described in the final Burrowing Owl Mitigation Plan. The final Burrowing Owl Mitigation Plan shall be approved by the CPM, in consultation with BLM, USFWS and CDFG, and shall:

a. identify suitable sites within 1 mile of the Project Disturbance Areas for creation or enhancement of burrows prior to passive relocation efforts;

b. provide guidelines for creation or enhancement of at least two natural or artificial burrows per relocated owl; **design of the artificial burrows shall be consistent with CDFW guidelines (CDFW 2012) and shall be approved by the CPM in consultation with CDFW and USFWS;**

c. provide detailed methods and guidance for passive relocation of burrowing owls occurring within the Project Disturbance Area; and

d. describe monitoring and management of the passive relocation effort, including the created or enhanced burrow location and the project area where burrowing owls were relocated from, and provide a reporting plan.

3. <u>Implement Avoidance Measures</u>. If an active burrowing owl burrow is detected within 500 feet from the Project Disturbance Area the following avoidance and minimization measures shall be implemented:

   a. <u>Establish Non-Disturbance Buffer.</u> Fencing shall be installed at a 250-foot radius from the occupied burrow to create a non-disturbance buffer around the burrow. The non-disturbance buffer and fence line may be reduced to 160 feet if all Project-related activities that might disturb burrowing owls would be conducted during the non-breeding season (September 1 through January 31). Signs shall be posted in English and Spanish at the fence line indicating no entry or disturbance is permitted within the fenced buffer.

   b. <u>Monitoring</u>: If construction activities would occur within 500 feet of the occupied burrow during the nesting season (February 1 – August 31) the Designated Biologist or Biological Monitor shall monitor to determine if these activities have potential to adversely affect nesting efforts, and shall make recommendations to minimize or avoid such disturbance.

4. <u>Acquire Burrowing Owl Habitat.</u> The Project owner shall acquire, in fee or in easement land suitable to support a resident population of burrowing owls and shall provide funding for the enhancement and long-term management of these compensation lands. The responsibilities for acquisition and management of the compensation lands may be delegated by written agreement to CDFG or to a third party, such as a non-governmental organization dedicated to habitat conservation, subject to approval by the CPM, in consultation with CDFG and USFWS prior to land acquisition or management activities. Additional funds shall be based on the adjusted market value of compensation lands at the time of construction to acquire and manage habitat.

   a. <u>Criteria for Burrowing Owl Mitigation Lands.</u> The terms and conditions of this acquisition or easement shall be as described in **BIO-12** [Desert

Tortoise Compensatory Mitigation], with the additional criteria to include: 1) mitigation land per **BIO-29 - Table 2** that must provide suitable habitat for burrowing owls, and 2) the acquisition lands must either currently support burrowing owls or be **within dispersal distance from areas occupied by burrowing owls (generally approximately five miles).** ~~no farther than 5 miles from an active burrowing owl nesting territory.~~ The burrowing owl mitigation lands may be included with the desert tortoise mitigation lands ONLY if these two burrowing owl criteria are met. If the burrowing owl mitigation land is separate from the acreage required for desert tortoise compensation lands, the Project owner shall fulfill the requirements described below in this condition.

b. Security. If the burrowing owl mitigation land is separate from the acreage required for desert tortoise compensation lands the Project owner or an approved third party shall complete acquisition of the proposed compensation lands within the time period specified for this acquisition (see the verification section at the end of this condition). Alternatively, financial assurance can be provided by the Project owner to the CPM and CDFG, according to the measures outlined in **BIO-12**. The amount of the Security shall be as described in **BIO-29 – Table 3** for the proposed Project or any of the Project alternatives. These funds shall be used solely for implementation of the measures associated with the Project. Financial assurance can be provided to the CPM in the form of an irrevocable letter of credit, a pledged savings account or another form of security ("Security") prior to initiating ground-disturbing Project activities. Prior to submittal to the CPM, the Security shall be approved by the CPM, in consultation with CDFG and the USFWS to ensure funding. The final amount due will be determined by an updated appraisal and PAR analysis conducted as described in **BIO-12**.

Verification: If pre-construction surveys detect burrowing owls within the Project Disturbance Area and relocation of the owls is required, within 30 days of completion of the burrowing owl pre-construction surveys the Project owner shall submit to the CPM, BLM, CDFG, and USFWS a Burrowing Owl Mitigation Plan. The Burrowing Owl Mitigation Plan shall identify suitable areas for construction of burrows and the other passive relocation as described above. As part of the Annual Compliance Report each year following construction for a period of five years, the Designated Biologist shall provide a report to the CPM, BLM, USFWS and CDFG that describes the results of monitoring and management of the burrowing owl burrow creation or enhancement area(s).

If pre-construction surveys detect burrowing owls within 500 feet of proposed construction activities, at least 10 days prior to the start of any Project-related site disturbance activities the Designated Biologist shall provide to the CPM, BLM, CDFG, and USFWS documentation indicating that non-disturbance buffer fencing has been installed as described above. The Project owner shall report monthly to the CPM, BLM, CDFG and USFWS for the duration of construction on the implementation of burrowing owl avoidance and minimization measures. Within 30 days after completion of construction the Project owner shall provide to the CPM and CDFG a written report identifying how mitigation measures described in the plan have been completed.

No less than 30 days prior to the start of Project ground-disturbing activities the Project owner shall provide the CPM with an approved form of Security in accordance with this condition of certification. Actual Security for acquisition of 78 acres of burrowing owl habitat shall be provided no later than 7 days prior to the beginning of Project ground-disturbing activities.

No fewer than 90 days prior to the land or easement purchase, as determined by the date on the title, the Project owner shall provide the CPM with a management plan for review and approval, in consultation with CDFG, BLM, and USFWS, for the compensation lands and associated funds.

No later than 18 months from initiation of construction, the Project owner shall provide written verification to the CPM that the compensation lands or conservation easements have been acquired and recorded in favor of the approved recipient.

SPECIAL-STATUS PLANT IMPACT AVOIDANCE, MINIMIZATION AND COMPENSATION

BIO-19 This condition contains the following four sections:

- **Section A: Special-Status Plant Impact Avoidance and Minimization Measures** contains the Best Management Practices and other measures designed to avoid accidental indirect impacts to plants during construction, operation, and closure. The measures are required for special-status plants located outside of the Project Disturbance Area and within 100 feet of the Project Disturbance Area. The same measures shall also be implemented for plants within the Project Disturbance Area that are avoided pursuant to Section C of this condition.
- **Section B: Conduct Late Season Botanical Surveys** describes guidelines for conducting summer-fall 201~~0~~**3** surveys to detect special-status plants that would have been missed during the spring 201~~0~~**3** surveys.
- **Section C: Avoidance Requirements for Special-Status Plants** Detected **in the Summer/Fall 201~~0~~3 Surveys** outlines the level of on-site avoidance required for any special-status plants detected during the summer-fall surveys, and specifies when off-site mitigation is required..
- **Section D: Off-Site Compensatory Mitigation for Special-Status Plants** describes performance standards for off-site mitigation through acquisition or restoration/enhancement.

"Project Disturbance Area" encompasses all areas to be temporarily and permanently disturbed by the Project, including the plant site, linear facilities, and areas disturbed by temporary access roads, fence installation, construction work lay-down and staging areas, parking, storage, or by any other activities resulting in disturbance to soil or vegetation. The term

"Permanent Project Disturbance Area" refers only to the solar facility; "linears" includes transmission lines, laydown areas, pipelines, and access roads.

The Project owner shall implement the following measures in Section A, B, C, and D to avoid, minimize, and compensate for direct, indirect, and cumulative impacts to special-status plant species:

Section A: Special-Status Plant Impact Avoidance and Minimization Measures

To protect all special-status plants[10][11]located outside of the Project Disturbance Area and within 100 feet of the permitted Project Disturbance Area from accidental and indirect impacts during construction, operation, and closure, the Project owner shall implement the following measures:

1. Designated Botanist. An experienced botanist who meets the qualifications described in Section **B-2** below shall oversee compliance with all special-status plant avoidance, minimization, and compensation measures described in this condition throughout construction and closure. The Designated Botanist shall oversee and train all other Biological Monitors tasked with conducting botanical survey and monitoring work. During operation of the Project, the Designated Biologist shall be responsible for protecting special-status plant occurrences within 100 feet of the Project boundaries.

2. Special-Status Plant Impact Avoidance and Minimization Measures. The Project owner shall incorporate all measures for protecting special-status plants in close proximity to the site into the BRMIMP (**BIO-7**). These measures shall include the following elements:

   a. Site Design Modifications: i) Incorporate s modifications to site design or construction techniques to minimize direct and indirect impacts to special-status plants along the Project linears to include: limiting the width of the work area; adjusting the location of staging areas, lay downs, spur roads and poles or towers; driving and crushing vegetation as an alternative to blading temporary roads to preserve the seed bank, and minor adjustments to the alignment of the roads and pipelines within the constraints of the ROW; ~~ii)modify diffusers on engineered channel to ensure discharge into existing small channels that were deprived of flows from diversion into engineered channel to minimize impacts downstream and maintain the natural surface~~

[10] This shall include special-status plants found during the fall 2010 surveys and the following species found during the spring 2009-2010 surveys: Harwood's milk-vetch; Harwood's woolly-star; California ditaxis; ribbed cryptantha, and the "Palen Lake atriplex (Andre sp. nov.).

[11] Staff defines special-status plants as described in *Protocols for Surveying and Evaluating Impacts to Special-Status Native Plant Populations and Natural Communities* (California Natural Resources Agency, Department of Fish and Game, issued November 24, 2009). "List 3 plants may be analyzed under CEQA §15380 if sufficient information is available to assess potential impacts to such plants. Factors such as regional rarity vs. statewide rarity should be considered in determining whether cumulative impacts to a List 4 plant are significant even if individual project impacts are not."

~~drainage patterns and sediment transport critical to wash-dependent special-status plants; iii~~**ii**) These modifications shall be clearly depicted on the grading and construction plans, and on report-sized maps in the BRMIMP.

b. Establish Environmentally Sensitive Areas (ESAs). Prior to the start of any ground- or vegetation-disturbing activities, the Designated Botanist shall establish ESAs to protect avoided[12] special-status plants located outside of the Project Disturbance Areas and within 100 feet of the boundary of construction. This includes plant occurrences identified during the **all** spring ~~2009-2010 surveys and the~~ **and** late season ~~2010~~ surveys. The locations of ESAs shall be clearly depicted on construction drawings, which shall also include all avoidance and minimization measures on the margins of the construction plans. The boundaries of the ESAs shall be placed a minimum of 20 feet from the uphill side of the occurrence and 10 feet from the downhill side. Where this is not possible due to construction constraints, other protection measures such as silt-fencing and sediment controls may be employed to protect the occurrences. Equipment and vehicle maintenance areas, and wash areas, shall be located 100 feet from the uphill side of any ESAs. ESAs shall be clearly delineated in the field with temporary construction fencing and signs prohibiting movement of the fencing or sediment controls under penalty of work stoppages and additional compensatory mitigation. ESAs shall also be clearly identified (with signage or by mapping on site plans) to ensure that avoided plants are not inadvertently harmed during construction, operation, or closure.

c. Special-Status Plant Worker Environmental Awareness Program (WEAP). The WEAP **(BIO-6)** shall include training components specific to protection of special-status plants as outlined in this condition.

d. Herbicide and Soil Stabilizer Drift Control Measures. Special-status plant occurrences within 100 feet of the Project Disturbance Area, and any occurrences avoided within the Project Disturbance Area[3] shall be protected from herbicide and soil stabilizer drift. The Weed **Management Plan** ~~Control Program~~ (**BIO-14**) shall include measures to avoid chemical drift or residual toxicity to special-status plants consistent with guidelines such as those provided by the Nature Conservancy's *The Global Invasive Species Team*[13] , the U.S.

[12] "Avoided" includes plants occurring within 100 feet outside of the Project boundary, and all plants within the Project Disturbance Area (linears or solar facility) that were avoided pursuant to Section C of this condition.

[13] Hillmer, J. & D. Liedtke. 2003. Safe herbicide handling: a guide for land stewards and volunteer stewards. Ohio Chapter, The Nature Conservancy, Dublin, OH. 20 pp. Online: <http://www.invasive.org/gist/products.html.

Environmental Protection Agency, and the Pesticide Action Network Database[14].

e. Erosion and Sediment Control Measures. Erosion and sediment control measures shall not inadvertently impact special-status plants by using invasive or non-native plants in seed mixes, introducing pest plants through contaminated seed or straw, accidental burial by mulches, etc. These specifications shall be incorporated in the Drainage, Erosion, and Sedimentation Control Plan required under **SOIL&WATER-1**.

f. Locate Staging, Parking, Spoils, and Storage Areas Away from Special-Status Plant Occurrences. Areas for spoils, equipment, vehicles, and materials storage areas; parking; equipment and vehicle maintenance areas, and wash areas shall be placed at least 100 feet from any ESAs. These specifications shall be incorporated in the Drainage, Erosion, and Sedimentation Control Plan required under **SOIL&WATER-1**.

g. Pre-Construction Seed Collection. For all significant impacts to special-status plants, mitigation shall include seed collection from the affected special-status plants population on-site prior to construction to conserve the germplasm and provide a seed source for restoration efforts. Seed collection shall follow the guidelines described in Section D.**III**.3 of this condition.

h. Monitoring and Reporting Requirements. The Designated Botanist, or BM under supervision of the Designated Botanist, shall conduct weekly monitoring of the ESAs that protect special-status plant occurrences during construction and decommissioning activities.

Section B: Conduct Late-Season Botanical Surveys

The Project owner shall conduct late-summer/fall botanical surveys for late-season special-status plants prior to start of construction or by the end of 201~~0~~**3**, as described below:

1. Survey Timing. Surveys shall be timed to detect: a) summer annuals triggered to germinate by the warm, tropical summer storms (which may occur any time between June and October), and b) fall-blooming perennials that respond to the cooler, later season storms (typically beginning in September or October). For those species that are identified by vegetative characteristics, surveys do not have to be timed for blooming or fruiting. The surveys shall not be timed to coincide with the statistical peak bloom period of the target species but shall instead, if possible, be based on plant phenology and the timing of a significant

[14] Pesticide Action Network of North America. Kegley, S.E., Hill, B.R., Orme S., Choi A.H., PAN Pesticide Database, Pesticide Action Network, North America. San Francisco, CA, 2010 <http://www.pesticideinfo.org>

storm event (e. g., a 10mm or greater rain or multiple storm events of sufficient volume to trigger germination as determined by a qualified botanist.). If possible, surveys shall occur at the appropriate time to capture the characteristics necessary to identify the taxon. Construction is authorized to commence following a 201~~0~~**3** late season survey.

2. Surveyor Qualifications and Training. Surveys shall be conducted by a qualified botanist knowledgeable in the complex biology of the local flora, and consistent with CDFG (2009) and BLM (2009) guidelines for surveyor qualifications. Each surveyor shall be equipped with a GPS unit and record a complete tracklog; these data shall be compiled and submitted along with the Summer-Fall Survey Botanical Report (described below). Prior to the start of surveys, all crew members shall, at a minimum, visit reference sites (where available) and/or review herbarium specimens of all BLM Sensitive plants, ~~CNPS List~~ **California Rare Plant Rank (RPR)** 1B or 2 (Nature Serve rank S1 and S2) or proposed ~~List~~ **RPR** 1B or 2 taxa, and any new reported or documented taxa, to obtain a search image. Because the potential for range extensions is unknown, the list of potentially occurring special-status plants shall include all special-status taxa known to occur within the Sonoran Desert region and the eastern portion of the Mojave in California. The list shall also include taxa with bloom seasons that begin in fall and extend into the early spring as many of these are reported to be easier to detect in fall, following the start of the fall rains.

3. Survey Coverage. The survey coverage or intensity shall be in accordance with BLM Survey Protocols (issued July 2009)[15], **or most recent BLM protocols,** which specify that intuitive controlled surveys shall only be accomplished by botanists familiar with the habitats and species that may reasonably be expected to occur in the project area.

4. Pre-Construction Seed Collection. For all significant impacts to special-status plants, mitigation shall include seed collection from the affected special-status plants population on-site prior to construction to conserve the germplasm and provide a seed source for restoration efforts. Seed collection shall be conducted during the late-season surveys follow the guidelines described in Section D.III.3 of this condition.

5. Documenting Occurrences. If a special-status plant is detected, the full extent of the population onsite shall be recorded using GPS in accordance with BLM survey protocols. Additionally, the extent of the population within one mile of Project boundaries shall be assessed at least qualitatively to facilitate an accurate estimation of the proportion of the population affected by the Project. For populations that are very dense or very large, the population size may be estimated by simple sampling techniques. When populations are very extensive or locally abundant, the surveyor

[15] Bureau of Land Management (BLM), California State Office. *Survey Protocols Required for NEPA/ESA Compliance for BLM Special Status Plant Species*. Issued July 2009.

must provide some basis for this assertion and roughly map the extent on a topographic map. All but the smallest populations (e.g., a population occupying less than 100 square feet) shall be recorded as area polygons; the smallest populations may be recorded as point features. All GPS-recorded occurrences shall include: the number of plants, phenology, observed threats (e.g., OHV or invasive exotics), and habitat or community type. The map of occurrences submitted with the final botanical report shall be prepared to ensure consistency with definition of an occurrence by CNDDB, i.e., occurrences found within 0.25 miles of another occurrence of the same taxon, and not separated by significant habitat discontinuities, shall be combined into a single 'occurrence'. The Project owner shall also submit the raw GPS shape files and metadata, and completed CNDDB forms for each 'occurrence' (as defined by CNDDB).

6. Reporting. Raw GPS data, metadata, and CNDDB field forms shall be provided to the CPM and the BLM State Botanist within two weeks of the completion of each survey. If surveys are split into two or more periods (e.g., a late summer survey and a fall survey), then a summary letter shall be submitted following each survey period.

   The Final Summer-Fall Botanical Survey Report shall be prepared consistent with CDFG guidelines (CDFG 2009), and BLM 2009 guidelines **(or the most recent version of CDFG and BLM guidelines)** and shall include all of the following components:

   a. the BLM designation, NatureServe Global and State Rank of each species or taxon found (or proposed rank, or CNPS List);

   b. the number or percent of the occurrence that will be directly affected, and indirectly affected by changes in drainage patterns or altered geomorphic processes;

   c. the habitat or plant community that supports the occurrence and the total acres of that habitat or community type that occurs in the Project Disturbance Area;

   d. an indication of whether the occurrence has any local or regional significance (e.g., if it exhibits any unusual morphology, occurs at the periphery of its range in California, represents a significant range extension or disjunct occurrence, or occurs in an atypical habitat or substrate);

   e. a completed CNDDB field form for every occurrence (occurrences of the same species within one-quarter mile or less of each other combined as one occurrence, consistent with CNDDB methodology), and

f. two maps: one that depicts the raw GPS data (as collected in the field) on a topographic base map with Project features; and a second map that follows the CNDDB protocol for occurrence mapping.

Section C: Avoidance Requirements for Special-Status Plants Detected in the Summer/Fall ~~2010~~2013 Surveys

The Project owner shall apply the following avoidance and mitigation standards for impacts to late blooming special-status plants that might be detected during late summer/fall season surveys. The Project owner shall immediately notify the CDF~~G~~**W**, USFWS, BLM State Botanist, and the CPM if any State- or Federal-listed species or BLM Sensitive species are detected. Avoidance and/or the off-site mitigation measures described in Section D below would reduce impacts to these special-status plant species to less-than-significant levels. Plants shall be considered impacted if they are within the Project footprint, or if they would be affected by Project-related hydrologic changes or changes to the local sand transport system Downstream/ downwind impacts from altered hydrology or geomorphic processes shall be considered direct impacts.

Mitigation for CNDDB Rank 1 Plants (Critically Imperiled). If late blooming species with a CNDDB rank of 1[16] are detected within the Project Disturbance Area, complete avoidance is mandatory along the linears and within construction laydown areas. The Project owner shall limit the width of the work area; adjusting the location of staging areas, lay downs, spur roads and poles or towers; driving and crushing vegetation as an alternative to blading temporary roads, and other construction or design modifications as necessary to achieve avoidance of any Rank 1 plants detected.

If late-season Rank 1 plants are detected on the solar facility, the Project owner shall avoid all plants around the perimeter[17] of the facility as necessary to achieve 75 percent avoidance of the local population of the affected species. The local population shall be measured by the number of individuals occurring on the Project Site and within the immediate watershed of the Project for wash dependent-species or species of unknown dispersal mechanism, or within the local sand transport corridor for wind dispersed species. Measurement of percent avoidance shall be based on population for perennials and on habitat for annuals (habitat containing the species' micro-habitat preferences, such as "fine silts and moist depressions"). Avoidance within the central portion of the solar facility is not recommended because it would create fragmented conditions that would not sustain persistence of the affected species. For all portions of the local population not avoided, the Project owner shall implement off-site mitigation at a ratio of 3:1. The off-site mitigation may include land acquisition or implementation of a

[16] The CNDDB Rank is provided in the California Natural Diversity Database (CNDDB). Plants with a Rank of 1 are "Critically imperiled in the nation or state/province because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the state."

[17] The inside "perimeter" is used here to describe the distance or length equal to two troughs.

restoration/enhancement program for the species, and shall meet the performance standards described in section D of this Condition. The Applicant must demonstrate, subject to review and approval by the CPM, that the impacts, after mitigation, will not cause a loss of viability[18] for that species. The Project owner shall prepare and implement a Special-Status Plant Mitigation Plan (Plan). The content of the Plan and definitions shall be as described above in subsection C.3, below.

1. Mitigation for CNDDB Rank 2[19] Plants (Imperiled). If late-season CNDDB Rank 2 species are detected within the Project Disturbance Area avoidance is mandatory along the linears and construction laydown areas. The Project owner shall limit the width of the work area, adjusting the location of staging areas, lay downs, spur roads and poles or towers; driving and crushing vegetation as an alternative to blading temporary roads, and other construction or design modifications as necessary to achieve avoidance of any Rank 2 plants detected[20].

   If late-season Rank 2 plants are detected on the solar facility, the Project owner shall implement off-site mitigation, at a ratio of 2:1, for any impacts exceeding 25 percent of the local population. The off-site mitigation may include land acquisition or implementation of a restoration/enhancement program for the species, and shall meet the performance standards described in section D of this Condition. The Project owner must demonstrate, subject to review and approval by the CPM, that the impacts, after mitigation, will not cause a loss of viability for that species. The Project owner shall prepare and implement a Special-Status Plant Mitigation Plan (Plan). The content of the Plan and definitions shall be as described above in subsection C.3, below.

2. Mitigation for CNDDB Rank 3[21] Plants (Vulnerable). If CNDDB Rank 3 plants are detected (which constitutes most **RPR** 4 plants), mitigation is

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[18] A "viable" species is one consisting of self-sustaining and interacting populations that are well-distributed throughout the species' range. "Self-sustaining populations" are those that are sufficiently abundant and have sufficient diversity to display the array of life history strategies and forms to provide for their long-term persistence and adaptability over time. The definition of the term "well-distributed" can vary based on current, historic, and potential population and habitat conditions. Maintaining viability is a means of ensuring, as much as possible, that a species will not go extinct in the foreseeable future. Because species and their environments are dynamic, there is not a single population size above which a species is viable and below which it will become extinct. Viability is best expressed as a level of risk of extinction.

[19] CNDDB Rank 2 plants are "Imperiled in the nation or state/province because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the state".

[20] The CNDDB Rank 2 plants California ditaxis was detected along the linears within the Project Disturbance Area (Solar Millenium 2010p). Staff concluded the impact was significant and all terms and conditions of Section C.2 shall be implemented. Staff concluded that the direct impacts to Harwood's milk-vetch were minor and no compensatory mitigation is required beyond the avoidance and minimization measures described in Section A of this condition.

[21] CNDDB Rank 3 plants are "Vulnerable in the nation or state/province due to a restricted range, relatively few populations (often 80or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.

not required unless the occurrence has local or regional significance, in which case the plant occurrence shall be treated as a CNDDB Rank 2 plant; avoidance and mitigation would be as described above under C.2. A plant occurrence would be considered to have local or regional significance if:

a. It occurs at the outermost periphery of its range in California;

b. It occurs in an atypical habitat, region, or elevation for the taxon that suggests that the occurrence may have genetic significance (e.g., that may increase its ability to survive future threats), or;

c. It exhibits any unusual morphology that is not clearly attributable to environmental factors that may indicate a potential new variety or sub-species.

3. Prepare Special-Status Plant Mitigation Plan. If the project will impact any CNDDB Rank 1 or Rank 2 plants, or Rank 3 plants of local or regional significance, or new taxa, the Project owner shall prepare and implement a Special-Status Plant Mitigation Plan (Plan). Compensatory mitigation, as described in Section D of this condition, and at a mitigation ratio of 3:1 for Rank 1 plants, and 2:1 for Rank 2 plants and Rank 1 plants of local or regional significance, and new taxa. The Plan shall include, at a minimum, the following components and definitions:

   a. A description of the occurrences of the affected special-status species, ecological characteristics such as soil, hydrology, and other micro-habitat requirements, ecosystem processes required for maintenance of the species or its habitat, reproduction and dispersal mechanisms, pollinators, local distribution, a description of the extent of the population off-site, the percentage of the local population affected, and a description of how these occurrences would be impacted by the Project, including direct and indirect effects. Occurrences shall be considered impacted if they are within the Project footprint, and if they would be affected by Project-related hydrologic changes or changes to the local sand transport system.

   b. A description of the avoidance and minimization measures that would achieve complete avoidance of occurrences on the Project linears and construction laydown areas. If avoidance is also required on the solar facility (Rank 1 species), provide a description of the measures that would be implemented to avoid or minimize impacts to occurrences on the solar facility. "Avoidance" shall include protection of the ecosystem processes essential for maintenance of the protected plant occurrence, and protection of the seed bank. Isolated 'islands' of protected plants disconnected by the Project from natural fluvial, aeolian (wind), or other processes essential for maintenance of the species, shall not be considered avoidance.

c. If off-site mitigation is also required, pursuant to C.1 –C.3 above, the Plan shall include a description of the proposed mitigation (acquisition or restoration/enhancement) and demonstrate how the mitigation will meet the performance standards described in Section D of this condition.

For CNDDB Rank 1 plants that cannot be avoided (i.e., plants located in the central portion of the solar facility), the Plan must demonstrate that the impacts (after mitigation) will not cause a loss of viability for that species. The assessment of viability shall include: *i*) current literature compilation and review on the affected species, it's documented and reported occurrences, range and distribution, habitat, and the ecological conditions needed to support it; *ii)* consultation with scientists and others with expertise and local knowledge of the species to gather unpublished data and other information to supplement the literature review findings, and (if available) *iii*) information on species' habitat relationships, demographics, genetics, and risk factors.

Section D: Off-Site Compensatory Mitigation for Special-Status Plants

Where compensatory mitigation is required under the terms of Section C, above, the Project owner shall mitigate Project impacts to special-status plant occurrences with compensatory mitigation. Compensatory mitigation shall consist of acquisition of habitat supporting the target species, or restoration/enhancement of populations of the target species, and shall meet the performance standards for mitigation described below. In the event that no opportunities for acquisition or restoration/enhancement exist, the Project owner can fund a species distribution study designed to promote the future preservation, protection or recovery of the species. Compensatory mitigation shall be at a ratio of 3:1 for Rank 1 plants, with three acres of habitat acquired or restored/enhanced for every acre of habitat occupied by the special status plant that will be disturbed by the Project Disturbance Area (for example if the area occupied by the special status plant collectively measured is ¼ acre than the compensatory mitigation will be ¾ of an acre). The mitigation ratio for Rank 2 plants shall be 2:1. So, for the example above, the mitigation ratio would be one-half acre for the Rank 2 plants.

The Project owner shall provide funding for the acquisition and/or restoration/enhancement, initial improvement, and long-term maintenance and management of the acquired or restored lands. The actual costs to comply with this condition will vary depending on the Project Disturbance Area, the actual costs of acquiring compensation habitat, the actual costs of initially improving the habitat, the actual costs of long-term management as determined by a Property Analysis Record (PAR) report, and other transactional costs related to the use of compensatory mitigation.

The Project owner shall comply with other related requirements in this condition:

I. **Compensatory Mitigation by Acquisition:** The requirements for the acquisition, initial protection and habitat improvement, and long-term maintenance and management of special-status plant compensation lands include all of the following:

1. Selection Criteria for Acquisition Lands. The compensation lands selected for acquisition may include any of the following three categories:

   a. Occupied Habitat, No Habitat Threats. The compensation lands selected for acquisition shall be occupied by the target plant population and shall be characterized by site integrity and habitat quality that are required to support the target species, and shall be of equal or better habitat quality than that of the affected occurrence. The occurrence of the target special-status plant on the proposed acquisition lands should be viable, stable or increasing (in size and reproduction).

   b. Occupied Habitat, Habitat Threats. Occupied compensation lands characterized by habitat threats may also be acquired as long as the population could be reasonably expected to recover with habitat restoration efforts (e.g., OHV or grazing exclusion, or removal of invasive non-native plants) and is accompanied by a Habitat Enhancement/Restoration Plan as described in Section D.II, below.

   c. Unoccupied but Adjacent. The Project owner may also acquire habitat for which occupancy by the target species has not been documented, if the proposed acquisition lands are adjacent to occupied habitat. The Project owner shall provide evidence that acquisitions of such unoccupied lands would improve the defensibility and long-term sustainability of the occupied habitat by providing a protective buffer around the occurrence and by enhancing connectivity with undisturbed habitat. This acquisition may include habitat restoration efforts where appropriate, particularly when these restoration efforts will benefit adjacent habitat that is occupied by the target species.

2. Review and Approval of Compensation Lands Prior to Acquisition. The Project owner shall submit a formal acquisition proposal to the CPM describing the parcel(s) intended for purchase. This acquisition proposal shall discuss the suitability of the proposed parcel(s) as compensation lands for special-status plants in relation to the criteria listed above, and must be approved by the CPM.

3. Management Plan. The Project owner or approved third party shall prepare a management plan for the compensation lands in consultation with the entity that will be managing the lands. The goal of the management plan shall be to support and enhance the long-term viability of the target special-status plant occurrences. The

Management Plan shall be submitted for review and approval to the CPM.

4. Integrating Special-Status Plant Mitigation with Other Mitigation lands. If all or any portion of the acquired Desert Tortoise, Waters of the State, or other required compensation lands meets the criteria above for special-status plant compensation lands, the portion of the other species' or habitat compensation lands that meets any of the criteria above may be used to fulfill that portion of the obligation for special-status plant mitigation.

5. Compensation Lands Acquisition Requirements. The Project owner shall comply with the following requirements relating to acquisition of the compensation lands after the CPM, has approved the proposed compensation lands:

   a. Preliminary Report. The Project owner, or an approved third party, shall provide a recent preliminary title report, initial hazardous materials survey report, biological analysis, and other necessary or requested documents for the proposed compensation land to the CPM. All documents conveying or conserving compensation lands and all conditions of title are subject to review and approval by the CPM. For conveyances to the State, approval may also be required from the California Department of General Services, the Fish and Game Commission and the Wildlife Conservation Board.

   b. Title/Conveyance. The Project owner shall acquire and transfer fee title to the compensation lands, a conservation easement over the lands, or both fee title and conservation easement, as required by the CPM. Any transfer of a conservation easement or fee title must be to ~~CDFG~~ **CDFW**, a non-profit organization qualified to hold title to and manage compensation lands (pursuant to California Government Code section 65965), or to BLM or other public agency approved by the CPM. If an approved non-profit organization holds fee title to the compensation lands, a conservation easement shall be recorded in favor of ~~CDFG~~ **CDFW** or another entity approved by the CPM. If an entity other than ~~CDFG~~ **CDFW** holds a conservation easement over the compensation lands, the CPM may require that ~~CDFG~~ **CDFW** or another entity approved by the CPM, in consultation with ~~CDFG~~ **CDFW**, be named a third party beneficiary of the conservation easement. The Project owner shall obtain approval of the CPM of the terms of any transfer of fee title or conservation easement to the compensation lands.

   c. Initial Protection and Habitat Improvement. The Project owner shall fund activities that the CPM requires for the initial protection and habitat improvement of the compensation lands. These activities will vary depending on the condition and location of the land acquired, but may include trash removal, construction and repair of fences, invasive plant removal, and similar measures to protect habitat and improve habitat quality on the compensation lands. The costs of these activities would use the estimated cost per acre for Desert Tortoise mitigation as a best available proxy, at the ratio of 3:1 for Rank 1 plants and 2:1 for Rank 2 plants, but actual costs will vary depending on the measures that are required for the compensation lands. A non-profit organization, ~~CDFG~~ **CDFW** or another public agency may hold and expend the habitat improvement funds if it is qualified to manage the compensation lands (pursuant to California Government Code section 65965), if it meets the approval of the CPM in consultation with ~~CDFG~~ **CDFW**, and if it is authorized to participate in implementing the required activities on the compensation lands. If ~~CDFG~~ **CDFW** takes fee title to the compensation lands, the habitat improvement fund must be paid to ~~CDFG~~ **CDFW** or its designee.

d. <u>Property Analysis Record</u>. Upon identification of the compensation lands, the Project owner shall conduct a Property Analysis Record (PAR) or PAR-like analysis to establish the appropriate amount of the long-term maintenance and management fund to pay the in-perpetuity management of the compensation lands. The PAR or PAR-like analysis must be approved by the CPM before it can be used to establish funding levels or management activities for the compensation lands.

e. <u>Long-term Maintenance and Management Funding</u>. The Project owner shall deposit in NFWF's REAT Account a capital long-term maintenance and management fee in the amount determined through the Property Analysis Record (PAR) or PAR-like analysis conducted for the compensation lands.

The CPM, in consultation with V, may designate another non-profit organization to hold the long-term maintenance and management fee if the organization is qualified to manage the compensation lands in perpetuity. If ~~CDFG~~ **CDFW** takes fee title to the compensation lands, ~~CDFG~~ **CDFW** shall determine whether it will hold the long-term management fee in the special deposit fund, leave the money in the REAT Account, or designate another entity to manage the long-term maintenance and management fee for ~~CDFG~~ **CDFW** and with ~~CDFG~~ **CDFW** supervision.

<u>Interest, Principal, and Pooling of Funds.</u> The Project owner shall ensure that an agreement is in place with the long-term maintenance and management fund (endowment) holder/manager to ensure the following requirements are met:

i. <u>Interest</u>. Interest generated from the initial capital long-term maintenance and management fund shall be available for reinvestment into the principal and for the long-term operation, management, and protection of the approved compensation lands, including reasonable administrative overhead, biological monitoring, improvements to carrying capacity, law enforcement measures, and any other action that is approved by the CPM and is designed to protect or improve the habitat values of the compensation lands.

ii. Withdrawal of Principal. The long-term maintenance and management fund principal shall not be drawn upon unless such withdrawal is deemed necessary by the CPM or by the approved third-party long-term maintenance and management fund manager, to ensure the continued viability of the species on the compensation lands.

iii. Pooling Long-Term Maintenance and Management Funds. An entity approved to hold long-term maintenance and management funds for the Project may pool those funds with similar funds that it holds from other projects for long-term maintenance and management of compensation lands for special-status plants. However, for reporting purposes, the long-term maintenance and management funds for this Project must be tracked and reported individually to the CPM.

f. Other Expenses. In addition to the costs listed above, the Project owner shall be responsible for all other costs related to acquisition of compensation lands and conservation easements, including but not limited to the title and document review costs incurred from other state agency reviews, overhead related to providing compensation lands to ~~CDFG~~ **CDFW** or an approved third party, escrow fees or costs, environmental contaminants clearance, and other site cleanup measures.

g. Mitigation Security. The Project owner shall provide financial assurances to the CPM to guarantee that an adequate level of funding is available to implement any of the mitigation measures required by this condition that are not completed prior to the start of ground-disturbing Project activities. Financial assurances shall be provided to the CPM in the form of an irrevocable letter of credit, a pledged savings account or another form of security ("Security") approved by the CPM. The amount of the Security shall use the estimated cost per acre for Desert Tortoise mitigation as a best available proxy, at a ratio of 3:1 for Rank 1 plants and 2:1 for Rank 2 plants, for every acre of habitat supporting the target special-status plant species which is significantly impacted by the project. The actual costs to comply with this condition will vary depending on the actual costs of acquiring compensation habitat, the costs of initially improving the habitat, and the actual costs of long-term management as determined by a PAR report. Prior to submitting the Security to the CPM, the Project owner shall obtain the CPM's approval of the form of the Security. The CPM may draw on the

Security if the CPM determines the Project owner has failed to comply with the requirements specified in this condition. The CPM may use money from the Security solely for implementation of the requirements of this condition. The CPM's use of the Security to implement measures in this condition may not fully satisfy the Project owner's obligations under this condition, and the Project owner remains responsible for satisfying the obligations under this condition if the Security is insufficient. The unused Security shall be returned to the Project owner in whole or in part upon successful completion of the associated requirements in this condition.

h. NFWF REAT Account. The Project owner may elect to comply with the requirements in this condition for acquisition of compensation lands, initial protection and habitat improvement on the compensation lands, or long-term maintenance and management of the compensation lands by funding, or any combination of these three requirements, by providing funds to implement those measures into the Renewable Energy Action Team (REAT) Account established with the National Fish and Wildlife Foundation (NFWF**) except to the extent Government Code section 65968 does not authorize NFWF to hold long-term maintenance and management funds for the project..** To use this option, the Project owner must make an initial deposit to the REAT Account in an amount equal to the estimated costs (as set forth in the Security section of this condition) of implementing the requirement. If the actual cost of the acquisition, initial protection and habitat improvements, or long-term funding is more than the estimated amount initially paid by the Project owner, the Project owner shall make an additional deposit into the REAT Account sufficient to cover the actual acquisition costs, the actual costs of initial protection and habitat improvement on the compensation lands, and the long-term funding requirements as established in an approved PAR or PAR-like analysis. If those actual costs or PAR projections are less than the amount initially transferred by the Applicant, the remaining balance shall be returned to the Project owner.

The responsibility for acquisition of compensation lands may be delegated to a third party other than NFWF, such as a non-governmental organization supportive of desert habitat conservation, by written agreement of the Energy Commission. Such delegation shall be subject to approval by the CPM, in consultation with ~~CDFG~~ **CDFW**, BLM and USFWS, prior to land acquisition, enhancement or management activities. Agreements to delegate land acquisition to an approved third party, or to manage compensation lands, shall be executed and implemented within 18 months of the start of ground disturbance.

II. Compensatory Mitigation by Habitat Enhancement/Restoration: As an alternative or adjunct to land acquisition for compensatory mitigation the Project owner may undertake habitat enhancement or restoration for the target special-status plant species. Habitat enhancement or restoration activities must achieve protection at a 3:1 ratio for Rank 1 plants and 2:1 for Rank 2 plants, with improvements applied to three acres, or two acres, respectively, of habitat for every acre special-status plant habitat directly or indirectly_disturbed by the Project Disturbance Area (for example if the area occupied by the special status plant collectively measured is 1/4 acre than the improvements would be applied to an area equal to 3/4 of an acre at a 3:1 ratio, or one-half acre at a 2:1 ratio). Examples of suitable enhancement projects include but are not limited to the following: i) control unauthorized vehicle use into an occurrence (or pedestrian use if clearly damaging to the species); ii) control of invasive non-native plants that infest or pose an immediate threat to an occurrence; iii) exclude grazing by wild burros or livestock from an occurrence; or iv) restore lost or degraded hydrologic or geomorphic functions critical to the species by restoring previously diverted flows, removing obstructions to the wind sand transport corridor above an occurrence, or increasing groundwater availability for dependent species.

If the ~~P~~**p**roject owner elects to undertake a habitat enhancement project for mitigation, the project must meet the following performance standards: The proposed enhancement project shall achieve rescue of an off-site occurrence that is currently assessed, based on the NatureServe threat ranking system[22] with one of the following threat ranks: a) long-term decline >30%; b) an immediate threat that affects >30% of the population, or c) has an overall threat impact that is High to Very High. “Rescue” would be considered successful if it achieves an improvement in the occurrence trend to “stable” or “increasing” status, or downgrading of the overall threat rank to slight or low (from “High” to “Very High”).

If the ~~P~~**p**roject owner elects to undertake a habitat enhancement project for mitigation, they shall submit a Habitat Enhancement/Restoration Plan to the CPM for review and approval, and shall provide sufficient funding for implementation and monitoring of the Plan. The amount of the Security shall use the estimated cost per acre for Desert Tortoise mitigation as a best available proxy, at the ratio of 3:1 for Rank 1 plants and 2:1 for Rank 2 plants, for every acre of habitat supporting the target special-status plant species which is directly or indirectly impacted by the project. The amount of the security may be adjusted based on the actual costs of implementing the enhancement, restoration and monitoring. The implementation and

[22] Master, L., D. Faber-Langendoen, R. Bittman, G. A., Hammerson, B. Heidel, J. Nichols, L. Ramsay, and A. Tomaino. 2009. *NatureServe Conservation Status Assessments: Factors for Assessing Extinction Risk.* NatureServe, Arlington, VA. Online: http://www.natureserve.org/publications/ConsStatusAssess_StatusFactors.pdf, “Threats”. See also: Morse, L.E., J.M. Randall, N. Benton, R. Hiebert, and S. Lu. 2004. An Invasive Species Assessment Protocol: Evaluating Non-Native Plants for Their Impact on Biodiversity. Version 1. NatureServe, Arlington, Virginia. Online: http://www.natureserve.org/publications/pubs/invasiveSpecies.pdf

monitoring of the enhancement/restoration may be undertaken by an appropriate third party such as NFWF, subject to approval by the CPM. The Habitat Enhancement/Restoration Plan shall include each of the following:

1. Goals and Objectives. Define the goals of the restoration or enhancement project and a measurable course of action developed to achieve those goals. The objective of the proposed habitat enhancement plan shall include restoration of a target special-status plant occurrence that is currently threatened with a long-term decline. The proposed enhancement plan shall achieve an improvement in the occurrence trend to “stable” or “increasing” status, or downgrading of the overall threat rank to slight or low (from “High” to “Very High”).

2. Historical Conditions. Provide a description of the pre-impact or historical conditions (before the site was degraded by weeds or grazing or ORV, etc.), and the desired conditions.

3. Site Characteristics. Describe other site characteristics relevant to the restoration or enhancement project (e.g., composition of native and pest plants, topography and drainage patterns, soil types, geomorphic and hydrologic processes important to the site or species.

4. Ecological Factors. Describe other important ecological factors of the species being protected, restored, or enhanced such as total population, reproduction, distribution, pollinators, etc.

5. Methods. Describe the restoration methods that will be used (e.g., invasive exotics control, site protection, seedling protection, propagation techniques, etc.) and the long-term maintenance required. The implementation phase of the enhancement must be completed within five years.

6. Budget. Provide a detailed budget and time-line, and develop clear, measurable, objective-driven annual success criteria.

7. Monitoring. Develop clear, measurable monitoring methods that can be used to evaluate the effectiveness of the restoration and the benefit to the affected species. The Plan shall include a minimum of five years of quarterly monitoring, and then annual monitoring for the remainder of the enhancement project, and until the performance standards for rescue of a threatened occurrence are met. At a minimum the progress reports shall include: quantitative measurements of the projects progress in meeting the enhancement project success criteria, detailed description of remedial actions taken or proposed, and contact information for the responsible parties.

8. Reporting Program. The Plan shall ensure accountability with a reporting program that includes progress toward goals and success criteria. Include names of responsible parties.

9. Contingency Plan. Describe the contingency plan for failure to meet annual goals.

10. Long-term Protection. Include proof of long-term protection for the restoration site. For private lands this would include conservations easements or other deed restrictions; projects on public lands must be contained in a Desert Wildlife Management Area, Wildlife Habitat Management Area, or other land use protections that will protect the mitigation site and target species.

II. Contingency Measures

1. Preservation of the Germplasm of Affected Special-Status Plants. For all significant impacts to special-status plants, mitigation shall also include seed collection from the affected special-status plants population on-site prior to construction to conserve the germplasm and provide a seed source for restoration efforts. The seed shall be collected under the supervision or guidance of a reputable seed storage facility such as the Rancho Santa Ana Botanical Garden Seed Conservation Program, San Diego Natural History Museum, or the Missouri Botanical Garden. The costs associated with the long-term storage of the seed shall be the responsibility of the Project owner. Any efforts to propagate and reintroduce special-status plants from seeds in the wild shall be carried out under the direct supervision of specialists such as those listed above and as part of a Habitat Restoration/Enhancement Plan approved by the CPM.

2. Compensatory Mitigation by Conducting or Contributing to a Management Plan for the Affected Species. Subject to approval of the CPM, as a contingency measure in the event there are no opportunities for mitigation through acquisition or restoration/enhancement to meet the obligations for off-site mitigation as described in Section C.1-3 of this condition, , a Management Plan for the affected special-status plant species may be conducted or funded. The goal of the Management Plan is to devise a science-based, region-wide strategy to ensure the long-term viability of the affected species, and to acquire, protect, and restore existing populations and the habitat that supports them. The information gathered shall be used to develop conservation approaches to address the identified risk factors. These approaches include land allocations, restoration needs, identifying and preserving important refugia to facilitate species dispersal and maintain biodiversity in the face of climate change, recommending Best Management Practices or other measures that could be used to minimize threats, and identifying planning needs at the regional level. The results of the study would also be provided to the resource agencies, conservation organizations, and academic institutions, as well as the state's Natural Diversity Database and Consortium of California Herbaria.

3. Under this contingency measure, the Project owner shall acquire all available information on the distribution, status or health of known occurrences, ecological requirements, and ownership and management opportunities of the affected special-status plant species and other special status plants known to occur in the Chuckwalla Valley. Some of these late blooming species are only known from a few viable occurrences in California, and historic occurrences that have not been re-located or surveyed since they were first documented. At a minimum, the study shall include the following:

    a. <u>Occurrence and Life History Review</u>. The Study shall include an evaluation of all documented, historical and reported localities for the affected species, and a review of current information on the species life history. This would include a review of the CNDDB database, records from regional and national herbaria, literature review, consultation with U.C. Riverside, San Diego Natural History Museum, and other educational institutions or natural heritage organizations in California, Arizona, and Nevada, etc.), other biotechnical survey reports from the region, and information from regional botanical experts.

    b. <u>Conduct Site Visits to Documented and Reported Localities.</u> Documented and reported occurrences would be evaluated in the field during the appropriate time of the year for each late blooming species. If located, these occurrences would be evaluated for population size (area and quantity), population trend, ecological characteristics, soils, habitat quality, potential threats, degree and immediacy of threats, ownership and management opportunities. GPS location data would also be collected during these site visits.

    c. <u>Survey Surrounding Areas.</u> Areas surrounding the occurrences that contain habitat suitable to support the affected species shall be surveyed to determine the full extent of its range and distribution. If additional populations are found, collect data (GPS and assessment) on these additional populations consistent with III.2 above.

    d. <u>Prepare Report on Status, Distribution, and Management Needs.</u> A report shall be prepared that contains the results of the surveys and assessment. The report shall contain the following components: a) Range and Distribution (including maps and GPS data); b) Abundance and Population Trends; c) Life History; d) Habitat Necessary for Survival; d) Factors Affecting Ability to Survive and Reproduce; e) Degree and Immediacy of Threat; f) Ownership and Management Opportunities for Protection or Recovery; g) Sources of Information, and g) Conclusions. The conclusions shall contain an explanation of whether the species' survival is threatened by any of the following factors: i) present or threatened modification or destruction of its habitat; ii) competition; iii) disease; iv) other natural occurrences (such as climate change) or human-related activities. This valuable information will provide a better understanding of the ecological factors driving the distribution of these species, and will identify opportunities for mitigation and management opportunities for recovery. All data from this study will be submitted for incorporation into the CNDDB system and the study report will be made available to resource agencies, and conservation groups, and other interested parties.

e. The cost to implement or fund the study shall be no greater than the cost for acquisition, enhancement, and long-term management of compensatory mitigation lands based on the specifications and standards for acquisition or restoration/enhancement described above under D.I and D.II.

Verification: The Special-Status Plant Impact Avoidance and Minimization Measures shall be incorporated into the BRMIMP as required under Condition of Certification **BIO-7.**

The Project owner shall notify the CPM and the BLM State Botanist no less than 14 days prior to the start of late-season surveys and provide a target list of late season special-status plants that will be considered. Concurrently, the Project owner shall coordinate with BLM to obtain a permit for seed collection. Seed collection is required for all special-status plants located within the Project Disturbance Area and shall be conducted according to the specifications in Section D.III.1 of this condition and with all terms and conditions of the BLM permit.

Raw GPS data, metadata, and CNDDB field forms shall be submitted to the CPM within two weeks of the completion of each survey. A preliminary summary of results for the late summer/fall botanical surveys, prepared according to guidelines in Section B of this condition, shall also be submitted to the CPM and BLM's State Botanist within two weeks following the completion of the surveys. If surveys are split into more than one period, then a summary letter shall be submitted following each survey period. The Final Summer-Fall Botanical Survey Report, GIS shape files and metadata shall be submitted to the BLM State Botanist and the CPM no less than 30 days prior to the start of ground-disturbing activities. The Final Report shall include a detailed accounting of the acreage of Project impacts to special-status plant occurrences.

For any special-status plant species located within the Project Disturbance Area, the Project owner shall submit to the CPM to less than 30 days prior to the start of ground-disturbing activities proof, in the form of a letter or receipt, of the seed or other propagules collected pursuant to Section D.III #1 of this Condition.

The draft conceptual Special-Status Plant Mitigation Plan, as described under Section C.4 of this condition, shall be submitted to the CPM for review and approval no less than 30 days prior to the start of ground-disturbing activities.

The Project owner shall immediately provide written notification to the CPM, ~~CDFG~~**CDFW**, USFWS, and BLM State Botanist if it detects a State- or Federal-Listed Species, or BLM Sensitive Species at any time during its late summer/fall botanical surveys or at any time thereafter through the life of the Project, including conclusion of Project decommissioning.

No less than 30 days prior to the start of ground-disturbing activities the Project owner shall submit grading plans and construction drawings to the CPM which depict the location of Environmentally Sensitive Areas and the Avoidance and Minimization Measures contained in Section A of this Condition, and under Section C.1-3.

If compensatory mitigation is required, pursuant to Section C.1-3, no less than 30 days prior to the start of ground-disturbing activities the Project owner shall submit to the CPM the form of Security adequate to acquire compensatory mitigation lands and/or undertake habitat enhancement or restoration activities, as described in this condition. Actual Security shall be provided 7 days prior to start of ground-disturbing activities.

No fewer than 90 days prior to acquisition of compensatory mitigation lands, the Project owner shall submit a formal acquisition proposal and draft Management Plan for the proposed lands to the CPM, with copies to ~~CDFG~~**CDFW**, USFWS, and BLM, describing the parcels intended for purchase and shall obtain approval from the CPM prior to the acquisition. No fewer than 90 days prior to acquisition of compensatory mitigation lands, the Project owner shall submit to the CPM and obtain CPM approval of any agreements to delegate land acquisition to an approved third party, or to manage compensation lands; such agreement shall be executed and implemented within 18 months of the start of ground disturbance.

No fewer than 30 days after acquisition of the property the Project owner shall deposit the funds required by Section I e above (long term management and maintenance fee) and provide proof of the deposit to the CPM.

The Project owner or an approved third party shall complete the acquisition and all required transfers of the compensation lands, and provide written verification to the CPM of such completion no later than 18 months after the start of Project ground-disturbing activities. If NFWF or another approved third party is being used for the acquisition, the Project owner shall ensure that funds needed to accomplish the acquisition are transferred in timely manner to facilitate the planned acquisition and to ensure the land can be acquired and transferred prior to the 18-month deadline. If habitat enhancement is proposed, no later than six months following the start of ground-disturbing activities, the Project owner shall obtain CPM approval of the final Habitat Enhancement/Restoration Plan, prepared in accordance with Section D, and submit to the CPM or a third party approved by the CPM Security adequate for long-term implementation and monitoring of the Habitat Enhancement/Restoration Plan.

Enhancement/restoration activities shall be initiated no later than 12 months from the start of construction. The implementation phase of the enhancement project shall be completed within five years of initiation. Until completion of the five-year implementation portion of the enhancement action, a report shall be prepared and submitted as part of the Annual Compliance Report. This report shall provide, at a minimum: a summary of activities for the preceding year and a summary of activities for the following year; quantitative measurements of the Project’s progress in meeting the enhancement project success criteria; detailed description of remedial actions taken or proposed; and contact information for the responsible parties.

If a contingency measure is required, as described in Section D.III of this condition, the Project owner shall submit commence no later than six months following the start of ground-disturbing activities. The draft study shall be submitted to the CPM and BLM State Botanist for review and approval no more than two years following the start of ground-disturbing activities. The final study shall be submitted no more than 30 months following the start of ground-disturbing activities.

If a Distribution Study is implemented as contingency mitigation, the study shall be initiated no later than 6 months from the start of construction. The implementation phase of the study shall be completed within two years of the start of construction.

Within 18 months of ground-disturbing activities, the Project owner shall transfer to the CPM or an approved third party the difference between the Security paid and the actual costs of (1) acquiring compensatory mitigation lands, completing initial protection and habitat improvement , and funding the long-term maintenance and management of compensatory mitigation lands; and/or (2) implementing and providing for the long-term protection and monitoring of habitat enhancement or restoration activities.

Implementation of the special-status plant impact avoidance and minimization measures shall be reported in the Monthly Compliance Reports prepared by the Designated Botanist. Within 30 days after completion of Project construction, the Project owner shall provide to the CPM, for review and approval, in consultation with the BLM State Botanist, a written construction termination report identifying how measures have been completed.

The Project owner shall submit a monitoring report every year for the life of the project to monitor effectiveness of protection measures for all avoided special-status plants to the CPM and BLM State Botanist. The monitoring report shall include: dates of worker awareness training sessions and attendees, completed CNDDB field forms for each avoided occurrence on-site and within 100 feet of the Project boundary off-site, and description of the remedial action, if warranted and planned for the upcoming year. The completed forms shall include an inventory of the special-status plant occurrences and description of the habitat conditions, an indication of population and habitat quality trends.

SAND DUNE/MOJAVE FRINGE-TOED LIZARD MITIGATION

BIO-20 To mitigate for habitat loss and direct impacts to Mojave fringe-toed lizards the Project owner shall provide compensatory mitigation, which may include compensation lands purchased in fee or in easement in whole or in part, at the following ratios:

- 3:1 mitigation for direct impacts to stabilized and partially stabilized sand dunes (per **BIO-29 – Table 2** or final acreage impacted by the Project footprint);

- 1:1 mitigation for direct impacts non-dune Mojave fringe-toed lizard habitat (per **BIO-29 – Table 2** or final acreage impacted by the Project footprint); and
- 0.5:1 mitigation for indirect impacts to stabilized and partially stabilized sand dunes (per **BIO-29 – Table 2** or final acreage impacted by the Project footprint).

If compensation lands are acquired, the Project owner shall provide funding for the acquisition in fee title or in easement, initial habitat improvements, and long-term maintenance and management of the compensation lands. In addition, the compensation lands must include, at a minimum, the number acres of stabilized and partially stabilized sand dune habitat shown in **BIO-29 Table 2**.

1. Criteria for Compensation Lands: The compensation lands selected for acquisition shall:
   a. Provide suitable habitat for Mojave fringe-toed lizards, and, aside from the minimum amount of stabilized and partially stabilized sand dunes, may include stabilized and partially stabilized desert dunes, sand drifts over playas, or Sonoran creosote bush scrub;

   b. Be within the Palen or Chuckwalla valleys with potential to contribute to Mojave fringe-toed lizard habitat connectivity and build linkages between known populations of Mojave fringe-toed lizards and preserve lands with suitable habitat;

   c. Be prioritized near larger blocks of lands that are either already protected or planned for protection, or which could feasibly be protected long-term by a public resource agency or a non-governmental organization dedicated to habitat preservation;

   d. Provide quality habitat for Mojave fringe-toed lizard that has the capacity to regenerate naturally when disturbances are removed;

   e. Not have a history of intensive recreational use or other disturbance that might make habitat recovery and restoration infeasible;

   f. Not be characterized by high densities of invasive species, either on or immediately adjacent to the parcels under consideration, that might jeopardize habitat recovery and restoration;

   g. Not contain hazardous wastes that cannot be removed to the extent the site is suitable for habitat;

   h. Have water and mineral rights included as part of the acquisition, unless the CPM, in consultation with ~~CDFG~~**CDFW**, BLM and USFWS, agrees in writing to the acceptability of the land; and

   i. Be on land for which long-term management is feasible.

2. Security for Implementation of Mitigation: The Project owner shall provide financial assurances to the CPM to guarantee that an adequate level of funding is available to implement the acquisitions and enhancement of Mojave fringe-toed lizard habitat as described in this condition. These funds shall be used solely for implementation of the measures associated with the Project. Financial assurance can be provided to the CPM according to the measures outlined in **BIO-12**, and within the time period specified for this assurance (see the verification section at the end of this condition). The final amount due will be determined by an updated appraisal and a PAR analysis conducted as described in **BIO-12**, but current estimates are included in **Biological Resources Tables ~~2~~12** and **~~2~~13** located at the beginning of the conditions of certification subsection.

3. Preparation of Management Plan: The Project owner shall submit to the CPM, BLM, and ~~CDFG~~**CDFW** a draft Management Plan that reflects site-specific enhancement measures for the Mojave fringe-toed lizard habitat on the acquired compensation lands. The objective of the Management Plan shall be to enhance the value of the compensation lands for Mojave fringe-toed lizards, and may include enhancement actions such as weed control, fencing to exclude livestock, erosion control, or protection of sand sources or sand transport corridors.

Verification: No later than 30 days prior to beginning Project ground-disturbing activities, the Project owner shall provide written verification of an approved form of Security in accordance with this condition of certification. Actual Security shall be provided no later than 7 days prior to the beginning of Project ground-disturbing activities for each Project phase as described in **BIO-29**. The Project owner, or an approved third party, shall complete and provide written verification of the proposed compensation lands acquisition within 18 months of the start of Project ground-disturbing activities for each Project phase.

No less than 90 days prior to acquisition of the property, the Project owner shall submit a formal acquisition proposal to the CPM, ~~CDFG~~**CDFW**, and USFWS describing the parcels intended for purchase.

The Project owner, or an approved third party, shall provide the CPM, BLM, and ~~CDFG~~**CDFW**, with a management plan for the compensation lands and associated funds within 180 days of the land or easement purchase, as determined by the date on the title. The CPM shall review and approve the management plan, in consultation with BLM and ~~CDFG~~**CDFW**.

Within 90 days after completion of Project construction, the Project owner shall provide to the CPM and ~~CDFG~~**CDFW**an analysis with the final accounting of the amount (detailed by habitat type) of Mojave fringe-toed lizard habitat disturbed during Project construction.

The Project owner shall provide written verification to the CPM, and ~~CDFG~~**CDFW** that the compensation lands or conservation easements have been acquired and recorded in favor of the approved recipient no later than 18 months from the start of ground-disturbing activities.

MITIGATION FOR IMPACTS TO STATE WATERS

BIO-21 The Project owner shall implement the following measures to avoid, minimize and mitigate for direct and indirect impacts to waters of the state and to satisfy requirements of California Fish and Game Code sections 1600 and 1607.

1. Acquire Off-Site State Waters: The Project owner shall acquire, in fee or in easement, a parcel or parcels of land that includes state jurisdictional waters per **BIO-29 – Table 2**, or the area of state waters directly or indirectly impacted by the final Project footprint. The Project footprint means all lands disturbed by construction and operation of the Palen Project, including all linears. The parcel or parcels comprising the ephemeral washes shall include desert dry wash woodland per **BIO-29 – Table 2**, or the acreage of desert dry was woodland impacted by the final Project footprint at a 3:1 ratio. The terms and conditions of this acquisition or easement shall be as described in Condition of Certification **BIO 12**, and the timing associated with **BIO-29** (phasing). The current estimated costs are included in **BIO-29 – Table 3** located at the beginning of the Conditions of Certification subsection. Mitigation for impacts to state waters shall occur within the Chuckwalla, East Salton Sea, Hayfield, Rice, or portion of Whitewater within the NECO, Hydrologic Units (HUs) or the Palo Verde Watershed and be prioritized within the Chuckwalla HU in the Palen or adjacent watersheds.

2. Security for Implementation of Mitigation: The Project owner shall provide financial assurances to the CPM and CDFW to guarantee that an adequate level of funding is available to implement the acquisitions and enhancement of state waters as described in this condition. These funds shall be used solely for implementation of the measures associated with the Project. Financial assurance can be provided to the CPM and CDFW in the form of an irrevocable letter of credit, a pledged savings account or Security prior to initiating ground-disturbing Project activities. Prior to submittal to the CPM, the Security shall be approved by the CPM, in consultation with CDFW, to ensure funding. The final amount due shall be determined by updated appraisals and the PAR analysis conducted pursuant to **BIO-12.**

3. Preparation of Management Plan: The Project owner shall submit to the CPM and CDFW a draft Management Plan that reflects site-specific enhancement measures for the drainages on the acquired compensation lands. The objective of the Management Plan shall be to enhance the wildlife value of the drainages, and may include enhancement actions such as weed control, fencing to exclude livestock, or erosion control.

4. Code of Regulations: The Project owner shall provide a copy of this condition (Condition of Certification **BIO-21**) from the Energy Commission Decision to all contractors, subcontractors, and the Applicant's Project supervisors. Copies shall be readily available at work sites at all times during periods of active work and must be presented to any CDFW

personnel upon demand. The CPM reserves the right to issue a stop work order or allow CDFW to issue a stop work order after giving notice to the Project owner and the CPM, if the CPM in consultation with CDFW, determines that the Project owner has breached any of the terms or conditions or for other reasons, including but not limited to the following:

a. The information provided by the Applicant regarding impacts to waters of the state is incomplete or inaccurate;

b. New information becomes available that was not known in preparing the terms and conditions; or

c. The Project or Project activities as described in the Revised Staff Assessment have changed.

5. Road Crossings at Streams. The Project owner shall preserve pre-development downstream flows and sediment transport in washes crossed by permanent roads by incorporating culverts and Arizona crossings at stream crossings. Arizona crossings are the preferred option and shall be employed wherever such crossings do not present a safety hazard and where the roadbed elevation allows the construction of such crossings. Drainages that have been graded for temporary construction access shall be restored to original contours and surface drainage patterns and shall be revegetated according to specifications in **BIO-8**.

~~6. Diffuser Design. The Project owner shall maintain pre-project flow patterns (location and volume of flows) downstream of the Project boundaries. Flows shall not be discharged indiscriminately as sheet flow across the entire length of the diffusers, irrespective of the natural surface drainage patterns, but rather shall be designed to discharge into existing natural washes downslope of the Project.~~

7. Best Management Practices: The Project owner shall also comply with the following conditions to protect drainages near the Project Disturbance Area:

a. The Project owner shall minimize road building, construction activities and vegetation clearing within ephemeral drainages to the extent feasible.

b. The Project owner shall not allow water containing mud, silt, or other pollutants from grading, aggregate washing, or other activities to enter ephemeral drainages or be placed in locations that may be subjected to high storm flows.

c. The Project owner shall comply with all litter and pollution laws. All contractors, subcontractors, and employees shall also obey these laws, and it shall be the responsibility of the Project owner to ensure compliance.

d. Spoil sites shall be located at least 30 feet from the boundaries and drainages or in locations that may be subjected to high storm flows, where spoils might be washed back into drainages.

e. Raw cement/concrete or washings thereof, asphalt, paint or other coating material, oil or other petroleum products, or any other substances that could be hazardous to vegetation or wildlife resources, resulting from Project-related activities, shall be prevented from contaminating the soil and/or entering waters of the state. These materials, placed within or where they may enter a drainage, shall be removed immediately.

f. No broken concrete, debris, soil, silt, sand, bark, slash, sawdust, rubbish, cement or concrete or washings thereof, oil or petroleum products or other organic or earthen material from any construction or associated activity of whatever nature shall be allowed to enter into, or placed where it may be washed by rainfall or runoff into, waters of the state.

g. When operations are completed, any excess materials or debris shall be removed from the work area. No rubbish shall be deposited within 150 feet of the high water mark of any drainage.

h. No equipment maintenance shall occur within 150 feet of any ephemeral drainage where petroleum products or other pollutants from the equipment may enter these areas under any flow.

8. Changes of Conditions. A notifying report shall be provided to the CPM and CDFW if a change of conditions is identified. As used here, change of condition refers to the process, procedures, and methods of operation of a Project; the biological and physical characteristics of a Project area; or the laws or regulations pertinent to the Project as defined below. A copy of the notifying change of conditions report shall be included in the annual reports or until it is deemed unnecessary by the CPM, in consultation with CDFW.

   a. Biological Conditions: a change in biological conditions includes, but is not limited to, the following: 1) the presence of biological resources within or adjacent to the Project area, whether native or non-native, not previously known to occur in the area; or 2) the presence of biological resources within or adjacent to the Project area, whether native or non-native, the status of which has changed to endangered, rare, or threatened, as defined in section 15380 of Title 14 of the California Code of Regulations.

   b. Physical Conditions: a change in physical conditions includes, but is not limited to, the following: 1) a change in the morphology of a river, stream, or lake, such as the lowering of a bed or scouring of a bank, or substantial changes in stream form and configuration caused by storm events; 2) the movement of a river or stream channel to a different location; 3) a reduction of or other change in vegetation on the bed, channel, or bank of a drainage, or 4) changes to the hydrologic regime such as fluctuations in the timing or volume of water flows in a river or stream.

c. Legal Conditions: a change in legal conditions includes, but is not limited to, a change in Regulations, Statutory Law, a Judicial or Court decision, or the listing of a species, the status of which has changed to endangered, rare, or threatened, as defined in section 15380 of Title 14 of the California Code of Regulations.

Verification: No less than 30 days prior to the start of construction-related ground disturbance activities potentially affecting waters of the state, the Project owner shall provide written verification (i.e., through incorporation into the BRMIMP) to the CPM that the above best management practices will be implemented. The Project owner shall also provide a discussion of work in waters of the state in Annual Compliance Reports for the duration of the Project.

No less than 30 days prior to beginning Project ground-disturbing activities for each project phase as described in **BIO-29**, the Project owner shall provide to the CPM design drawings ~~of drainage diffusers depicting how these structures restore~~ **demonstrating how** pre-development drainage patterns (location and volume of flows) to drainages downstream of the Project boundaries **will be unaffected**. At the same time the Project owner shall provide design drawings for temporary and permanent stream crossings.

No less than 30 days prior to beginning Project ground-disturbing activities, the Project owner shall provide the form of Security in accordance with this condition of certification. No later than 7 days prior to beginning Project ground-disturbing activities, the Project owner shall provide written verification of the actual Security. The Project owner, or an approved third party, shall complete and provide written verification of the proposed compensation lands acquisition within 18 months of the start of Project ground-disturbing activities.

The Project owner, or an approved third party, shall provide the CPM, BLM, CDFW, and USFWS with a management plan for the compensation lands and associated funds within 180 days of the land or easement purchase, as determined by the date on the title. The CPM shall review and approve the management plan, in consultation with CDFW and the USFWS.

Within 90 days after completion of Project construction, the Project owner shall provide to the CPM, BLM, USFWS, and CDFW an analysis with the final accounting of the amount of jurisdictional state waters disturbed during Project construction.

The Project owner shall provide written verification to the CPM, BLM, USFWS and CDFW that the compensation lands or conservation easements have been acquired and recorded in favor of the approved recipient no later than 18 months of the start of Project ground-disturbing activities.

The Project owner shall notify the CPM and CDFW, in writing, at least five days prior to initiation of Project ground-disturbing activities in jurisdictional state waters and at least five days prior to completion of Project activities in jurisdictional areas. The Project owner shall notify the CPM and CDFW of any change of conditions to the Project, impacts to state waters, or the mitigation efforts.

DECOMMISSIONING AND RECLAMATION PLAN

BIO-22 Upon Project closure the Project owner shall implement a final Decommissioning and Reclamation Plan. The Decommissioning and Reclamation Plan shall include a cost estimate for implementing the proposed decommissioning and reclamation activities, and shall be consistent with the guidelines in BLM's 43 CFR 3809.550 et seq.

Verification: No fewer than 30 days prior to the start of Project-related ground disturbing activities or alternate date as agreed to with the BLM, the Project owner shall provide to the CPM (for review) and BLM (for review and approval) a draft Decommissioning and Reclamation Plan. The plan shall be finalized prior to the start of commercial operation and reviewed every five years thereafter and submitted to the CPM for review and to the BLM for approval. Modifications to the approved Decommissioning and Reclamation Plan shall be made only after approval from the BLM. The Project owner shall provide a copy of the approved Decommissioning and Reclamation Plan and any BLM approved revisions to the CPM.

GROUNDWATER DEPENDENT VEGETATION MONITORING

BIO-23 The Project owner shall prepare a Groundwater-Dependent Vegetation Monitoring Plan for monitoring the Project effects of groundwater pumping on groundwater dependent vegetation. The monitoring shall encompass the area depicted in *Figure Soil and Water-3 (Project Only Revised Operational Water Supply End of 30 Years)* within the 0.1-foot drawdown polygon of the Model Predicted Drawdown (Galati & Blek 2010i). The vegetation and groundwater data collected as part of the Plan shall be used to determine if remedial action is required, as described in **BIO-24.**

The Project owner may forgo development of a Groundwater Dependent Vegetation Monitoring Plan, or may cease implementation of such a plan, by providing evidence to the CPM that the source of water for the GDEs is a shallow perched water-bearing zone rather than the regional groundwater system and that the shallow perched water-bearing zone is unrelated and not influenced by the regional groundwater system that the Project owner proposes to use for water as described below under 15a – 15d.

The Project owner shall develop and implement a Groundwater-Dependent Vegetation Monitoring Plan (Plan) that meets the performance standards described below and includes the following components:

1. Monitoring Objectives and Performance Standards. The objectives of the Plan shall be to monitor the Project effects of groundwater pumping on vegetation and groundwater-dependent ecosystems (GDEs) and, in conjunction with the remedial action described in **BIO-24**, to ensure that

the Project groundwater pumping has a less than significant effect on biological resources. Monitoring shall be conducted at a level of detail adequate for detecting adverse effects, as reflected in vegetation attributes and groundwater levels in the shallow (alluvial) aquifer. The baseline for groundwater levels shall be the lowest baseline water level as measured at the Project site prior to the start of groundwater pumping.

2. Location of Monitoring Plots. The monitoring plots shall be established within the area depicted in *Figure Soil and Water -3 (Project Only Revised Operational Water Supply End of 30 Years)* within the Model Predicted Drawdown showing the 0.1-foot drawdown polygon (Galati & Blek 2010i). The majority of the plots shall be in the area north and east of the Project site, where groundwater-dependent ecosystems (GDEs) and the intersection of the ground surface and shallow groundwater are located, in the topographic lows in the valley.

3. Monitoring Plots and Controls. Because of the variation in vegetation types and depth to groundwater within the predicted groundwater drawdown zone, the study design shall treat the monitoring plot with a corresponding control plot as a pair (versus comparing the mean of all treatment plots to the mean of all control plots). The "control" plots shall consist of the data collected at the same plot during the baseline (pre-disturbance) monitoring for a pre-disturbance vs. post-disturbance comparison. Appropriate statistical methods shall be used to analyze the differences between the control and monitoring plots (for example, a one-tailed paired-sample statistical test (Manly 2008)[23]).

4. Off-Site Reference Plots: Off-site monitoring plots shall be established as reference sites to distinguish changes in plant vigor seen at the site from the effects of a region-wide drought. The off-site reference plots can be located within Chuckwalla Valley but shall be within areas that would not be affected hydrologically by groundwater pumping for the Project or other projects or agricultural operations. Off-site monitoring reference plots shall be located in the same general hydrologic and geologic setting (i.e., playa margins), in the same climatic region (Sonoran Desert region of California), and contain the same natural communities or vegetation alliances as those to which they are being compared. Impacts from pests and diseases, if present, must also be considered and excluded or adjusted for as part of the analysis. Data on climate and surface runoff in the study area shall be collected to identify "drought" conditions and correlate groundwater changes and weather changes.

5. Sample Size and Design The number of monitoring sites shall be established using appropriate statistical methods (for example, by a "priori power analysis" (Elzinga et al. 1998)) and shall be sufficient to achieve adequate (90%) statistical power. Following collection of the baseline data

[23] Manly, B. 2008. Statistics for Environmental Science and Management (2nd ed). CRC Press/Chapman and Hall. 292 pages.

a statistical analysis shall be conducted to refine the power analysis and evaluate the adequacy of the sampling design. If the analysis of baseline data indicates that the sampling design is insufficient to achieve adequate statistical power, the design shall be modified (for example, by adding additional monitoring sites).

6. Water Table Monitoring. The ~~P~~**p**roject owner shall install piezometers at each of the dominant vegetation community types within or near the monitoring plots. The number, location, depth and monitoring frequency of the piezometers shall be sufficient to establish the effect of ~~P~~**p**roject groundwater pumping on the shallow aquifer water levels. At a minimum, each piezometer shall be monitored twice per year, in early spring (March) and post-monsoon (September). The piezometers shall be designed to monitor the maximum expected fluctuation in the water table and to last the duration of the Project. Data collected from the ~~P~~**p**roject wells and piezometers for **SOIL &WATER-4** (Groundwater Level Monitoring, Mitigation, and Reporting) and **S&W-6** (groundwater monitoring for the evaporation ponds and land treatment unit) shall be used to refine the modeling of the predicted groundwater drawdown and zone of influence after two years of data collection following the start of groundwater production. The ~~P~~**p**roject owner shall submit to the CPM, for review and approval, a report on the results of the refined modeling. The report shall include all calculations and assumptions made in development of report data and interpretations, and all well monitoring data and piezometer data collected and used in the calculations. If the results indicate that the drawdown and zone of influence is greater than the effect predicted in the GRI, and the GDE are found to be drawing groundwater that is hydraulically connected to the regional groundwater system, then the project owner will submit a revised monitoring plan for GDE areas outside of the original monitoring area.

7. Soil Monitoring. Soil salinity and pH shall be monitored annually at every monitoring plot. The Plan shall describe the monitoring devices and techniques used to collect and interpret this data, relative to ecosystem function. One soil core sample per community type shall be collected as part of the baseline data to establish the approximate rooting depth of the phreatophytes, and thereafter shall be repeated every five years. The coring method must provide a continuous core that will provide visual examination of roots and root nodules, soil profile, and soil moisture.

8. Baseline and Long-term Data Collection. At a minimum, baseline data shall be collected at all monitoring sites prior to the start of pumping; however, vegetation data collected from sites farther from the nearest wells will allow for the collection of multiple years of “pre-disturbance” data. ~~Although the project proposes to begin construction (and pumping) by December 2010, it appears that the effects of pumping would not reach the areas supporting the GDEs or phreatophytic plants for several years (see C.9~~ ~~**Soil and Water Resources**).~~ Because the proposed well in the northeast portion of the ~~P~~**p**roject (Soil & Water Figure 1, Galati & Blek

2010i) is located in very close proximity to known phreatophytes, this well shall not be used within the first 3 years of the ~~P~~**p**roject in order to allow an adequate period for baseline data collection in the area northeast of the Project. Subject to approval by the CPM, if groundwater pumping ceases or is replaced by other water sources, groundwater and vegetation monitoring shall continue for a period of 5 years or until refined modeling indicates that the groundwater levels have returned to baseline levels and the decline in plant vigor has been restored to pre-disturbance conditions.

9. Target Vegetation Population. The monitoring sites shall include GDEs and other vegetation potentially affected by the drawdown that occur within the zone of influence. The following phreatophytes have been documented to occur around Palen Lake: honey mesquite (*Prosopis glandulosa*); iodine bush (*Allenrolfea occidentalis*), bush seep-weed (*Suaeda moquinii*), jackass clover (*Wislizenia refracta*), four-wing saltbush (*Atriplex canescens*), allscale (*A. polycarpa*), spinescale (*A. spinifera*), a potentially new taxon of saltbush (*Atriplex* sp. nov. Andre), ironwood (*Olneya tesota*), palo verde (*Cercidium microphyllum*), cat's claw (*Acacia greggii*), and smoke tree (*Psorothamnus spinosus).*The final number of each community type sample needed shall be based on the *priori* power test conducted after the first year of baseline data collection.

10. Fine-Scale Vegetation Mapping. Within the monitoring sites vegetation shall be mapped to the alliance level, consistent with classification protocol in the *Manual of California, 2nd edition* (Sawyer et al. 2009) but any important associations shall also be mapped. Mapping shall be done using minimum 1 meter resolution color orthophotos or higher resolution infrared imagery. The mapping shall also be used to determine the acreages of GDEs and establish the amount of security to be deposited in the event that adverse effects are detected during the monitoring. Boundaries of the permanent plots and any off-site reference sites shall be recorded using GPS technology and depicted on the geo-referenced aerials. GIS shapefiles and metadata shall be submitted along with the draft Plan and any subsequent revisions to the Plan (i.e., following the collection of baseline data and subsequent power analysis).

11. Guidelines for the Monitoring Plan. The Groundwater-Dependent Vegetation Monitoring Plan (Plan) shall be prepared with guidance from *Measuring and Monitoring Plant Populations* (Elzinga et al. 1998). The Plan shall provide a detailed description of each of the following components:

    a. Sampling Design. The sampling design shall include a description of: a) the populations (vegetation types) sampled; b) number, size, and shape of the sampling units; c) layout of the sampling units; d) methods for permanently marking plots in the field; e) monitoring schedule/frequency; f) vegetation and other attributes sampled; and g) sampling objectives (target/threshold, change/trend-based) for each attribute.

b. Habitat Function and Values. The Plan shall describe the hydrologic, geologic/geomorphic, geochemical, biological and ecological characteristics of the GDEs, and shall also describe whether species are obligate or facultative; root growth and water acquisition characteristics; morphological adaptations to the desert environment; reproduction and germination characteristics; general and micro-habitat preferences; obligate or facultative halophytes and phreatophytes; role in the morphology of dunes; and importance to wildlife, etc.

c. Field techniques for measuring vegetation. This will include the vegetation (or other) attributes selected based on a demonstrated knowledge of the biology and morphology of the species, and include a discussion of the limitations involved in each measurement. Examples of appropriate field techniques for measuring drought response include: percent dieback; live crown density; crown height and width, percent cover of live (versus dead or residual) vegetation, percent cover/frequency of associated species; percent composition of native versus non-native species; and percent cover based on wetland status codes (OBL, FACW, FAC, FACU, UPL[24]) and status as phreatophytes or halophytes. Photo monitoring shall not be considered an acceptable monitoring method but may be useful to conduct periodically (e.g., every 3 to 5 years).

d. Data Management. Including how the data will be recorded in the field (e.g., using a GPS data dictionary), processed and stored.

e. Training of personnel. Describe minimum standards for training and monitoring personnel.

f. Statistical analysis. Describe statistical methods used to analyze the monitoring data (incorporating the minimum standards for statistical power and error rate described above).

12. Peer Review of the Plan. The draft Plan shall undergo a peer review by recognized experts, which shall include one or more scientists with expertise in: the preparation of monitoring plans for plant populations; the physiological responses of desert phreatophytes to drought stress; assessing the effects of groundwater withdrawal on vegetation in the desert region; and biostatistics. The Project owner shall provide the resumes of suggested peer reviewers to the CPM for review and approval.

13. Annual Monitoring Report. Annual Monitoring Reports shall be submitted to the CPM and BLM and shall include, at a minimum: a) names and contact information for the responsible parties and monitoring personnel;

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[24] OBL= Obligate Wetland; FACW= Facultative Wetland; FAC= Facultative; FACU= Facultative Upland UPL= Obligate Upland. *In;* U.S. Fish and Wildlife Service. 1993. **1993 supplement to list of plant species that occur in wetlands: Northwest (Region 9).** Supplement to U.S. Fish & Wildlife Service Biological Report 88 (24.9). Online: http://plants.usda.gov/wetinfo.html

b) summaries of the results of the monitoring as required in **Soil&Water-4 and Soil&Water-6**; c) piezometer monitoring results**,** and a comparison of predicted versus actual water table declines; d) summary of the results of vegetation, groundwater, and soil monitoring data compared to the baseline data for each plot (pre- versus post-disturbance comparison); e) description of sampling and monitoring techniques used for each attribute; f) description of the data management and statistical analysis; g) photos; h) conclusions and recommendations for remedial action, if the monitoring data indicates that the threshold described below has been met.

The first Annual Monitoring Report shall include an appropriate statistical analysis using the first year baseline monitoring data to assess whether the sampling design was adequate to provide statistically meaningful data, as described above. If warranted, the first year Annual Monitoring Report shall include recommendations for revisions to the Plan based on this analysis.

14. Threshold for Remedial Action: The ~~P~~**p**roject owner shall implement remedial action, as described in Condition of Certification **BIO-24,** if the monitoring described in **BIO-23** detects a decline in plant vigor of 20 percent or more compared to the same plots pre-disturbance AND also detects a decline in the alluvial (shallow) aquifer confirmed by two consecutive annual water monitoring events in any amount greater than the lowest baseline water level as measured prior to groundwater pumping. If regional drought, off-site pumping or other activities unrelated to the Project are also contributing to the decline in water table, the ~~P~~**p**roject owner shall only be responsible for the portion of the effect that can be statistically demonstrated to be the result of ~~P~~**p**roject pumping. To determine whether declines in plant vigor are related to Project pumping as opposed to region wide drought or offsite pumping conditions the ~~P~~**p**roject owner shall install a network background monitoring piezometers and incorporate these data in the assessment of ~~P~~**p**roject-related effects on GDEs.

15. To understand the source of the water for the GDEs, the ~~P~~**p**roject owner shall prepare a groundwater investigation work plan for submittal to the CPM that will outline steps to determine if the source of water for the GDEs is a shallow perched water-bearing zone rather than the regional groundwater system, and that the shallow perched water-bearing zone is not hydraulically connected to the regional groundwater system. The groundwater investigation will be comprised of the following components:

    a. A continuous soil coring program at five locations to be identified based on field mapping of GDEs in the area shown on the Figure *Soil and Water-3 (Project Only Revised Operational Water Supply End of 30 Years)* within the 0.1-foot drawdown polygon of the Model Predicted Drawdown (Galati & Blek 2010i). One of the five borings will be drilled adjacent to a GDE containing mesquite, and the other four located to provide an assessment of the range of plant communities within GDEs in the area of interest (i.e., to assess the variability of GDE plant type water requirements and root zone depth).

b. The soil cores shall extend a minimum of 20 feet below the deepest root zones of the GDEs investigated to demonstrate separation between the shallow and regional water zones. At a minimum the soil cores shall show that 20 feet of unsaturated conditions are present below the deepest root zones of the plant communities investigated. The soil cores will be logged by a professional geologist in the State of California, and the coring program will be overseen by a qualified biologist with experienced in the plant communities identified within each GDE.

c. A sampling plan for selective analysis of soil moisture content and saturation will also be conducted for each soil core advanced adjacent to a GDE. The number and frequency of soil samples shall be established to confirm field observations of soil moisture content in the shallow water-bearing zone, through the root zone and in the deeper sediments below the root zone above the regional water table. Soil samples shall be analyzed for moisture content after ASTM Method D2216.

d. Depending on the results of the soil coring program, piezometers may be installed as monitoring points for the regional water table and to monitoring changes in the shallow water-bearing zone from ~~P~~**p**roject pumping. In the report of results from the soil coring program, a water-level monitoring program shall be proposed if it is shown that the regional water table is in direct hydraulic connection to the source of water to the GDE's. If the field data clearly shows an unsaturated zone of 20 feet or more below the deepest root zones of the GDEs, then piezometers will not be installed.

If the results of the pre-construction field observations and soil sampling demonstrate 20 feet or more of unsaturated sediments between the deepest root zones of the GDEs and the regional water table, there will be no requirements to implement any of the underlying conditions as provided for in **BIO-23** and **BIO-24**, as sufficient evidence will have been provided to demonstrate that the groundwater is not the source for the GDE's.

If the refined modeling of the predicted groundwater drawdown and zone of influence after two years of data collection (following the start of groundwater production), as described in Subsection 6 of this condition and in **SOIL&WATER-4** and **SOIL&WATER-6**, indicates the drawdown or zone of influence would be greater than predicted in the ~~P~~**p**roject owner's Groundwater Resources Investigation (GRI), and the GDE are found to be drawing groundwater that is hydraulically connected to the regional groundwater system, then the project owner will submit a revised monitoring plan for GDE areas outside of the original monitoring area .

<u>Verification:</u> At least 30 days prior to operation of project pumping wells, the ~~P~~**p**roject owner shall submit to the CPM and BLM for review and approval a draft Groundwater-Dependent Vegetation Monitoring Plan (Plan). The final plan-shall incorporate recommendations from the peer review and shall be submitted to the CPM and BLM no less than 15 days prior to the start of groundwater pumping.

No less than 15 days prior to the start of groundwater pumping the ~~P~~**p**roject owner shall submit as-built drawings indicating the location and depth of piezometers, and shall provide evidence that the piezometers are operational.

Baseline groundwater and groundwater-dependent vegetation monitoring shall begin 15 days prior to construction and shall occur every year during the same one to two week time period in early spring (March) and post-monsoon (September).

The First Annual Monitoring Report shall be provided to the CPM and BLM no later than January 31 following the first year of data collection, and shall include an assessment of whether the sampling design would provide statistically adequate monitoring data and whether modifications to the monitoring design would be needed. If the first Annual Monitoring Report recommends a revised sampling design, the ~~P~~**p**roject owner shall submit the revised Plan to the CPM and BLM no later than March 1.

Thereafter the ~~P~~**p**roject owner shall submit a Groundwater-Dependent Vegetation Annual Monitoring Report to the CPM and BLM no later than January 31 of each year for the duration of Project operation.

If the project owner elects to prepare a geologic and groundwater investigation (as described in Subsection 15 a-d of this condition) to determine if the source of water for the GDEs is a shallow perched water-bearing zone rather than the regional groundwater system, and that the shallow perched water-bearing zone is not hydraulically connected to the regional groundwater system that the ~~P~~**p**roject owner proposes to use for water supply, the project owner shall submit the resumes of at least two independent, qualified peer reviewers 45 days prior to submittal of the report to the CPM and BLM for review and approval. The ~~P~~**p**roject owner must submit the results of their investigation, subject to review and approval by the CPM, prior to the start of construction or ~~P~~**p**roject groundwater use.

If the refined modeling conducted according subsection 6 of this condition indicates that the drawdown and zone of influence is greater than the effect predicted in the GRI, and the GDE are found to be drawing groundwater that is hydraulically connected to the regional groundwater system, then the Project owner shall submit a revised monitoring plan for GDE areas outside of the original monitoring area. The Revised Monitoring Plan shall be submitted no later than January 31 in the third year following the start of groundwater pumping and well monitoring.

REMEDIAL ACTION AND COMPENSATION FOR ADVERSE EFFECTS TO GROUNDWATER-DEPENDENT BIOLOGICAL RESOURCES

BIO-24 If monitoring detects ~~P~~**p**roject-related adverse impacts to groundwater dependent ecosystems (GDEs), as described in **BIO-23** and the impacts are shown to be the result of a decline in the regional groundwater table due to

~~P~~**p**roject pumping, the ~~P~~**p**roject owner shall determine which well(s) are the source of the adverse impacts and shall implement remedial measures as outlined below. If regional drought, off-site pumping or other activities unrelated to the Project are also contributing to the decline in water table, the Project owner shall only be responsible for the portion of the effect that can be demonstrated to be the result of ~~P~~**p**roject pumping. The remedial measures shall be implemented with the objective of restoring the groundwater levels to the baseline described in **BIO-23**, and shall compensate for impacts to GDEs with off-site habitat acquisition or restoration. The Project owner shall do all of the following:

1. Modification and/or Cessation of Pumping: The ~~P~~**p**roject owner shall provide to the CPM evidence based on groundwater monitoring and modeling indicating which wells are likely to be causing adverse impacts to GDEs. The ~~P~~**p**roject owner shall initially modify operation of those wells to reduce the offsite drawdown in the areas of the GDEs.

2. Remedial Action Plan: The objective of remedial action shall be restoration of the spring groundwater table in the alluvial (shallow) aquifer to baseline levels, as described in **BIO-23**. The Remedial Action Plan shall include one or more of the following measures: 1) Begin rotational operation of the site water supply wells reducing pumping in wells that are the most proximal to the GDEs, 2) reducing the pumping rate in the wells that have been identified as the cause of the drawdown in the area of the GDEs, 3) focus pumping on wells on the southern portion of the project site away from the GDEs 4) cease operation of the well(s) that are the cause of the drawdown. Groundwater water level monitoring shall increase to a frequency necessary to document change and recovery in the drawdown from the changes in the pumping program.

   The Remedial Action Plan shall include a water level monitoring program of sufficient frequency to document changes in operation of the water supply wells, and demonstrate that the water table has been restored to baseline levels.

   The Project owner shall use the following guidelines for determining if an ecosystem (or species) is phreatophytic (Brown et al 2007; LeMaite et al 1999; Froend & Loomes 2004):

   a. It is not known or documented to depend on groundwater, based on scientific literature or expert opinion (local knowledge can be useful in making a determination as some species' dependence varies by setting);

   b. The species are not known to have roots extending over a meter in depth;

   c. The community does not occur in an area where the water table is known to be 'near' the surface (relative to the documented rooting depths of the species);

d. The herbaceous or shrub vegetation is not still green and/or does not have a high leaf area late in the dry season (compared to other dry areas in the same watershed that do not have access to groundwater).

3. Compensate for Loss of Ecosystem Function. If the decline in the water table in the alluvial (shallow) aquifer is accompanied by a corresponding decline in plant vigor greater than 20 percent (as described in BIO-23), the Project owner shall compensate for the loss of habitat functions and values in the affected groundwater-dependent ecosystems. The amount of compensation shall be at a 3:1 ratio based on area of affected area, using mapping as described in **BIO-23**. The Project owner shall acquire, in fee or in easement, a parcel or parcels of land that include an amount of groundwater-dependent vegetation that is of the same habitat-type as the community affected (e.g., mesquite woodland, alkali sink scrubs, or microphyll woodland) and of an equal or greater habitat quality. The compensation lands shall be located within the watersheds encompassing the Chuckwalla or Palen valleys. As an alternative to habitat compensation, the Project owner may submit a plan that achieves restoration of lost habitat function and value at another location within the Chuckwalla Groundwater Basin that contains the same habitats as those affected.

   a. Review and Approval of Compensation Lands Prior to Acquisition or Restoration. The ~~P~~**p**roject owner shall submit a formal acquisition proposal to the CPM describing the parcel(s) intended for purchase. This acquisition proposal shall discuss the suitability of the proposed parcel(s) as compensation lands in relation to the criteria listed above. Approval from the CPM shall be required for acquisition of all compensatory mitigation parcels.

   b. Preparation of Management Plan: The ~~P~~**p**roject owner shall submit to the CPM and CDFW a draft Management Plan that reflects site-specific enhancement measures for the acquired compensation lands. The objective of the Management Plan shall be to maintain the functions and values of the acquired GDE plant communities and may include enhancement actions such as weed control, fencing to exclude livestock, or erosion control.

   c. Delegation of Acquisition. The responsibility for acquisition of compensation lands may be delegated to NFWF or another third party other than NFWF, such as a non-governmental organization supportive of desert habitat conservation, by written agreement of the Energy Commission. Such delegation shall be subject to approval by the CPM prior to land acquisition, enhancement or management activities.

Verification: No more than 30 days following submission of the Groundwater Dependent Vegetation Annual Monitoring Report the Project owner shall submit to the CPM for review and approval a draft Remedial Action Plan if that report indicates that the threshold for remedial action as described in **BIO-23** has been met. At the same time the ~~P~~**p**roject owner shall submit written evidence that the Project wells responsible for impacts to groundwater levels and GDEs have modified their operation or ceased operation.

A final Remedial Action Plan shall be submitted to the CPM within 30 days of receipt of the CPM's comments on the draft plan. No later than 6 months following approval of the final Remedial Action Plan, the ~~P~~**p**roject owner shall provide to the CPM written documentation of the effectiveness of the completed remedial action.

No more than 30 days following submission of the Groundwater-Dependent Vegetation Annual Monitoring Report**,** the Project owner shall provide to the CPM a final accounting of the amount of GDE habitat affected by ~~P~~**p**roject groundwater pumping.

No more than 6 months following submission of the Groundwater-Dependent Vegetation Annual Monitoring Report the Project owner shall submit a formal acquisition or restoration proposal to the CPM, describing the mitigation parcels intended for purchase or restoration. The acquisition/restoration proposal shall describe how the proposed parcels meet the acquisition or restoration criteria described in this condition.

No fewer than 90 days prior to compensatory acquisition or restoration, the ~~P~~**p**roject owner shall submit to the CPM and obtain CPM approval of any agreements to delegate land acquisition to an approved third party, or to manage compensation lands; such agreement shall be executed and implemented no more than months following approval of the acquisition proposal.

The ~~P~~**p**roject owner shall provide written verification to the CPM that the compensation lands or conservation easements have been acquired and recorded in favor of the approved recipient no later than 18 months from submission of the Groundwater-Dependent Vegetation Annual Monitoring Report.

~~GOLDEN EAGLE INVENTORY AND MONITORING~~

~~**BIO-25** The Project owner shall implement the following measures to avoid or minimize Project-related construction impacts to golden eagles.~~

1. ~~Annual Inventory During Construction. For each calendar year during which construction will occur an inventory shall be conducted to determine if golden eagle territories occur within one mile of the Project boundaries. Survey methods for the inventory shall be as described in the Interim Golden Eagle Inventory and Monitoring Protocols; and Other Recommendations (Pagel et al. 2010) or more current guidance from the USFWS.~~

2. ~~Inventory Data: Data collected during the inventory shall include at least the following: territory status (unknown, vacant, occupied, breeding successful, breeding unsuccessful); nest location, nest elevation; age class of golden eagles observed; nesting chronology; number of young at each visit; digital photographs; and substrate upon which nest is placed.~~

3. ~~Determination of Unoccupied Territory Status: A nesting territory or inventoried habitat shall be considered unoccupied by golden eagles ONLY after completing at least 2 full surveys in a single breeding season.~~

~~In circumstances where ground observation occurs rather than aerial surveys, at least 2 ground observation periods lasting at least 4 hours or more are necessary to designate an inventoried habitat or territory as unoccupied as long as all potential nest sites and alternate nests are visible and monitored. These observation periods shall be at least 30 days apart for an inventory, and at least 30 days apart for monitoring of known territories.~~

4. ~~Monitoring and Adaptive Management Plan: If an occupied[25] nest is detected within one mile of the Project boundaries, the Project owner shall prepare and implement a Golden Eagle Monitoring and Adaptive Management Plan for the duration of construction to ensure that Project construction activities do not result in injury or disturbance to golden eagles. The monitoring methods shall be consistent with those described in the Interim Golden Eagle Inventory and Monitoring Protocols; and Other Recommendations (Pagel et al. 2010) or more current guidance from the USFWS. The Monitoring and Management Plan shall be prepared in consultation with the USFWS. Triggers for adaptive management shall include any evidence of Project-related disturbance to nesting golden eagles, including but not limited to: agitation behavior (displacement, avoidance, and defense); increased vigilance behavior at nest sites; changes in foraging and feeding behavior, or nest site abandonment. The Monitoring and Adaptive Management Plan shall include a description of adaptive management actions, which shall include, but not be limited to, cessation of construction activities that are deemed by the Designated Biologist to be the source of golden eagle disturbance.~~

Verification: ~~No fewer than 30 days from completion of the golden eagle inventory the project owner shall submit a report to the CPM, BLM, CDFGCDFW, and USFWS documenting the results of the inventory.~~

~~If an occupied nest is detected within one mile of the Project boundary during the inventory the Project owner shall contact staff at the USFWS Carlsbad Office and CDFGCDFW within one working day of detection of the nest for interim guidance on monitoring and nest protection. The project owner shall provide the CPM, CDFGCDFW, and USFWS with the final version of the Golden Eagle Monitoring and Management Plan within 30 days after detection of the nest. This final Plan shall have been reviewed and approved by the CPM in consultation with USFWS and CDFGCDFW.~~

[25] An occupied nest is one used for breeding by a pair of golden eagles in the current year. Presence of an adult, eggs, or young, freshly molted feathers or plucked down, or current years' mutes (whitewash) also indicate site occupancy. Additionally, all breeding sites within a breeding territory are deemed occupied while raptors are demonstrating pair bonding activities and developing an affinity to a given area. If this culminates in an individual nest being selected for use by a breeding pair, then the other nests in the nesting territory will no longer be considered occupied for the current breeding season. A nest site is considered occupied throughout the periods of initial courtship and pair bonding, egg-laying, incubation, brooding, fledging, and post-fledging dependency of the young.

EVAPORATION POND NETTING AND MONITORING

BIO-26 The ~~P~~**p**roject owner shall cover the evaporation ponds prior to any discharge with 1.5-inch mesh netting designed to exclude birds and other wildlife from drinking or landing on the water of the ponds. Netting with mesh sizes other than 1.5-inches may be installed if approved by the CPM in consultation with CDFW and USFWS. The netted ponds shall be monitored regularly to verify that the netting remains intact, is fulfilling its function in excluding birds and other wildlife from the ponds, and does not pose an entanglement threat to birds and other wildlife. The ponds shall include a visual deterrent in addition to the netting, and the pond shall be designed such that the netting shall never contact the water. Monitoring of the evaporation ponds shall include the following:

1. Monthly Monitoring. The Designated Biologist or Biological Monitor shall regularly survey the ponds at least once per month starting with the first month of operation of the evaporation ponds. The purpose of the surveys shall be to determine if the netted ponds are effective in excluding birds, if the nets pose an entrapment hazard to birds and wildlife, and to assess the structural integrity of the nets. The monthly survey shall be conducted in 1 day for a minimum of 2 hours following sunrise (i.e., dawn), a minimum of 1 hour mid-day (i.e., 1100 to 1300), and a minimum of 2 hours preceding sunset (i.e., dusk) in order to provide an accurate assessment of bird and wildlife use of the ponds during all seasons. Surveyors shall be experienced with bird identification and survey techniques. Operations staff at the Project site shall also report finding any dead birds or other wildlife at the evaporation ponds to the Designated Biologist within 1 day of the detection of the carcass. The Designated Biologists shall report any bird or other wildlife deaths or entanglements within 2 days of the discovery to the CPM, CDFW, and USFWS.

2. Dead or Entangled Birds. If dead or entangled birds are detected, the Designated Biologist shall take immediate action to correct the source of mortality or entanglement. The Designated Biologist shall make immediate efforts to contact and consult the CPM, CDFW, and USFWS by phone and electronic communications prior to taking remedial action upon detection of the problem, but the inability to reach these parties shall not delay taking action that would, in the judgment of the Designated Biologist, prevent further mortality of birds or other wildlife at the evaporation ponds.

3. Quarterly Monitoring. If after 12 consecutive monthly site visits no bird or wildlife deaths or entanglements are detected at the evaporation ponds by or reported to the Designated Biologist, monitoring, as described in paragraph 1, can be conducted on a quarterly basis.

4. Biannual Monitoring. If after 12 consecutive quarterly site visits no bird or wildlife deaths or entanglements are detected by or reported to the Designated Biologist and with approval from the CPM, USFWS, and CDFW, future surveys may be reduced to 2 surveys per year, during the spring nesting season and during fall migration. If approved by the CPM,

USFWS, and CDFW, monitoring outside the nesting season may be conducted by the Environmental Compliance Manager.

5. Modification of Monitoring Program. CDFW or USFWS may submit a request for modifications to the evaporation pond monitoring program based on information acquired during monitoring, and may also suggest adaptive management measures to remedy any problems that are detected during monitoring or modifications if bird impacts are not observed. Modifications to the evaporation pond monitoring described above and implementation of adaptive management measures shall be made only after approval from the CPM, in consultation with USFWS and CDFW.

Verification: No less than 30 days prior to operation of the evaporation ponds the project owner shall provide to the CPM as-built drawings and photographs of the ponds indicating that the bird exclusion netting has been installed. For the first year of operation the Designated Biologist shall submit quarterly reports to the CPM, BLM, CDFW, and USFWS describing the dates, durations and results of site visits conducted at the evaporation ponds. Thereafter the Designated Biologist shall submit annual monitoring reports with this information. The quarterly and annual reports shall fully describe any bird or wildlife death or entanglements detected during the site visits or at any other time, and shall describe actions taken to remedy these problems. The annual report shall be submitted to the CPM, BLM, CDFW, and USFWS no later than January 31 of every year for the life of the project.

REVEGETATION & RESTORATION OF TEMPORARILY DISTURBED AREAS

~~BIO-27~~ *Staff and the Applicant have agreed to delete this condition.*

IN-LIEU FEE MITIGATION OPTION

BIO-28 The ~~P~~**p**roject owner may choose to satisfy its mitigation obligations by paying an in-lieu fee instead of acquiring compensation lands, pursuant to Fish and Game code sections 2069 and 2099 or any other applicable in-lieu fee provision, provided that the Project's in-lieu fee proposal is found by the Commission to the mitigate the impacts identified herein. If the in-lieu fee proposal is found by the Commission to be in compliance, and the Project Owner chooses to satisfy its mitigation obligations through the in-lieu fee, the Project Owner shall provide proof of the in-lieu fee payment to the CPM prior to construction related ground disturbance.

Verification: If electing to use this provision, the Project owner shall notify the Commission and all parties to the proceeding that it would like a determination that the Project's in-lieu fee proposal would mitigate for the impacts identified herein. Prior to construction related ground disturbance the Project Owner shall provide proof of the in lieu fee payment to the CPM.

PROJECT CONSTRUCTION PHASING PLAN

BIO-29 The ~~P~~**p**roject ~~O~~**owner** shall provide compensatory mitigation for the total Project Disturbance Area and may provide such mitigation in two phases for ~~Units 1 and 2 as described in Figures BIO-5 and BIO-6 in the July 19, 2010 Response to Data Request (AECOM 2010u~~) **as depicted in Figure 1 (Palen Solar - Construction Phases) in the Supplement No. 1 Petition to Amend dated February 8, 2013 or updated figure provided by project owner and approved by the CPM.** For purposes of this condition, the Project Disturbance Area means all lands disturbed in the construction and operation of the Palen Project or its phases, including all linears and ancillary facilities, as well as undeveloped areas inside the Project's boundaries that would no longer provide viable long-term habitat.

The disturbance area for each project Phase and resource type is provided in **BIO-29** Table 1 below. Mitigation is shown in **BIO-29** Table 2, and mitigation security is shown in **BIO-29 Table 3,** below**.** This table shall be refined prior to the start of each construction phase with the disturbance area adjusted to reflect the final Project footprint for each phase. Prior to initiating each phase of construction the ~~P~~**p**roject owner shall submit the actual construction schedule, a figure depicting the locations of proposed construction and amount of acres to be disturbed. Mitigation acres are calculated based on the compensation requirements for each resource type as described in the above Conditions of Certification – **BIO-12** (Desert Tortoise), **BIO-20** (Mojave Fringe-toed Lizard), **BIO-18** (Western Burrowing Owl), and **BIO-22** (State Waters). Compensatory mitigation for each phase shall be implemented according to the timing required by each condition.

~~BIO-29 Table 1. Area of Habitat Type Disturbed by Construction Phase (acres)~~~~[1]~~

~~**Habitat Type**~~	~~**Reconfigured Alternative 2 Disturbance Area**~~		~~**Reconfigured Alternative 3 Disturbance Area**~~	
	~~**Phase 1**~~	~~**Phase 2**~~	~~**Phase 1**~~	~~**Phase 2**~~
~~**MFTL Habitat**~~	-	-	-	-
~~Stabilized & Partially Stabilized Dunes~~	~~44~~	~~112~~	~~59~~	~~128~~
~~Non-Dunes~~	~~637~~	~~711~~	~~509~~	~~845~~
~~Indirect Impacts~~[2]	~~**117**~~	~~**27**~~	~~**280**~~	~~**-186**~~
~~**TOTAL**~~	~~**798**~~	~~**850**~~	~~**848**~~	~~**787**~~
~~**DT Habitat**~~	-	-	-	-
~~DT Habitat - inside critical habitat~~[3]	~~225~~	~~0~~	~~225~~	~~0~~
~~DT Habitat - outside critical habitat~~	~~2115~~	~~1855~~	~~1969~~	~~1933~~
~~**TOTAL**~~[4] -	~~**2340**~~	~~**1855**~~	~~**2194**~~	~~**1933**~~
~~**WBO Habitat**~~	-	-	-	-

~~Impacts to 4 WBO~~	~~4 WBO~~	~~0~~	~~4 WBO~~	~~0~~
~~TOTAL~~ -	~~4 WBO~~	**~~0~~**	~~4 WBO~~	**~~0~~**
~~Jurisdictional Waters (Direct Impact)~~				
~~Dry Desert Wash Woodland~~	~~202~~	~~6~~	~~193~~	~~5~~
~~Unvegetated Ephemeral Dry Wash~~	~~99~~	~~81~~	~~95~~	~~73~~
~~Subtotal~~	***~~301~~***	***~~87~~***	***~~287~~***	***~~78~~***
~~Jurisdictional Waters (Indirect Impact)~~				
~~Dry Desert Wash Woodland~~	~~0~~	~~0~~	~~0~~	~~0~~
~~Unvegetated Ephemeral Dry Wash~~	~~17~~	~~2~~	~~15~~	~~2~~
~~Subtotal~~	***~~17~~***	***~~2~~***	***~~15~~***	***~~2~~***
~~TOTAL WATERS~~	**~~317~~**	**~~89~~**	**~~303~~**	**~~80~~**

~~1 – Sources: Reconfigured Alternatives 2 and 3 - Solar Millennium 2010l.~~
~~2 –Some indirect impacts in Alternative 3 within Phase 1 become direct impact in Phase 2. The security in Phase 3 is reduced to credit that portion of the security already provided to cover the indirect impacts in Phase 2.~~
~~3 – Impacts to desert tortoise critical habitat are assumed to be wholly within the Phase 1 Project Disturbance Area.~~
~~4 – Raven Acres subject to the one-time USFWS Regional Raven Management Program fee are equivalent to the total DT Habitat impact acreages.~~

~~BIO 29 Table 2. Mitigation by Habitat Type Disturbed by Construction Phase (acres)~~ [1]

~~Habitat Type~~	**~~Mitigation Ratio~~**	**~~Reconfigured Alternative 2 Disturbance Area~~**		**~~Reconfigured Alternative 3 Disturbance Area~~**	
		~~Phase 1~~	**~~Phase 2~~**	**~~Phase 1~~**	**~~Phase 2~~**
~~MFTL Habitat~~	-	-	-	-	-
~~Stabilized & Partially Stabilized Dunes~~	~~3:1~~	**~~132~~**	~~336~~	~~178~~	~~385~~
~~Non-Dunes~~	~~1:1~~	~~637~~	~~711~~	~~509~~	~~845~~
~~Indirect Impacts~~	~~0.5:1~~	**~~59~~**	**~~14~~**	**~~140~~**	**~~-93~~**
~~TOTAL~~	-	***~~828~~***	***~~1061~~***	***~~827~~***	***~~1137~~***
~~DT Habitat~~	-	-	-	-	-
~~DT Habitat – inside critical habitat~~[2]	~~5:1~~	~~1127~~	~~0~~	~~1126~~	~~0~~
~~DT Habitat – outside critical habitat~~	~~1:1~~	~~2115~~	~~1855~~	~~1969~~	~~1933~~
~~TOTAL~~	-	**~~3242~~**	**~~1855~~**	**~~3095~~**	**~~1933~~**
~~WBO Habitat~~		-	-	-	-
~~Impacts to 4 WBO~~	~~19.5 acre/WBO~~	~~78~~	~~0~~	~~78~~	~~0~~
~~TOTAL~~ -		~~78~~	**~~0~~**	~~78~~	**~~0~~**

~~Habitat Type~~	~~Mitigation Ratio~~	~~Reconfigured Alternative 2 Disturbance Area~~		~~Reconfigured Alternative 3 Disturbance Area~~	
		~~Phase 1~~	~~Phase 2~~	~~Phase 1~~	~~Phase 2~~
~~Jurisdictional Waters (Direct Impact)~~					
~~Vegetated (Dry Desert Wash Woodland)~~	~~3:1~~	~~605~~	~~18~~	~~578~~	~~15~~
~~Unvegetated Ephemeral Dry Wash~~	~~1:1~~	~~99~~	~~81~~	~~95~~	~~73~~
~~Subtotal~~	-	***~~704~~***	***~~99~~***	***~~673~~***	***~~88~~***
~~Jurisdictional Waters (Indirect Impact)~~					
~~Vegetated (Dry Desert Wash Woodland)~~	~~1.5:1~~	~~0~~	~~0~~	~~0~~	~~0~~
~~Unvegetated Ephemeral Dry Wash~~	~~0.5:1~~	~~8~~	~~1~~	~~8~~	~~1~~
~~Subtotal~~	-	***~~8~~***	***~~1~~***	***~~8~~***	***~~1~~***
~~TOTAL WATERS~~	-	**~~712~~**	**~~100~~**	**~~680~~**	**~~89~~**

~~1 – Sources: Reconfigured Alternatives 2 and 3 - Solar Millennium 2010l.~~

~~2 – Impacts to desert tortoise critical habitat are assumed to be wholly within the Phase 1 Project Disturbance Area.~~

~~BIO-29 Table 3. Mitigation Securities by Construction Phase (acres)~~ ~~[1]~~

~~Habitat Type~~	~~Reconfigured Alternative 2 Security~~		~~Reconfigured Alternative 3 Security~~	
	~~Phase 1~~	~~Phase 2~~	~~Phase 1~~	~~Phase 2~~
~~MFTL Habitat~~	~~$2,553,714~~	~~$3,283,006~~	~~$2,550,739~~	~~$3,509,144~~
~~DT Habitat~~	~~$10,006,571~~	~~$5,735,553~~	~~$9,551,173~~	~~$5,967,642~~
~~Raven Fee Impacts~~[2]	~~$340,410~~	~~$194,775~~	~~$324,975~~	~~$202,965~~
~~WBO Habitat~~	~~$250,089~~	~~$0~~	~~$250,089~~	~~$0~~
~~Jurisdictional Waters~~	~~$2,190,556~~	~~$315,550~~	~~$2,095,340~~	~~$282,820~~
~~Total~~	**~~$15,341,340~~**	**~~$9,528,883~~**	**~~$14,772,315~~**	**~~$9,962,570~~**

~~1– Securities (aside from Raven fees) based on REAT Biological Resources Mitigation/Compensation Cost Estimate Calculation Table - July 23, 2010 (REAT 2010), adjusted to reflect a 160-acre parcel size estimate. Security does not include NFWF fees. Security amounts may change based on final Project footprint. The final amount shall be determined by an updated appraisal conducted as described in~~ **~~BIO-12.~~**

~~2 – Based on U.S. Fish and Wildlife Service Cost Allocation Methodology for Implementation of the Regional Raven Management Plan, dated July 9, 2010 (USFWS 2010b). Fee calculated at $105/acre for direct project impacts.~~

BIO-29 Table 1. Area of Habitat Type Disturbed by Construction Phase (acres)[1]

Habitat Type	PSEGS Disturbance Area	
	Phase 1	Phase 2
MFTL Habitat		
Stabilized & Partially Stabilized Dunes	0	186.8
Non-Dunes	34.2	1258.2
Indirect Impacts[2]	TBD	TBD
TOTAL	TBD	TBD
DT Habitat		
DT Habitat - inside critical habitat	177.3	51.3
DT Habitat - outside critical habitat	778.8	2939.4
TOTAL[3]	956.1	2990.7
WBO Habitat		
Impacts to 4 WBO[4]	4 WBO	0
TOTAL	4 WBO	0
Jurisdictional Waters (Direct Impact)		
Dry Desert Wash Woodland	9.7	187.2
Unvegetated Ephemeral Dry Wash	4.9	157.3
Subtotal	14.60	344.47
Jurisdictional Waters (Indirect Impact)		
Dry Desert Wash Woodland	0.03	0
Unvegetated Ephemeral Dry Wash	0.04	0.47
Subtotal	0.07	0.47
TOTAL WATERS	14.67	344.94

1 – Sources: Petition to Amend Supplement No. 1 (Palen 2013a).
2 –Project owner assumed 39.7 of indirect impacts for private parcel adjacent to project site however staff will provide an independent assessment of indirect impacts. Indirect impacts will be assessed pending results of additional sand transport modeling in the Final Staff Assessment.
3 – Raven Acres subject to the one-time USFWS Regional Raven Management Program fee are equivalent to the total DT Habitat impact acreages.
4 – Impact to burrowing owl may change based on results of additional burrowing owl surveys along proposed modified generation tie-line corridor and new natural gasline corridor.

BIO 29 Table 2. Mitigation by Habitat Type Disturbed by Construction Phase (acres) [1]

Habitat Type	Mitigation Ratio	PSEGS Disturbance Area	
		Phase 1	Phase 2
MFTL Habitat			
Stabilized & Partially Stabilized Dunes	3:1	0	561
Non-Dunes	1:1	35	1259
Indirect Impacts	0.5:1	TBD	TBD
TOTAL		at least 34	at least 1820
DT Habitat			
DT Habitat - inside critical habitat[2]	5:1	887	257
DT Habitat - outside critical habitat	1:1	779	2940
TOTAL		1666	3197
WBO Habitat			
Impacts to 4 WBO	19.5 acre/WBO	78	0
TOTAL		78	0
Jurisdictional Waters (Direct Impact)			
Vegetated (Dry Desert Wash Woodland)	3:1	30	562
Unvegetated Ephemeral Dry Wash	1:1	5	158
Subtotal		35	720
Jurisdictional Waters (Indirect Impact)			
Vegetated (Dry Desert Wash Woodland)	1.5:1	0.045	0
Unvegetated Ephemeral Dry Wash	0.5:1	0.02	0.235
Subtotal		0.065	0.235
TOTAL WATERS		36	721

1 – Sources: Palen 2013a
2 – Impacts to desert tortoise critical habitat are assumed to be within the Phase 1 and Phase 2 Project Disturbance Area.

BIO-29 Table 3. Mitigation Securities by Construction Phase (acres) [1]

Habitat Type	PSEGS Security	
	Phase 1	Phase 2
MFTL Habitat	$104,992.00	$5,620,160.00
DT Habitat	$5,144,608.00	$9,872,335.90
Raven Fee Impacts[2]	$100,390.50	$314,023.50
WBO Habitat	$250,089.00	$00.00
Jurisdictional Waters	$111,168.00	$2,226,448.00
Total	$5,711,247.50	$18,032,967.4

1– Securities (aside from Raven fees) based on REAT Biological Resources Mitigation/Compensation Cost Estimate Calculation Table - July 23, 2010 (REAT 2010), adjusted to reflect a 160-acre parcel size estimate. Security does not include NFWF fees. Security amounts may change based on final Project footprint. The final amount shall be determined by an updated appraisal conducted as described in BIO-12.
2 – Based on U.S. Fish and Wildlife Service Cost Allocation Methodology for Implementation of the Regional Raven Management Plan, dated July 9, 2010 (USFWS 2010b). Fee calculated at $105/acre for direct project impacts.

Verification: The Project owner shall not disturb any area outside of the area that has been approved for that phase of construction and for the previously approved phases of construction.

No less than 30 days prior to the start of desert tortoise clearance surveys for each phase, the Project owner shall submit a description of the proposed construction activities for that phase to CDFW, USFWS and BLM for review and to the CPM for review and approval. The description for each phase shall include the proposed construction schedule, a figure depicting the locations of proposed construction, and amount of acres of each habitat type to be disturbed.

No less than 30 days prior to beginning Project ground-disturbing activities for each phase, the Project owner shall provide the form of Security in accordance with this Condition of Certification in the amounts described in **BIO-29 Table 3.** No later than 7 days prior to beginning Project ground-disturbing activities for each phase, the Project owner shall provide written verification of the actual Security. The Project owner, or an approved third party, shall complete and provide written verification of the proposed compensation lands acquisition within 18 months of the start of Project ground-disturbing activities for each phase.

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APPENDIX BIO1 - BIOLOGICAL RESOURCES RISK ASSESSMENT OF AVIAN EXPOSURE TO CONCENTRATED SOLAR RADIATION

Geoff Lesh PE, Rick Tyler, Alvin Greenberg Ph.D., and William E. Hass MS

SUMMARY OF CONCLUSIONS

The risk assessment examines the potential effect of avian exposure to concentrated solar radiation. Staff examines the nature and probability of adverse effects to birds, when exposed to concentrated solar electromagnetic radiation, including infrared, visible and ultraviolet light.

Staff's analysis of avian exposure to concentrated solar radiation indicates that a threshold of safe exposure does not exist above a solar flux density of 4 kilowatts per square meter or kW/m^2 for a one-minute exposure. The analysis also indicates that both the Hidden Hills and Rio Mesa facilities pose significant risk to avian populations that may encounter the air space in the facilities where concentrated flux density is above the safe levels, potentially resulting in avian morbidity and mortality. The available data regarding avian impacts is very limited; however, such data does provide at least some perspective regarding potential for impact.

There are significant questions regarding extrapolation from the available information regarding avian impacts. The most vexing is the complete absence of data that would allow estimation of avian morbidity. Staff's assessment provides estimates of exposure and dose that can lead to injury and late fatality. In addition, there are major unknowns in estimation of differences in avian populations from one site to the next. These limitations in the available data require exercise of considerable judgment in extrapolation of data from one site to another. However, the errors introduced by the lack of site specific data are likely to be small in comparison to the absence of morbidity estimates and effects of dramatically increased potential exposure duration resulting from the increased volume of the air space affected by concentrated solar flux at commercial-sized facilities like Hidden Hills as compared to pilot-scale facilities.

Staff reviewed the following list of submittals provided by Bright Source regarding potential for impacts on avian resources as a result of potential exposure to concentrated solar flux. While providing descriptions of the heat flux field strengths around the solar receiver steam generator tower, the references are unpublished, lack peer review, are of very limited duration, and are from facilities that are much smaller than the proposed facility with regard to observed adverse avian effects of concentrated solar radiation.

Bright Source contends based on this information that the proposed Hidden Hills Project poses no significant risk to birds that would be exposed to the concentrated flux field associated with the project. They also contend that $50kW/m^2$ is a safe level of exposure for a duration of 30 seconds and that exposures to lower flux densities are without consequence. Staff disagrees with these conclusions, and provides its own independent analysis, with references, of the potential for impacts on avian resources associated with the proposed Hidden Hills Project.

25. BS 2012a – Bright Source (tn 63357). Rio Mesa Solar Electric Generating Facility CEC Biological Resources Workshop Presentation, dated January 6, 2012. Submitted to CEC Docket Unit on January 12, 2012.

26. BS 2012c – Bright Source/T. Stewart (tn 63365). Rio Mesa Avian Survey Counterproposal, dated January 12, 2012. Submitted to CEC Docket Unit on January 13, 2012.

27. ESH 2012a – Ellison Schneider & Harris, LLP/C. Ellison (tn 63475). Bright Source Comments on Issues Identification Report, dated January 30, 2012. Submitted to CEC Dockets Unit on January 30, 2012.

28. CBD 2012a – Center for Biological Diversity/L. Belenky (tn 63521). Comments on Issues Identification Report, dated January 31, 2012. Submitted to CEC / Dockets Unit on February 2, 2012.

29. FWS 2012a - Fish and Wildlife Services (tn 63565) Rio Mesa Golden Eagle Survey Clarification, dated January 31, 2012. Submitted to CEC Dockets Unit on February 6, 2012.

30. ESH 2012b – Ellison Schneider & Harris, LLP (tn 63956) Applicant's Notice Pursuant to 20 C.C.R. § 1716(f) For California Energy Commission's Staff Data Request Set 1A, dated March 2, 2012. Submitted to CEC Dockets Unit on March 2, 2012.

31. URS 2012a – URS/A. Leiba (tn 64060) Applicant's Data Response to Data Request Set 1A, dated March 8, 2012. Submitted to CEC Dockets Unit on March 8, 2012.

32. BS 2012m – Bright Source (tn 64467) Biological Workshop Presentation, dated March 13, 2012. Submitted to CEC Dockets Unit on March 28, 2012.

33. EHS 2012c – Ellison Schneider & Harris/C. Ellison (tn 64093) Applicant's Opening Brief for March 19, 2012. Status Conference, dated March 9, 2012. Submitted to CEC Dockets Unit on March 9, 2012.

34. CBD 2012c – Center for Biological Diversity/L. Belenky (tn 64173) Center for Biological Diversity Data Request, dated March 15, 2012. Submitted to CEC Dockets Unit on March 16, 2012.

35. URS 2012c – URS/A. Leiba (tn 64722) Response to Center for Biological Diversity Data Request, dated April 12, 2012. Submitted to CEC Dockets Unit on April 12, 2012.

36. URS 2012e – URS/A. Leiba (tn 64814) Supplemental Response, dated April 16, 2012. Submitted to CEC Dockets on April 16, 2012.

37. MDM 2012a – Michael D. McCrary, etal. (tn 64807) Avian Mortality at a Solar Energy Power Plant, accepted January 24,1986. Submitted to CEC Dockets Unit on April 17, 2012.

38. BS 2012r – Bright Source (tn 65431) Applicant's Supplemental Response to Data Requests, Set 1B, 143 and 144, dated May 23, 2012. Submitted to CEC Dockets Unit on May 23, 2012.

39. ESH 2012c – Ellison Schneider & Harris, LLP (tn 65696) Applicant's Notice – Staff's Data Requests Set 2A, dated June 8, 2012. Submitted to CEC Dockets Unit on June 8, 2012.

40. ESH 2012e – Ellison Schneider & Harris, LLP (tn 65745) Applicant's Supplemental Notice for CEC Staff's Data Requests Set 2A, dated June 13, 2012. Submitted to CEC Dockets Unit on June 13, 2012.

41. BS 2012u – Bright Source/ T. Stewart (tn 66280) Applicant's Response to Data Requests, Set 2A, #159 dated July 20, 2012. Submitted to CEC Dockets Unit on July 20, 2012.

42. BS 2012v – BrightSource (tn 68364) Applicant Submitted Power Point Presentation (Flux Impacts on Avian Species) for August 28, 2012 Joint Workshop on Rio Mesa SEGF and Hidden Hills SEGS , dated August 28, 2012. Submitted to CEC Dockets Unit on November 5, 2012.

43. BS 2012w – BrightSource (tn 68360) Applicant Submitted Slide on Dr. Pleguezuelos' Conclusions at GEMASolar Plant in Andulusia, Spain, for August 28, 2012 Joint Workshop on Rio Mesa SEGF and Hidden Hills SEGS. Submitted to CEC Dockets Unit on November 5, 2012.

44. BS 2012u – Bright Source/ T. Stewart (tn 66280) Applicant's Response to Data Requests, Set 2A, #159 dated July 20, 2012. Submitted to CEC Dockets Unit on July 20, 2012.

45. BS 2012v – BrightSource (tn 68364) Applicant Submitted Power Point Presentation (Flux Impacts on Avian Species) for August 28, 2012 Joint Workshop on Rio Mesa SEGF and Hidden Hills SEGS , dated August 28, 2012. Submitted to CEC Dockets Unit on November 5, 2012.

46. BS 2012w – BrightSource (tn 68360) Applicant Submitted Slide on Dr. Pleguezuelos' Conclusions at GEMASolar Plant in Andulusia, Spain, for August 28, 2012 Joint Workshop on Rio Mesa SEGF and Hidden Hills SEGS. Submitted to CEC Dockets Unit on November 5, 2012.

47. BS 2012x – BrightSource (tn 68294) Applicant Supplemental Avian Study Information – 1: Assessment of Potential Impacts to Birds from Solar Thermal Power Plant, Dimona Israel; 2: Environmental Impact of the GEMASOLAR Thermosolar Plant on the Bird Community in the Monclova Surrounding Area (Fuentes de Andalucía, Seville, Spain, Juan M Pleguezuelos, Granada, 08-23-2012); 3: Impact of the GEMASOLAR Solar Power Plant (La Monclova, Fuentes de Andalucía, Province of Seville) on the Bird Population, Report 4 (September 2010): Nesting avifauna in the study area during the plant construction phase (March – July 2009-2010); 4: Impact of the GEMASOLAR Solar Power Plant (La Monclova, Fuentes de Andalucía, Province of Seville) on the Bird Population.

48. CH2 2012qq- CH2MHill/j. Carrier (tn: 68630) Data Response, Set 3. 11/21/2012.

49. SJ 2012a- Dr. Johnsen Ph.D (tn 68785) Dr. Johnsen's Presentation at December 5, 2012 Joint Rio Mesa SEGF and Hidden Hills SEGF Workshop Submitted to CEC Docket Unit On December 5, 2012.

SETTING

Concentrating solar thermal power plants, like Hidden Hills and Rio Mesa, collect ambient solar radiation and concentrate it onto a solar receiver to generate steam for the steam turbine generator. The concentration of the solar radiation creates a range of solar radiation flux densities between the solar receiver steam generator located atop the power tower and the reflecting mirrors arrayed on the ground. At ground level, nominal solar radiation, or solar energy per unit area, is about 1 kilowatt per square meter (kW/m^2). At the solar receiver steam generator, the reflected concentrated solar radiation is about 600 kW/m^2.

However, because the heliostat mirror arrays do not form a continuous reflective surface across the solar field due to gaps from roads or non-uniform spacing due to terrain or maintenance spacing, the solar flux density does not increase linearly with increasing elevation up to the maximum at the receiver. Gaps in the mirror array result in discontinuities in flux overlaps at elevations closer to the mirrors.

The applicant provided flux density modeling results of the proposed Rio Mesa solar flux fields in response to Staff Data Request 159. Staff relied upon these modeling results for this analysis, but has not been provided the necessary information to independently verify the modeling results. Consequently, staff's analysis remains subject to additional information and analysis of the flux fields. Nevertheless, as expected, values are low near the surface of the mirrors and increase in a non-linear manner in close proximity to the receiver. When the mirrors are concentrating sunlight onto the receiver, the shape of the higher flux regions between the receiver and mirror is an inverted cone, with a small section at the receiver that broadens as you descend towards the solar field. When the mirrors are directed off the receiver in standby mode, the shape of the higher flux regions are like two cones, one facing downward towards the mirrors and one upward away from the focal point (BS 2012u, Fig. 5).

Note that our sun emits a broad spectrum of radiation, including radio waves, visible light, and x-rays. The earth's atmospheric layers filter much of the radiation, diminishing and/or eliminating certain wavelengths particularly in the ultraviolet (UV) spectrum. And the solar field heliostat mirrors further diminish the reflected solar radiation of the shorter (e.g., UV) wave lengths.

It may not be obvious to the reader what the nature of these various flux intensities is, or at what point they could become dangerous. It is instructive because typically people are unaware of the level of flux exposure they are undergoing, aside from being under a sunny clear sky (a level of 1 kW/m^2), whether it is near a fireplace, radiant heater, or other warm device. Thus, to give some perspective to the lower range of values discussed herein, the following **Appendix BIO1 Table 1** (Drysdale 1998, p. 61) shows the effects of thermal radiation (flux) on various organic materials. Reported experiments have shown that several polymeric materials can be heated to beyond 300°C by radiant flux levels ranging from 11 to 15 kW/m^2. Similarly, experiments have shown that wood can be heated to 350 °C by 12 kW/m^2 and to 600°C by 28 kW/m^2 (Drysdale 1998, p. 221, Table 6.5). Staffs notes that these effects are for still air, and surface temperatures would be reduced somewhat in moving air.

Appendix BIO1 Table 1 Effects of thermal radiation

Radiant Heat flux (kW/m^2)	Observed effect
0.67	Summer sunshine in UK[a]
1	Maximum for indefinite skin exposure
6.4	Pain after 8 s skin exposure[b]
10.4	Pain after 3 s skin exposure[a]
12.5	Volatiles from wood may be ignited by pilot after prolonged exposure
16	Blistering of skin after 5 s[b]
29	Wood ignites spontaneously after prolonged exposure[a]
52	Fibreboard ignites spontaneously in 5 s[a]

[a]D. I. Lawson (1954) [b]S.H. Tan (1967)
The data quoted for human exposure are essentially in agreement with information given by Purser (1995) and Mudan and Croce (1995)
Table source: Drysdale 1998, An introduction to Fire Dynamics, 2nd Ed., by Dougal Drysdale, Publ. John Wiley and Sons, 1998, Table 2.8, P. 61

HIDDEN HILLS

The Hidden Hills Solar Electric Generating System (HHSEGS) would be located on Old Spanish Highway, near the community of Charleston View on approximately 3,277 acres (5.12 square miles) of privately owned land in Inyo County, California, adjacent to the Nevada border. The project site is approximately 8 miles south of Pahrump, Nevada, and approximately 45 miles west of Las Vegas, Nevada.

HHSEGS would consist of two 250 MW solar plants. Each solar plant would use heliostats which are elevated mirrors mounted on a pylon to focus the sun's rays on one solar receiver steam generator (SRSG) or receiver atop a 750-foot tall solar power tower near the center of each solar field. In each solar plant, one Rankine-cycle steam turbine would receive steam from the SRSG (or solar boiler) to generate electricity. The solar field and power generation equipment would start each morning after sunrise and would shut down when insolation[1] drops below the level required keeping the turbine online, or during upsets and emergencies.

Each of the heliostat assemblies would be composed of two mirrors, each approximately 12 feet high by 8.5 feet wide with a total reflecting surface of approximately 204 square feet (19 square meters – m^2). Each heliostat assembly would be mounted on a single pylon, along with a computer-programmed aiming control system that directs the motion of the heliostat to track the movement of the sun. The 85,000 heliostats have an effective total reflective area of approximately 1.7 million m^2. These heliostats concentrate solar radiation on the solar receiver boiler and superheater sections (the SRSG is four -sided, with boiler tube walls on the outside to be heated by the concentrated solar radiation).

The receiver absorbs the concentrated radiation from the heliostats and transfers the resultant heat into water and steam in steel tubes at the receiver surface. The efficiency of the Rankine-cycle (steam cycle) is about 43 percent under optimum conditions (summer mid-day). This equates to a solar energy transfer of about 610 million watts

[1] **Insolation** is a measure of solar radiation energy received on a given surface area and recorded during a given time. It is also called solar irradiation and expressed as hourly irradiation if recorded during an hour, daily irradiation if recorded during a day.

(610 MW) between the heliostats and the receiver. While the concentration to an energy density of 600 kW/m^2 is roughly analogous to focusing a 3 inch magnifying glass down to a 1/8 inch point, the power tower does not focus the reflected sun to a point, but rather overlays thousand of heliostat reflections onto the boiler tube walls of the receiver.

The total concentrated solar energy of 610 MWhr is approximately equal to burning 17,000 gallons of gasoline per hour. The solar flux density is intense enough that if the water and steam in the boiler were to stop flowing and the heliostats remained focused on the receiver, it would be destroyed in a short period of time.

RIO MESA

The Rio Mesa Solar Electric Generating Facility (RMSEGF) is very similar to the Hidden Hills facility and consists of two 250-megawatt (MW) (nominal) solar concentration thermal power plants situated on the Palo Verde Mesa in Riverside County, California, 13 miles southwest of Blythe, and is located partially on private land and partially on public land administered by BLM. Design aspects of the RMSEGF are essentially the same as for the HHSEGS.

ANALYTICAL APPROACH

Staff's analysis includes the following analytical steps in estimating the avian mortality and morbidly from exposure to concentrated solar radiation:

a. Hazard Assessment -- the determination of whether a particular environmental exposure is or is not causally linked to particular health effects on the receptors.

b. Dose-Response Assessment -- the determination of the relation between the magnitude of exposure and the probability of occurrence of the health effects in question.

c. Exposure Assessment -- the determination of the extent of receptor exposure before or after application of regulatory controls.

d. Risk Characterization -- the description of the nature and often the magnitude of receptor risk.

e. Analysis of Uncertainty -- Uncertainty represents a discussion of the gaps in knowledge about factors such as adverse effects or exposure levels which may be reduced with additional study. Generally, risk assessments carry several categories of uncertainty, and each merits consideration. Measurement uncertainty refers to the usual error that accompanies scientific measurements -- standard statistical techniques can often be used to express measurement uncertainty. An amount of uncertainty is often inherent in environmental sampling. There are likewise uncertainties associated with the use of scientific models, e.g., dose-response models, models of the physical environment, the assumed values of material properties that may vary in nature or not be well characterized, the probability of occurrence of particular circumstances, etc.

Birds are exposed to this concentrated solar radiation when they enter the flux field and receive the incident radiant energy that is reflected from the array of heliostats on the ground. The radiant energy that exists in the flux field is converted to heat when it is absorbed on any solid opaque surface that receives the transmission of the radiant energy through an otherwise transparent medium (air).

The absorption efficiency of radiant flux is governed by the emissivity of the surface of the object that receives it. Emissivity can range from 0 to 1 with 0 representing perfect reflection of all the incident radiation and 1 representing complete absorption and conversion to heat. It is also governed by the angle of incidence between the radiant flux and the surface that receives it. A mirror is an example of a surface with a low emissivity (typically below 0.05) absorbing and converting to heat less than 5 percent of the incident light. Black pavement is an example of a surface with high emissivity (about 0.95) absorbing 95 percent of the incident light. This is the reason that blacktop becomes so hot when exposed to sunlight.

In actual circumstances the rise in temperature of a surface exposed to radiant flux is often diminished by the transfer of heat to the surrounding air from that surface. This is typically referred to as convective heat transfer. The amount of heat removed by convection is governed by the speed and turbulence of the air passing over the surface and the temperature difference between the air and the heated surface. In the case of birds, the speed of flight through the air is equivalent to a velocity of air over the surface.

The convective heat transfer between bird feathers and the ambient air is analogous to the convective heat transfer between the heated boiler tubes in the receiver and the water and steam flowing in the receivers at the Hidden Hills and Rio Mesa power plants. In the absence of this continuous convective heat removal by the water and steam inside the boiler tubes (i.e. if the tubes were too empty) the temperature of the boiler tubes would rise rapidly to a new higher equilibrium temperature much higher than the normal 540 ^{o}C operating temperature. The surface of the receiver would be damaged unless the incident radiation is removed by putting the heliostats in a standby mode whereby radiant flux is no longer directed on to the receiver.

The potential for injury to birds that fly through a concentrated solar flux field results from heating of the outer surface feathers and subsequent conduction of heat into the exposed feathers causing breakdown of their molecular structure. Conduction is the transfer of heat into a solid object due to the temperature difference between the object and its surroundings. While exposure could also cause a rise in body temperature it is likely that severe damage to the outer feathers would occur much more quickly as a result of the insulating effect of the plumage covering the bird’s body.

In this analysis, staff has attempted to estimate levels of exposure to concentrated radiant flux that are safe and would result in little or no damage to exposed birds. It can then be concluded that exposures above such safe levels would result in irreversible and potentially significant impact to exposed birds that enter the flux field.

HAZARD ASSESSMENT

While the highest flux density occurs at the surface of the receiver, high concentration solar flux densities also occur in other parts of the air space above the heliostats, ranging continuously from 1 up to 600 times the background solar radiation of about 1 kW per square meter (1.0 kW/m^2). The applicant's response to Data Request 159 (BS 2012u) provides maps of flux densities throughout the air space above the Rio Mesa Solar fields. Similar flux density fields will exist at the proposed Hidden Hills facility.

When high solar flux densities impinge on objects, for example, a bird's flight feathers (primary, secondary, and tail feathers), the solar radiant flux is converted to heat, which can cause damage resulting in injury or death depending on the exposure level and duration of exposure (i.e. dose). For example, for exposed (bare) human skin, at an exposure level of 5 kW/m^2, first-degree burns would occur within 20 seconds of continuous exposure; second-degree burns would occur within 30 seconds; and third-degree burns would occur within 50 seconds with a 1 percent fatality rate. Because feathers are effectively dead structural protein similar to hair without nerves and other physiological activity, bare human skin is more sensitive than avian feathers to the effects of thermal radiation but does serve as a useful comparison.

Exposures of birds to concentrated solar flux did actually occur at the Solar One facility near Daggett California (McCrary et. al. 1986). Birds were found dead on the site that had clear evidence of thermally induced damage to flight feathers caused by exposure to concentrated solar flux. The birds had near complete removal of both barbules and barbs of flight feathers leaving only the rachis (the main central shaft of the flight feather) remaining. This suggests that the flight feathers had reached temperatures in excess of 300 ^{o}C and demonstrates the potential for damage to flight feathers resulting from exposure to concentrated solar flux. The barbules, which comprise the major resistance to air flow through surface of the feather, are essential to the creation of lift by wing flapping. The barbules are very small (less than 1/1000 of an inch thick) and have very low mass. Thus, damage to barbules from exposure to concentrated flux will be virtually instantaneous, and damage to barbs, feathers and birds very likely.

DOSE RESPONSE ASSESSMENT

This assessment provides an analysis of the potential damage to flight feathers of the bird associated with exposure to concentrated solar flux. Staff has determined that damage to surface feathers is one of the most sensitive types of adverse effects that can occur in avian species from such exposure. Staff's dose response assessment provides analysis of the relationship of potential feather damage associated with increasing levels of concentrated radiant flux exposure. Staff's analysis identifies levels of concentrated solar flux exposure that are just below the levels that could cause irreversible damage to flight feathers as the criteria to establish safe avian exposure levels.

Bird feathers are composed predominantly of keratin which is a naturally occurring polymeric protein chain. These polymer chains of keratins also form secondary structures creating hard natural fibers (for example hair and wool) and hard fibrous sheets (for example feathers, claws, nails, and hooves). The keratin in feathers is the beta form of keratin, or β-keratin. It has a macromolecular secondary form resulting from folding and cross linking at the edges of the poly peptide polymer primary chains. The β-keratin in feathers also typically contains small amounts of both loosely bound water and more tightly bound water that exists in the molecular structures of the secondary proteins (Conn et al 1987 pages 84-99) (Mazur and Harrow 1968 pages 61-72) (Greenwold and Sawer 2010 page1).

The structural properties (strength, stiffness, elasticity etc.) of the keratin that makes up feathers is central to the feathers function in flight (Bachmann et. al. 2007) (Bachmann and Wagner 2011) (Videler 2005 pages 46 -55). Intact keratin structure is also essential to maintenance of the feather's aerodynamic shape and surface smoothness. Both structural and molecular changes occur when keratin is exposed to temperatures above about 160 ^{o}C (Takahashi et. al. 2004) (Senoz.et.al. 2011) (Istrate et. al. 2011). Alpha and Beta keratin from wool, hair, and feathers have remarkably similar thermal decomposition characteristics (Brebu et. al. 2011).

At ambient, atmospheric pressure, feathers lose unbound water before the feather surface temperature can rise above 100 ^{o}C. Unbound water can also be lost through evaporation at temperatures below 100 ^{o}C with low relative humidity. Heating above 100 ^{o}C in the absence of water is often referred to as heating in the dry state. Keratin is more resistant to thermal degradation when heated in a dry state than in a wet state (Takahashi et. all 2004). Because unbound water cannot exist in the keratin at temperatures above 100 ^{o}C at ambient atmospheric pressure, exposures to concentrated radiant solar flux at ambient conditions will result in dry heating.

Loss of water that is unbound (not molecularly bound) is reversible. Typically the presence of unbound water would result in a transient period before temperatures inside the feather would rise upon heating above 100 ^{o}C due to latent heat required to vaporize the unbound water. However, in the environment of the project site in summer the elevated ambient temperatures and low humidity would suggest very low moisture content in the feathers of indigenous birds, particularly for the flight feathers.

At about 160 ^{o}C, bonds in the molecular structure of secondary proteins are broken leading to loss of structural integrity of the β-keratin molecular structure and a permanently weakened feather. The keratin begins to melt at about 250 ^{o}C. At temperatures of 250 to 450 ^{o}C, bonds in the primary polymer protein chains are broken into smaller molecular compounds through pyrolysis (Senoz et. al. 2011) (Brebu et. al. 2011). When temperatures reach 450 to 500 ^{o}C, keratin will almost completely break down and carbon will be the primary constituent of what remains.

Once bonds on the ends of the protein chains are broken, damage to the keratin is not reversible and thus the structural properties of the secondary proteins and ultimately the exposed feathers are adversely affected. This breaking of the chemical bonds that secure the secondary molecular structure of keratin, which leads to structural changes without affecting the primary protein chains is referred to as denaturing (Istrate 2011) (Takahashi et. al. 2004). This is very similar to the boiling of an egg where the protein structures in the albumin (egg whites) are permanently changed but the basic protein chains are not disrupted. Ultimately the level of damage to the flight feathers will be a function of both the magnitude of exposure and its duration. The dose will thus have units of kilowatt-seconds per square meter or kW-s/m^2.

Based on the results of staff's thermodynamic equilibrium analysis discussed below, exposure to solar flux greater than 4kW/m^2 can result in temperatures above 160 ^{o}C with 60 seconds of exposure. Exposure of 4kW/m^2 can be considered a no observed adverse effect level (NOAEL). Exposures above this level can compromise the keratin molecular structure of a bird's flight feathers, therefore potentially causing irreversibly weakening of feathers leading to an irreversible adverse impact on the feathers. While molting may ultimately replace some damaged feathers, it will in most cases not occur for some time after that damage occurs. Feathers, in which the quill was heated enough to damage the follicle from which the feather grows, might not get replaced during molt.

EXPOSURE ASSESSMENT

To estimate exposure staff modeled the change in surface temperature of flight feathers of a bird during flight when the bird's feathers are exposed on their underside to a concentrated flux in a solar heliostat field. The intensity of exposure depends on the path the bird traverses from the point where it enters a space with concentrated flux until it exits that space. The figures in the applicant's response to Data Request 159 (BS 2012u) are contour plot depictions of concentrated flux density isopleths indicating the locations of flux density levels of 5, 10, 25, 50, 100, and 150 kW/m^2.

To evaluate the potential for damage, it is necessary to convert the radiant flux to a resultant increase in the temperature at the surface of the exposed feathers. During flight, concentrated solar radiation is reflected from the heliostats on to the bottom surface of the feather, causing heating of the surface. The rate of heating depends upon the intensity, or flux, and how fast the surface is simultaneously being cooled. By summing the heat being gained from the incoming flux together with the heat losses occurring through convection and radiation, the resulting feather surface temperature can be estimated.

Potential cooling of the exposed feather surface results from the ongoing heat loss from the bottom surface of the wing feather by multiple mechanisms. The most important of these is convection of heat to the air stream passing under the wing bottom surface (at the bird's air speed). Additional losses include re-radiation of heat (energy) from the hot surface, and by conduction of heat through the feather to its backside, where it can be lost through convection to the air stream passing over the top side of the feather, but only for those areas of the backside that are exposed to topside airflow. Staff has assumed that most flux-exposed feathers will have much of their backside surfaces covered by either other feathers or body skin. Therefore, for purposes of conducting a worst-case risk analysis, staff has ignored the potential heat loss mechanisms of back-side convection and back-side re-radiation (i.e. heat loss from the top of the wing). Staff modeled convective loss from the wing using a heat transfer coefficient from a flat or cambered plate assuming laminar flow over the plate (McArthur 2008, Mueller 1999, Pelletier and Muller 2000, Tucker 1987, Tucker and Parrot 1969). Approximation of a wing using a flat or cambered plate model is the accepted method of modeling fluid flow over wings and is, therefore, also the best method for modeling heat transfer to and from a wing, particularly on the underside where there is no issue of flow separation from the wing surface (Ward 1999), (Withers 1981), Holman 1976), (Incroera 2007), Cengel 2007), (MERM 2001).

These loss mechanisms depend upon the difference between the surface temperature of the feather and the temperature of the ambient air, and they increase in effectiveness as the temperature difference increases. Thus, as the feather surface temperature heats from solar radiation exposure, the heat losses increase until they collectively match in their heat loss rate, the heat gain rate caused by the concentrated solar radiation. At that point the surface temperature stabilizes, and becomes what is called “steady-state.” Due to the extremely small size and low mass density of the keratin micro structures that make up the surface of the feather, at realistic bird flight speeds in the gradually changing solar flux densities of a solar field, surface temperatures reach to within a few degrees of this steady-state temperature virtually instantaneously. During realistic flight conditions in the power plant’s solar field, flux densities change continuously with location, so any sudden change is an unrealistic simplification of actual conditions experienced in flying through the air space having concentrated flux densities.

Because changes in flux density occur gradually during flight, there are no large “step changes”, so temperature rise-times for re-equilibration to changing flux levels can be ignored. After conducting dynamic analyses and examination of several plausible flight paths and comparing those results to the simple assumption of instantaneous equilibrium, staff used the assumption of instantaneous equilibrium to establish safe exposure criteria as this assumption created little error in the result. Assuming instantaneous equilibrium eliminates the dependence on flight path in analyzing potential avian exposures to concentrated solar radiation. **Appendix BIO1 Tables 1** and **2** below provide estimates of equilibrium temperatures for a range of plausible exposure intensities and exposure conditions, a flight speed of 18 miles-per-hour (about 8 meters-per-second), an ambient temperature of 45 ^{o}C, and at incidence angles of 0 degrees and 71 degrees off-perpendicular to the feather surfaces.

Appendix BIO1 Figures 1 through **4** below show the results of dynamic modeling of a range of plausible flight paths. The simplification of using instantaneous equilibrium, allows staff to reduce multiple variables (flux level, emissivity, angle of incidence, flight speed, path through solar field) down to a simpler set of only two variables (flux level and exposure time). Equilibrium surface temperatures are also largely dependent on the cord length of the bird wing (i.e. the distance from the front of the wing to the trailing edge). **Appendix BIO 1 Figure 5** provides an analysis of flux levels causing 160 ^{o}C surface temperatures for different cord lengths and flight speeds. The vast majority of bird species fly within a range of 6 to 16 meters-per-second (Videler 2005 Pages 154 and 155) (Alerstam et. al.)). During flap gliding flight, birds fly at the lower end of the range. Therefore, staff used a flight speed of 8 meters-per-second or 18 miles-per-hour.

Dynamic modeling was conducted by choosing several plausible straight-line flight paths through the solar field, utilizing the isopleth solar field diagrams provided by the applicant. This was be done by re-calculating the feather surface temperature at one-hundredth of a second intervals along a presumed flight path by adjusting for the incoming radiant flux and convective and radiative loses that would be occurring at each interval using the assumed ambient air temperature, flight speed, and incidence angle, etc.

Staff used linear interpolation to estimate flux intensities between isopleths, then plotted temperature on a continuous basis during the flight path through the field. Points where exposure resulted in estimated surface temperatures above 160 ^{o}C, and 300 ^{o}C were noted. **Appendix BIO1 Tables 2** and **3** provide estimates and comparisons of maximum surface temperatures reached based on varying flux densities, and flight paths to assumed steady-state exposure to flux levels.

Appendix BIO1 Table 2 Feather Surface Temperatures vs Flux Intensity

Flux Intensity (kW/m^2)	Steady State Temp (deg C)	Flight Condition		
		Directly at Tower Temp (deg C)	Tangent to 100yds off Tower (deg C)	Flying upward near tower (deg C)
1	80	70	68	60
5	170	160	160	140
10	260	240	240	160
25	430	360	410	220
50	610	600	na	410
100	810	740	na	Na
150	950	930	na	Na

All at 18mph, View factor = 1 (Angle of incidence = 0 deg)

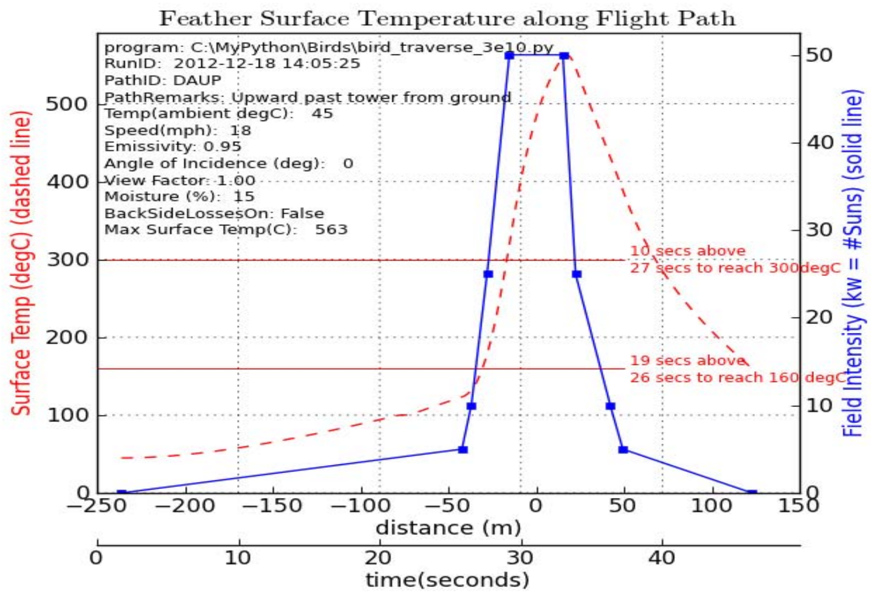
Appendix BIO1 Table 3 Feather Surface Temperatures vs Flux Intensity

Flux Intensity (kW/m^2)	Steady State Temp (deg C)	Flight Condition	
		Directly at Tower Temp (deg C)	Tangent to 100yds off Tower (deg C)
1	60	54	55
5	90	87	88
10	130	120	120
25	220	160	200
50	340	330	na
100	500	380	na
150	600	500	na

All at 18mph, View factor = 0.33 (Angle of incidence = 71 deg)

Staff modeled absorption of flux by the feather to occur in the initial half-thickness of material, at and just beneath the surface of the feather. The resultant heating is the cause of the temperature rise in the feather material and of the subsequent damage to the fragile keratin structures and molecules that provide the structural integrity of feathers.

Appendix BIO1 Figure 1 Path is from ground up past tower receiver while operating at full load



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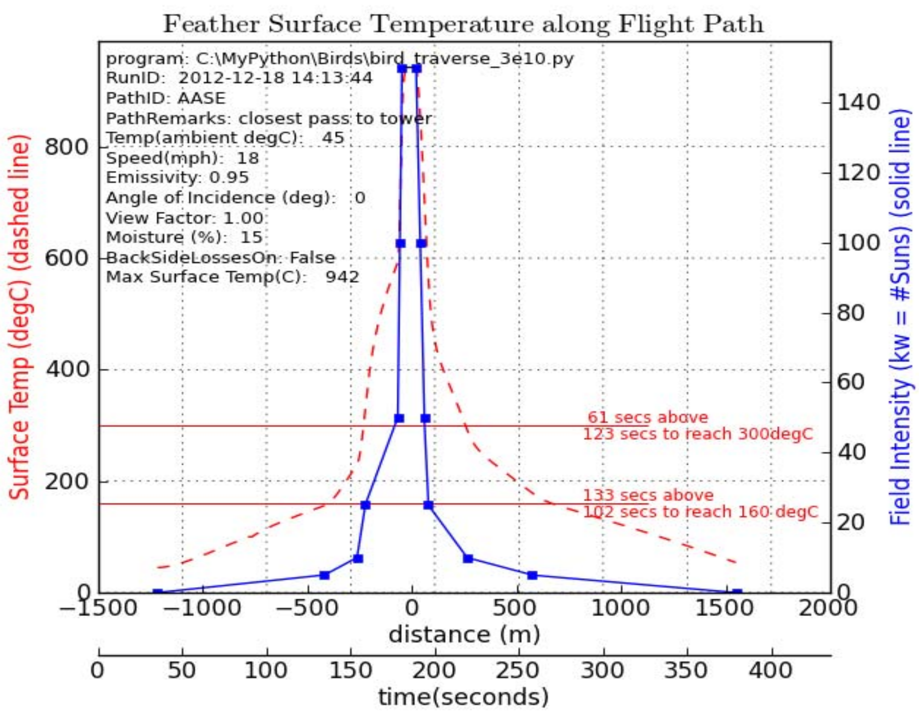
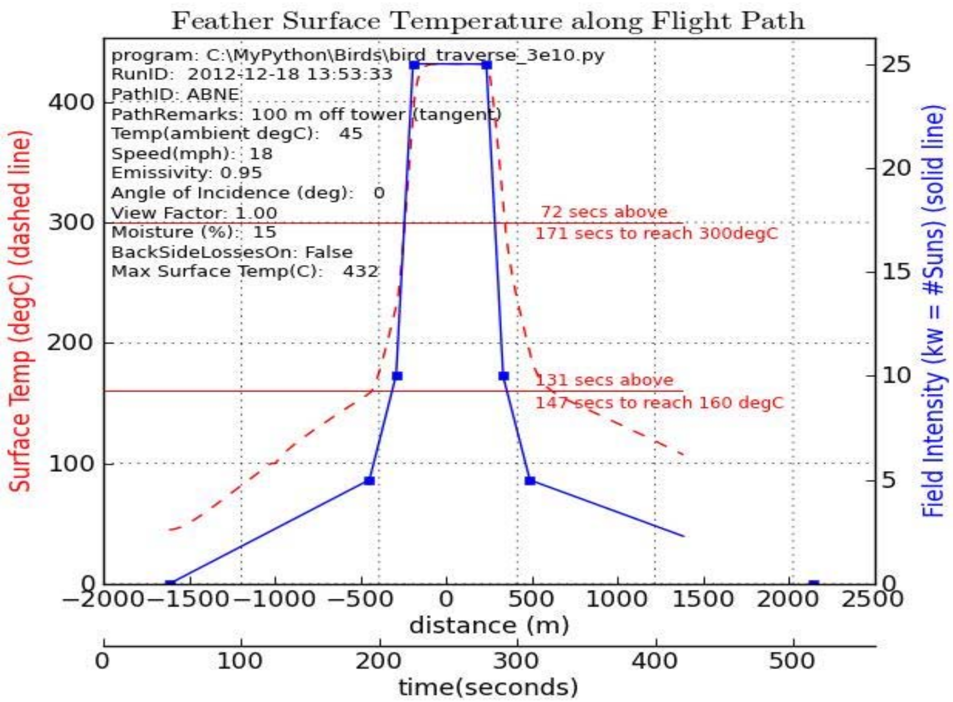
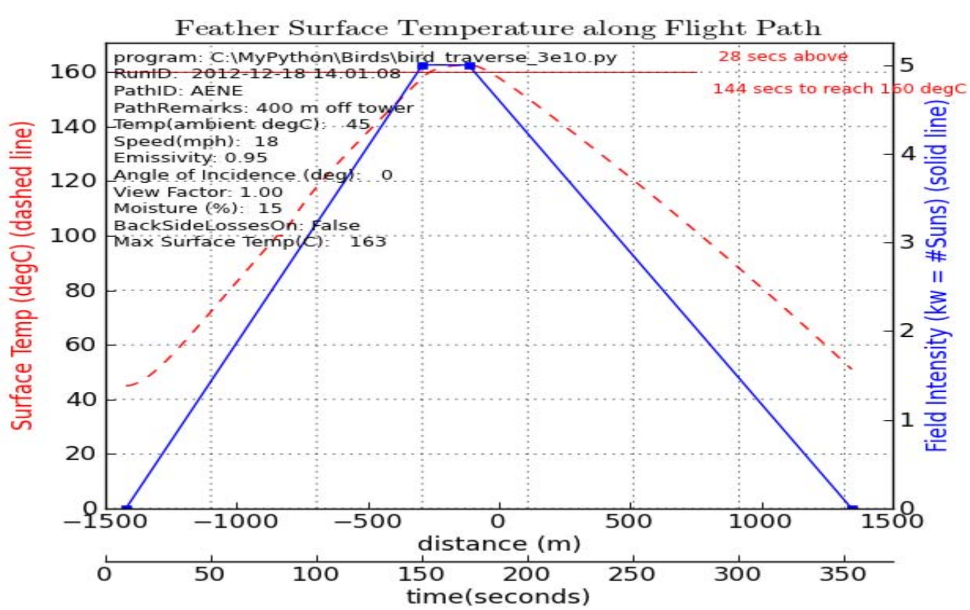


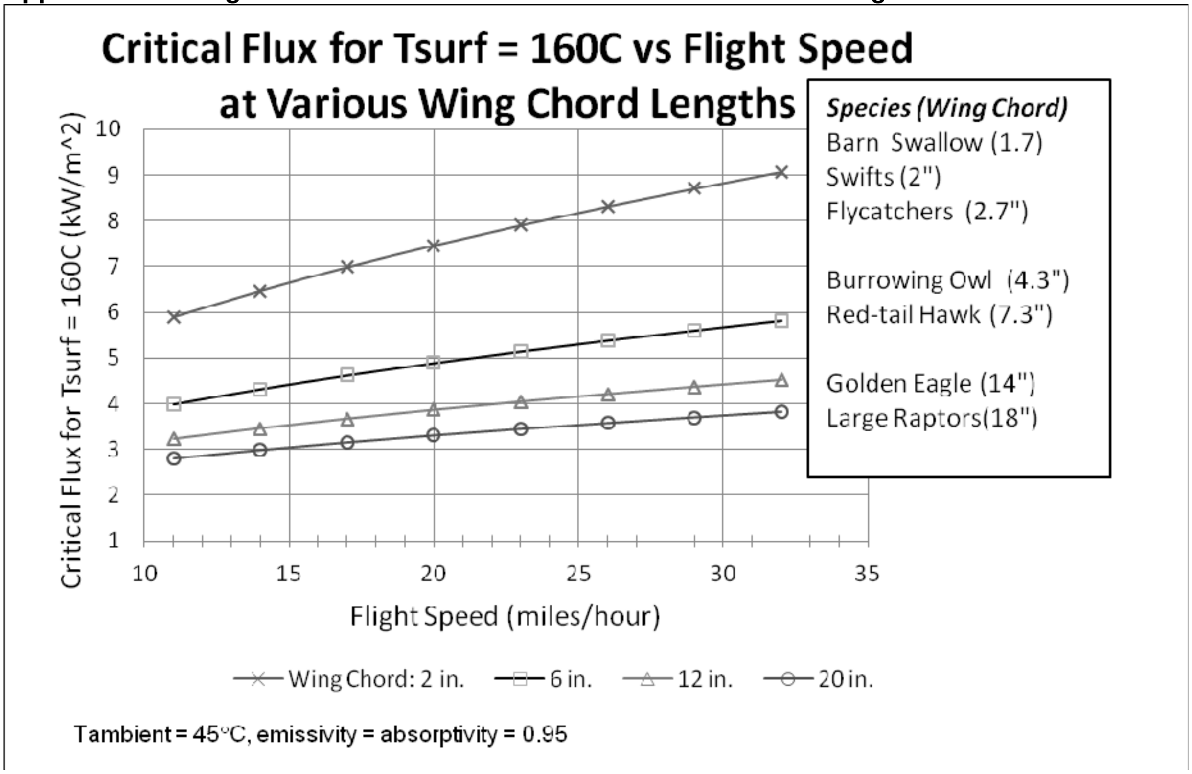
Appendix BIO1 Figure 3 Flight path is straight line tangent to circle with radius of 100 meters around tower



Appendix BIO1 Figure 4 Flight path is tangent to circle with radius of 400 meters



Appendix BIO1 Figure 5 Critical Flux Levels for Tsurf = 160°C vs Wing Chord



Appendix BIO1a provides documentation of the equations, calculations, and source codes for programs used to produce staff's results.

CHARACTERIZATION OF RISK

In flying completely across areas of the facility with flux densities above 5kW/m^2, maximum distances would be between 900 to 1000 meters. At a flight speed of 4.5 meters per second (about 10 miles per hour), the flight would take about 200 seconds and at 18 meters per second (about 40 miles per hour) it would take about 50 seconds to traverse 900 meters. During such flight, the bird would receive exposures ranging from 5 kW/m^2 up to possibly 500 kW/m^2 of varying duration depending on the flight path taken. This exposure including heat loss mechanisms and duration is integrated along the flight path to obtain a time / temperature profile. Integrating flux level and duration along the flight path provides an exposure dose.

As stated previously, when the exposure and duration are sufficient to cause the feather to reach temperatures above 160 ^{o}C, the bird would suffer some level of irreversible damage to feathers that are critical to its ability to fly. This damage can lead to secondary effects such as collision with towers, heliostats and the ground if damage is sufficient to impair normal flight, or even the ability to become and remain air-borne.

Feather damage that results in impairment of flight capability could also decrease the bird's overall probability of survival and life expectancy. For birds of prey, the ability to carry small animals that are caught could be severely compromised leading to potential malnutrition or even starvation of the bird or its young. The carrying of prey significantly increases load-carrying demands placed on the wings and critical flight feathers. For other birds, damaged feathers will impair their ability to forage or to flee predators.

In conducting any risk assessment where fatality is used as the metric to evaluate risk to an exposed population the analyst should always be cognizant that the existence of fatality implies the high likelihood of a significantly higher number of injuries (i.e. morbidity). The ratio of morbidity to mortality can range from less than 5 to one to over 100 to one for different hazards and levels of injury deemed significant. For example, for every death from an explosion, one should expect about 5 serious injuries (K.T. Bogen, E.D. Jones 2005) (Stellman 1998, Table 39.10). For hazards that result in direct trauma to the exposed receptor there is a general relationship of level of damage and level of energy or power to which the receptor is exposed (Frank P. Lees 1980). McCrary did not, nor would it have been practical, to survey a region of sufficient size surrounding the project to account for scavenging of injured birds or latent fatality offsite. Thus staff cannot, based on available data, define morbidity due to exposure to concentrated solar radiation from actual survey data. Staff believes that the hazard to birds from this facility is most analogous to explosive hazards as both have high energy or power levels at a central point with energy levels decreasing exponentially with distance radially from the center. Based on this analogy the level of seriously injured birds for every death is likely to be between 5 and 10.

Thus, the potential damage caused by avian exposure to concentrated solar flux can range from minor impairment (and potentially leading to death) to near immediate fatality depending on the dose received. Low doses of 5 kW/m^2 to 15 kW/m^2 for short exposure periods may not cause effects that are observable to the naked eye but could nonetheless result in significant flight impairment. For example if a significant portion of the feather barbules (the fragile micro structure between barbs) (See Reddy and Yang 2007) were lost the feather's structural integrity would be impaired. Because loss of barbules would significantly compromise integrity of a large portion of the feathers surface area, the differential pressure between the top and bottom of the feather necessary to produce lift and thrust (Videler 2005 Page 55) will also be compromised (Werner and Patone 1998). Such impairment could reduce the bird's level and climbing flight speeds. Longer but still short term exposures to the 10 to 25 kW/m^2 flux densities could cause nearly complete loss of barbules or even complete feather vanes on one or both sides of the rachis and result in loss of flight capability and inability to remain airborne. Staff has identified $4kW/m^2$ as a safe level for short exposures (less than 60 seconds). This level of exposure should not result in any damage to flight feathers.

Using the only available data on avian mortality, provided by (McCrary et. al. 1986), staff estimates that the proposed Hidden Hills and Rio Mesa facilities could each result in avian mortality in excess of 22 times that of the Solar One facility previously studied based on linear extrapolation from total relative mirror surface area of the two facilities. This extrapolation is based on mirror area as collision with mirrors played a major role in the total avian fatalities documented at the Solar One facility. It should be noted that the McCrary study provides no data to assess avian morbidity. It should be recognized that estimates of avian mortality that ignore excess morbidity will necessarily underestimate ultimate fatality that will be associated with that excess morbidity (i.e. latent fatality). It should also be noted that damage to flight feathers could be cumulative if flights through concentrated flux are repeated. Such factors would be expected to contribute to substantial underestimation of avian impacts.

In addition to these concerns extrapolation from a 10 MW pilot plant to a 250 MW facility with many thousands of heliostats and a much taller receiver tower “may produce non-linear increases in the rate of avian mortality when compared to Solar One…” according to McCrary. Also, the volume of the air space with solar flux densities greater than 4 kW/m^2 (i.e. the hazardous air space) would increase with increasing power output rating or solar field size, increasing the likelihood of avian exposure. The effect of a larger volume of the proposed projects would have a greater effect on bird mortality and morbidity given that exposure duration at high intensities would be much greater.

To evaluate the potential for non-linear effect of scale-up in facility size from a pilot scale to a commercial scale, staff estimated the relative volume of air space and relative dose for both a facility the size of Solar One and Hidden Hills/Rio Mesa (see **Appendix BIO1 Figures 5** and **6**) below. Staff chose a range of plausible straight-line flight paths past a Rio Mesa-like facility re-scaled to the reduced size of the Solar One heliostat field having a heliostat field of approximately one-fourth the diameter of Rio Mesa. Three paths were taken from this Solar One model: one having a closest approach distance to the tower at the radius of the 5 kW/m^2 isopleth, another at one-half of that closest approach distance, and a third at one-fourth of that closest approach distance, providing three hypothetical flight paths at distances of 120 feet, 60 feet and 30 feet from the assumed center of the receiver tower. Exposure doses were calculated using these three flight paths at Solar One. Staff then calculated the comparative doses associated with the analogous three hypothetical flight paths, again at distances of 120 feet, 60 feet and 30 feet from the center of the receiver tower at the Rio Mesa facility. **Appendix BIO1 Tables 4** and **5** below provide the results of this comparative analysis.

The volume of the flux field at the Hidden Hills / Rio Mesa size facility with concentrated flux above 5 kW/m^2 is about 20 times larger than the similar flux field volume of the Solar One size facility. The magnitude of the doses resulting from flights at the same distances from the receiver towers described above is between 5 and 6 times larger at the Rio Mesa-size than at the Solar One-sized facility. The product of increased dose and volume is about 100 times larger at Hidden Hills / Rio Mesa as compared to Solar One. This analysis confirms the validity of McCrary’s concern regarding the potential for non-linear increase in scaling of adverse effects on avian populations associated with exposure to concentrated solar flux from scale up of a small 10 MW pilot plant like Solar One to a 250 MW or greater facility like Hidden Hills / Rio Mesa.

Table 4 Comparison of Dose Resulting From Flight Paths at Equal Distance from the Center of Each Receiver Tower (view factor 1.0)

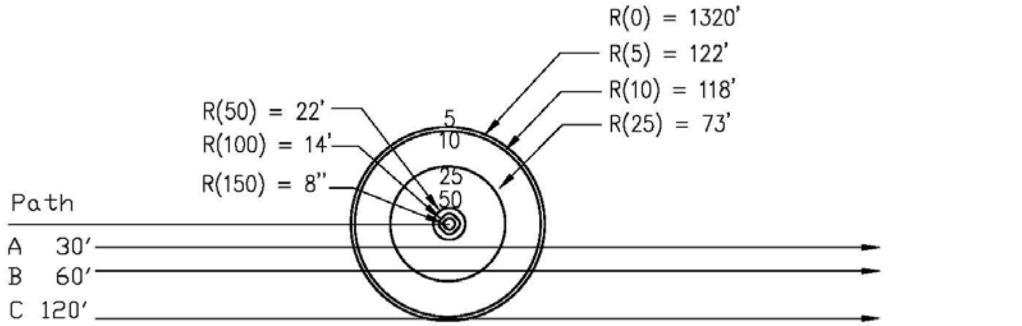
ViewFactor= 1.0 Speed = 18 mph	Path closest approach to tower (feet)	Max flux (kW/m^2)	Exposure time (secs)	Total Dose ($kW\text{-}secs/m^2$)	Dose above Threshold ($kW\text{-}secs/m^2$)
Rio Mesa	30	100	372	2000	1400
	60	50	372	1800	1200
	120	25	372	1500	900
Solar One	30	25	100	400	250
	60	25	100	370	220
	120	5	100	240	80
Solar One Standby Points[1]	NA	1500	0.3	440	440

[1.] assumes flight speed of 18mph through 8ft flight path

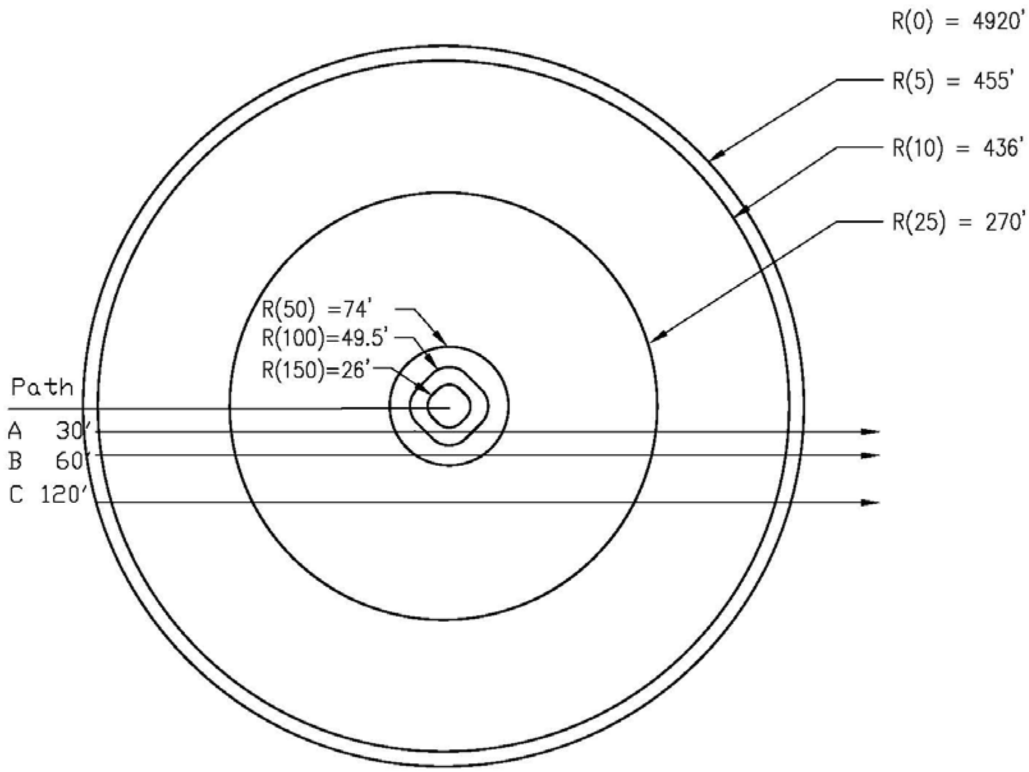
Table 5 Comparison of Dose Resulting From Flight Paths at Equal Distance from the Center of Each Receiver Tower (view factor 0.33)

View Factor=0.33 Speed = 18 mph	Path closest approach to tower (feet)	Max flux (kW/m^2)	Exposure time (secs)	Total Dose ($kW\text{-}secs/m^2$)	Dose above Threshold ($kW\text{-}secs/m^2$)
Rio Mesa	30	100	372	650	380
	60	50	372	580	300
	120	25	372	480	210
Solar One	30	25	100	130	60
	60	25	100	120	50
	120	5	100	80	0

COMPARATIVE FLIGHT PATHS FOR SOLAR ONE & RIO MESA/HIDDEN HILLS



Appendix BIO1 Figure 5 SOLAR ONE - FLUX ARRAY AT TOWER



Appendix BIO1 Figure 6 RIO MESA / HIDDEN HILLS - FLUX ARRAY AT TOWER

ANALYSIS OF UNCERTAINTY

There are significant uncertainties associated with staff's analysis of risk to avian plumage potentially resulting from exposure to concentrated solar flux. Evaluation of the relative sensitivity to various inputs to the thermodynamic equilibrium calculation indicates that the orientation of the bird in the flux field causes the greatest effect on the resultant radiant exposure. This is the result of the strong effect of the angle of incidence on effective flux density. This is reflected in the view factor of the incident rays on the surface (i.e., the angle of the rays to the object's surface). The view factor used in staff's model can vary from about 0.25 to 1 depending on the bird's orientation in the radiant field. This can result in a fourfold change in effective exposure level between level flight and flight that causes the feathers to be perpendicular to the incident solar radiation.

The choice of chord length of the potentially exposed bird wing has the next largest effect on the estimated feather surface temperature. Cord lengths for potentially exposed birds range from about 2 to about 20 inches with the longest cord lengths resulting in the most impact. Choice of chord length can change the analysis outcome by about a factor of three.

The choice of flight speed of the bird is also an important variable in estimation of the resultant surface temperature reached. A decrease in flight speed from 40 miles per hour to 20 miles per hour would increase resultant relative surface temperature rise by about 50 percent. This is the result of decreased convective heat transfer from the feather surface to the ambient air at lower flight speeds.

The emissivity (the fraction of the incident radiation that is absorbed or not reflected from the surface) of the feather would also affect the resultant temperature. However, staff used an emissivity of 0.95 as a plausible worst case eliminating the potential variability associated with differences in emissivity of different feathers. It should also be noted that the micro structure of the feathers may allow radiant energy to penetrate deeply into the feather below the boundary of the outer surface. For example the radiant energy could first contact the barbules that are well within the feather. This could substantially reduce the effect of convection and substantially increase the rate of temperature rise on these surfaces. If this does in fact occur, staff's analysis could substantially underestimate the effect of flight feather damage associated with exposure to concentrated flux.

It is also conceivable that conduction of heat down the quill of the feather could result in damage to the follicle resulting in complete loss of the feather and loss of ability to re-grow a new feather during subsequent molting cycles.

Another uncertainty is the effect of exposure of the feather surface to UV radiation with concurrent exposure to high temperatures. Staff was not able to include the potential effect of increased keratin molecular bond scission that could be associated with concurrent exposures. Such exposure could result in adverse effects on keratin integrity at lower surface temperatures than would otherwise be required, accelerating the rate of damage.

Exposure to summer ambient conditions mid-day results in exposure to solar flux of 1 kW/m^2, and is thus the base line beyond which excess damage can occur. Preexisting exposure of 1 kW/m^2 with or without the existence of the proposed facilities places a lower limit on exposure. An exposure to 5 kW/m^2 is the lowest exposure that results in a surface temperature of 160 ^oC which can be considered a lowest observed adverse effect level (LOAEL). Use of an uncertainty factor greater than 5 and a LOAEL of 5 kW/m^2 would render the exposure criteria moot as it would require exposure to remain below the preexisting background of $1kW/m^2$. Exposures below 4 kW/m^2 did not result in surface temperatures of above 160^o C and can be considered a NOAEL. Use of an uncertainty factor of 2 and a LOAEL of 5 kW/m^2 results in an estimated safe exposure level of 2.5 kW/m^2. Based on this analysis, staff estimates that a one-time exposure to a solar flux density between 2.5 kW/m^2 and 4 kW/m^2, for a duration not exceeding 1 minute or so, would cause little if any damage to flight feathers and can be considered safe.

CONCLUSIONS

Staff's analysis of avian exposure to concentrated solar radiation indicates that a threshold of safe exposure does not exist above a solar flux density of about 4 kW/m^2. The analysis also indicates that both the Hidden Hills and Rio Mesa facilities pose potentially significant risk to avian populations that may encounter the air space in the facilities where concentrated flux density is above staff's estimated safe levels, resulting in avian morbidity and mortality. The available data regarding avian impacts is very limited; however, such data does provide at least some perspective regarding potential for impact.

There are significant questions regarding extrapolation from the available information regarding avian impacts. The most vexing is the complete absence of data that would allow estimation of avian morbidity (i.e. reliable dose response data). Staff's assessment provides estimates of exposure and dose that can lead to injury and late fatality. In addition, there are major unknowns in estimation of differences in avian populations from one site to the next. These limitations in the available data require exercise of considerable judgment in extrapolation of data from one site to another. However, the errors introduced by the lack of site specific data are likely to be small in comparison to the absence of morbidity estimates and effects of dramatically increased potential exposure duration resulting from the increased volume of the air space affected by concentrated solar flux of the proposed project.

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APPENDIX BIO1a - PROCEDURAL MODEL AND CALCULATIONS USED TO ESTIMATE AVIAN EXPOSURE TO CONCENTRATED SOLAR RADIATION

Geoff Lesh, P.E. and Rick Tyler

FOR HIDDEN HILLS BIOLOGY RESOURCES APPENDIX BIO1

INTRODUCTION

A surface exposed to and thus absorbing incident concentrated solar flux will convert the absorbed flux to heat and rise in temperature until it reaches a thermal equilibrium with its surroundings, including the incident flux. The heat loss mechanisms of convection and radiation will increase their rate of removing heat from the surface until they together match the rate of incoming heat from the incoming solar flux, then the temperature will stabilize. The stable temperature at which this thermal equilibrium occurs is determined by the level of incoming solar flux and parameters that affect the loss mechanisms such as flight speed, ambient temperature, and the view factor. Thus it is possible to, within a reasonable degree of accuracy (with some dependence on materials and circumstances), to relate an incoming solar flux level to the steady-state temperature to which a material surface may rise.

To determine this relationship between solar flux and temperature, staff modeled the temperature response of exposed feather surfaces to concentrated solar flux using a dynamic iterative method that allows for the examination of the various mechanisms of cooling that begin to operate when the material is heated. This method allows for the variation of material properties and allows examination of changing external conditions (e.g. flux levels with position). Transient responses of the material being heated (i.e. the time needed for the material to respond to those changes of external conditions) can also be examined to see how quickly the surface temperature rises and falls.

The surface temperature model is driven by the incoming thermal radiation (flux) to the surface. The absorbed flux causes the absorbing material (the feather in this case) to rise in temperature. The rising temperature causes the material to heat to a temperature above its surroundings, and so the material starts to lose heat back to its surroundings through convection and re-radiation. These three mechanisms are well understood and characterized and can be found in nearly any college level textbook on heat transfer and fluid mechanics (Holman 1976) (Incropera 2007) (Cengel 2007) (MERM 2001).

The model assumes that the material being heated maintains its integrity throughout the modeled flight path regardless of temperatures predicted so that potential temperature rise and response to changing input flux can be observed. The observation of steady-state as well as transient responses help to verify that the model is responding according to well established and verified expected thermal behaviors.

In the real world, most organic materials will begin to decompose (pyrolize) at some elevated temperature (about 160 °C for keratin, the material of feathers), and the material's properties (mass, thickness, stiffness, composition, toughness, brittleness, density, dimensions, etc.) will begin to change. Shrinkage and melting of filamentary structures is expected to occur by approximately 300 °C. Upon reaching a temperature of 400 °C the remaining material would be mostly carbon and have little if any remaining structural integrity. Therefore, for the purpose of risk assessment to evaluate potential damage to feathers, accurately predicting temperatures very much over 300 ^{o}C is not meaningful. By then the keratin will have pyrolized and out-gassed most of its volatile components leaving behind a mostly carbonaceous material. For more information and references on this see **APPENDIX BIO1**. References listed throughout this document refer to the list of references published at the end of **APPENDIX BIO1.**

The following is an outline of the logical steps through which the computerized model proceeds to predict the temperature response of a feather-covered surface (i.e. bird's wing) as it flies along some chosen path above and across a solar concentrated flux field. Some assumptions regarding the material properties and the actual scenario must be made, and attempts have been made to choose reasonable and realistic values and cases for use in conducting a risk assessment of avian exposure to concentrated flux.

OUTLINE OF STEPS FOLLOWED IN BIRD FLIGHT MODEL (WITH REFERENCES WHERE APPLICABLE)

1) Set path conditions

   a) Pick a straight-line path through the applicant-provided flux map (provided in **Response to Data Request, Set 2A, #159**). Note: The diagram used for cross-field paths and to get location and flux density values along that path is included in the top half of the applicant's Figure 3, page 9 of the data response. Most paths were directed northeast, passing at some selected distance of nearest approach to the tower on its northwest side.

   b) Measure the distances to each of the flux contours across the heliostat field

      i) Assume flux = 0 at edge of field, linearly interpolated elsewhere between flux levels indicated on the diagram. (Note: Where paths penetrated inside an indicated contour, but did not penetrate the next higher contour before passing the tower, flux levels were not taken to increase beyond the last penetrated contour. This assumption would tend to underestimate the actual maximum flux level along the path.)

      ii) Make a linear interpolation table of distance and path / flux level. This table is comprised of two vectors (nSunsVect and distData) included for each path shown in the **pathData()** section of the computer program code. The paths modeled are mostly straight lines crossing the solar field coming within some selected nearest approach distance to the solar receiver tower. One reported path involves a short path upward from the ground near the tower at an angle of approximately 45 degrees, to simulate a bird leaving the ground, and flying up through the flux pattern to a level above the tower.

2) Set environmental and flight conditions

a) Ambient temperature Tambient = 45°C (113 °F). This is a temperature that is near the expected maximum, but which would still be expected to occur several times during the summer months. Ultimately, a shift in the assumed ambient temperature affects the flux-exposed equilibrium temperature by an amount similar to the temperature shift for temperature of interest (less than 300 °C). Thus, an ambient temperature shift of 4 °C, would affect the flux level to reach 160 °C on a surface by about 0.2 kW/m^2.

b) Flight speed V = 18 mph is used in the risk assessment. This is a speed, within the lower-middle range of speeds (Alerstam 2007) that would be expected of birds at these solar sites.

c) Angle of incidence of flux to feather surface (angle from perpendicular incidence) "offVert". Values used were (a) 71 degrees as a likely angle to the underside of a horizontal surface (e.g. bird wing) estimated from applicants flux maps, and (b) 0 degrees as there would always be some portion of the surface of any three-dimensional object (e.g. bird) exposed to the flux at this angle. The term "view factor" is equal to the trigonometric cosine of the incidence angle, (i.e. cosine (offVert angle)) is used to indicate the heating "effectiveness" of incident flux on a surface.

d) Wing chord length (distance from leading to trailing edge of a wing) "L" (6 inches was chosen as representative), is a factor used in determination of the fluid mechanics-related Reynolds number, and thus is a factor in whether airflow over the wing surface is laminar or turbulent, which in turn affects rate of convective cooling of the surface. The L = 6" assumption yields a Reynolds number of approximately 70,000, well within the range spanning bird flight (Videler 2005, p. 17). With the commonly used for air flow over a wing "external flow over a flat plate" analogy model (Ward 1999), the resulting Reynolds number for the underside of the wing remains well below the accepted critical value of 500,000 where air flow would be expected to become turbulent. For all considered cases of bird flight, the air flow passing the underside of the wing is considered to be laminar (Withers 1981). This choice drives the equations used for determining the appropriate convective heat transfer coefficient (Holman 1976) (Incropera 2007) (Cengel 2007) (MERM 2001).

3) Assume feather's physical properties

a) Thickness = 600 microns (assumed)

b) Optical emissivity = 0.95 (assumes a dark colored bird) (Ward 1999) Staff assumes for this risk assessment that the absorbance coefficient for solar flux will be the same as the emissivity of the surface for re-radiation of infrared radiation. This assumption is based on reported data on values reported for black plumage, the effects of dirt on surfaces, and the properties of the feathers structure (Quintiere 1974, Osorio 2002, Bass 1995).

c) Optical transmissivity = 0 (assumes incident flux does not pass through without being blocked and absorbed)

d) Optical absorption depth = 0.5 (Assume incident flux is absorbed in first half of thickness)

e) Mass density of solid keratin = 1.3e3 kg/m^3 Ref: (Munn 2009)

f) Void density (to account for the open keratin structure of feathers) (assumed to be 50% of volume). Note that the density characteristics affect transient effects (the timing) of the heating effects, but not the steady-state temperatures used for this risk assessment.

g) Mass density per unit area of plumage = half that of solid keratin to account for void volume of feather structure (See note above on effect of void density).

h) Thermal conductivity of keratin = 0.05 W/m-K Ref: (Dawson 1999), (Baxter 1946),(Martinez 2012)

i) Thermal conductivity of plumage = 0.074 W/m-K Ref: (Walsberg 1988)

j) Moisture level delays heating by adding water mass to the plumage that must be heated to 100 °C. Heating beyond 100 °C, is further delayed as the water consumes and carries away heat during its evaporation. This effect is minor (on the order of 2-3 seconds) for the flight paths modeled.

4) Set initial conditions:

a) Tsurf = Tambient (Assume initial surface temperature is at the ambient air temperature.)

b) Qin = 0 (Solar radiation arriving at the top of the wing surface directly from the sun, is not considered in this analysis).

c) t = 0

5) Start clock (intervals of dt). Repeat the following steps for each clock tick interval, until all way across the heliostat field. Output and graph are stored in viewable files. See Hidden Hills **Appendix BIO1 Figures 1** thorough **4** and **Appendix BIO1 Tables 2** and **5** for examples:

a) Calculate new time (t) from clock ticks by adding dt (the time interval)

b) Calculate position along path
X = V * t where t = elapsed time, V = flight speed

c) Calculate flux Level from position by interpolation between flux contours (from applicant)

d) Calculate solar energy received in from Flux Level, emissivity, view factor, transmissivity
Qin = 1000 * (SunsIn+1) * emissivity * viewFactor * (1 - transmissivity)
Ref: MERM 2001, p. 37-2, eqtn. 37.8

e) Calculate hot-side convective energy losses
   Qv = h * (Tsurf - Tambient)   Ref: MERM 2001, p. 36-3, eqtn. 36.14

f) Calculate hot-side re-radiative losses energy losses
   Qrad = SBsigma * emissivity * ($Tsurf^4$ - $Tambient^4$)   Ref: MERM 2001 p. 37-4, eqtn 37.14

g) If backside of plumage is uncovered (i.e. feather is solely protruding without being covered on front or back side by either plumage or flesh), calculate conductive-convective combination losses as:

   Qcomb = (Tsurf-Tamb) / (thkPlumage * (1-abDepth) / kPlumage + 1/h) going through the feather with heat going out to the air flowing over the backside of the feather (Holman 1976 p. 29); (this option not used for the conservative general case of this analysis) if backside of feather is covered by other feathers or the bird's body, set Qcomb = 0. (option used in this analysis)

h) Calculate energy change during interval as Qnet = Qin – Qv – Qcomb – Qrad

i) Calculate change in surface temperature during interval
   dT = Qnet * dt / (CpPlumage * mDryfeather + CpWater * mWater)
   ref: MERM 2001, p. 34.15

   Note: Possible moisture in the feather is accounted for by making the incoming flux warm its mass as well as the feather's, until 100 °C. At 100 °C, temperature rise is stalled until the water has been vaporized from the liquid state, then is assumed to be released to the atmosphere. A moisture level of constituting 15 percent of the mass of the dry feather is assumed.

j) Calculate new surface temperature Tsurf = Tsurf + dT

k) Repeat the loop until path has traversed the solar field.

BIRD FLIGHT MODEL MATERIAL PROPERTIES ASSUMPTIONS WITH REFERENCES

FOR HIDDEN HILLS BIOLOGY RESOURCES APPENDIX BIO1

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Selected code extractions showing values used, and source references

```
# bird plumage characteristics

    Tskin = 41                    #  degC assumed body temperature of bird

    transmissivity = 0.0          # of bird plumage

    emissivity = 0.95             # of bird feather  ref: Ward 1999, Wolf 2000

    kPlumage = .074               #  W/m-K plumage thermal conductivity   ref: Walsberg 1988

    rhoPlumage = 1.3e3 *.5        #  density in kg/m^3 (keratin density is assumed halved by void
                                                         density)
```

```
    thkPlumage =    60e-5         #  meters

    CpPlumage =     1.53e3        #  J/kg-K

    abDepth = .5                  # fraction of plumage thickness that
                                     absorbs the Qin flux

    Tsurf =  Tamb                 # start here for initial temp

    mDryFeather = rhoPlumage * thkPlumage   # feather mass in kg/m^2

    mWater = waterFraction * mDryFeather    # water mass per unit area
                                             (kg/m^2 )  adds mass to feathers

    m = mDryFeather + mWater      #water absorbs heat until 100C

    #initialized constants and parameters

    viewFactor = math.cos(offVert * math.pi/180.)

    L = L / 39.4        # Convert from inches to meters

    Pr = 0.705          # Prantl number (dimensionless) air       ref: MERM App 35.D

    V =  Vmph / 2.237   # convert flight speed from mph to meters/sec

    airVis = 1.78e-5    # air kinematic viscosity at 49°C         ref: MERM App 35.D

    kAir = .028         # air thermal conductivity W/(m-degK)     ref: MERM App 35.D

    Qthresh = 4000.     # in watts/m^2 (staff-determined)

    Reynolds = V * L / airVis     # Ref: MERM 2001, p. 36-4 eq. 36.18

    Nu = 0.664 * Reynolds**0.5 * Pr**(.33333333)    #Nusselt number  Ref: MERM 2001, p. 36-4 eq.
36.18

    h = kAir * Nu / L             # convective heat transfer coeff   Ref: MERM 2001, p. 36-3
eq.36.14

    SBSigma = 5.6704e-8           #  W/(m^2 * K^4) Stephan-Boltzman constant Ref: MERM 2001, p.
37-2
```

The following source code listing contains the computer model used for the risk assessment. It is written in the Python Open Source Programming Language, Version 2.7.2. An interpreter for executing the code is available at http://www.python.org/ . This program code was designed and written by staff for this particular project-specific risk assessment, and should not be considered a general purpose heat transfer modeling code. Lines and portions of lines that begin with a '#' mark are comment lines for use in understanding the code. The code is included here for completeness in discussing staff's analytical method and assumptions. No user manual has been written.

Printed in mono-spaced font for readability of computer code.

Source Code

```
# heat rise of bird surface temperature
# bird_traverse_3e10.py  10/28/2012  Geoff Lesh
# added: option for backside losses
def pathData():

    global distVect, nSunsVect, towerLocation, waterFraction, offVert, runID, emissivity,Tamb, ,\
```

```
        pathID, pathRemarks

    #findPathID = 'modelRMOff30'
    #findPathID = 'modelRMOff120'
#

    ##if findPathID == 'modelRMOff30':
    #scale =  12/39.4  #meters real world per feet scale
    #pathID = 'modelRMOff30'
    #pathRemarks = 'Modeled RM Off Tower 30 ft'
    #towerDist = 0
    #nSunsVect = (0,   5,      10,     25,     50,     100,100,50,25,10,5,0)
    #distData=   [ -4920,-454,-435,-268,-68,-39,     39,68,268,435,454,4920] # units in feet



    ##if findPathID == 'modelRMOff60':
    #scale =  12/39.4  #meters real world per feet scale
    #pathID = 'modelRMOff60'
    #pathRemarks = 'Modeled RM Off Tower 60 ft'
    #towerDist = 0
    #nSunsVect = (0, 5, 10, 25, 50, 50, 25, 10, 5, 0)
    #distData=   [ -4920,-451,-432,-263,-43,43,263,432,451,4920] # units in feet


    ##if findPathID == 'modelRMOff120':
    #scale =  12/39.4  #meters real world per feet scale
    #pathID = 'modelRMOff120'
    #pathRemarks = 'Modeled RM Off Tower 120 ft'
    #towerDist = 0
    #nSunsVect = (0,   5,      10,     25,     25,10,5,0)
    #distData=   [ -4919,-439,-419,-242,242,419,439,4919] # units in feet


    ##if findPathID == 'modelS1Off30':
    #scale =  12/39.4  #meters real world per feet scale
    #pathID = 'modelS1Off30'
    #pathRemarks = 'Modeled S1 Off Tower 30 ft'
    #towerDist = 0
    #nSunsVect = (0,   5,      10,     25,     25,10,5,0)
    #distData=   [ -1320,-118,-114,-67,67,114,118,1320] # units in feet

    ##if findPathID == 'modelS1Off60':
     #scale =  12/39.4  #meters real world per feet scale
     #pathID = 'modelS1Off60'
     #pathRemarks = 'Modeled S1 Off Tower 60 ft'
     #towerDist = 0
     #nSunsVect = (0,  5,      10,     25,     25,10,5,0)
     #distData=   [ -1319,-106,-102,-42,42,102,106,1319] # units in feet

    ##if findPathID == 'modelS1Off120':
    #scale =  12/39.4  #meters real world per feet scale
    #pathID = 'modelS1Off120'
    #pathRemarks = 'Modeled S1 Off Tower 120 ft'
    #towerDist = 0
    #nSunsVect = (0.,  5.,     5.,0.)
    #distData=   [ -1315,-22,22,1315] # units in feet

    #scale=1500./7.7   # meters real world per cm on scale This is general scale for path not
having their own scale

    ###flying upward  Note: this path has its own scale!
    #scale=300 / 16.7  #meters Real world per cm on map: map data is in same cm.
    #pathID =  'DAUP'
    #pathRemarks = 'Upward past tower from ground'
```

```
    #towerDist = 13.15
    #nSunsVect = (0,5,10,25,50,50,25,10,5,0)
    #distData=   [0,10.8,11.1,11.6,12.3,14,14.4,15.5,15.9,20]  #cm of scale #

    #pathID = 'Constant 1KW'
        #scale=1500./7.7   # meters real world per cm on scale This is general scale for path not
having their own scale
    #pathRemarks = 'Constant 1KW'
    #towerDist = 24.3
    #nSunsVect = (0,1,1,0)
    #distData=   [16.95,17.0, 31.2, 31.25]  #cm of scale #

    #pathID = 'Constant 5KW'
    #pathRemarks = 'Constant 5KW'
    #scale=1500./7.7   # meters real world per cm on scale This is general scale for path not
having their own scale
    #towerDist = 24.3
    #nSunsVect = (0,5,5,0)
    #distData=   [16.95,17.0, 31.2, 31.25]  #cm of scale #

    #pathID = 'Constant 8KW'
    #pathRemarks = 'Constant 8KW'
    #scale=1500./7.7   # meters real world per cm on scale This is general scale for path not
having their own scale
    #towerDist = 24.3
    #nSunsVect = (0,8,8,0)
    #distData=   [16.95,17.0, 31.2, 31.25]  #cm of scale #


    #pathID = 'Constant 10KW'
    #pathRemarks = 'Constant 10KW'
    #scale=1500./7.7   # meters real world per cm on scale This is general scale for path not
having their own scale
    #towerDist = 24.3
    #nSunsVect = (0,10,10,0)
    #distData=   [16.95,17.0, 31.2, 31.25]  #cm of scale #


    #pathID = 'Constant 25W'
    #pathRemarks = 'Constant 25KW'
    #scale=1500./7.7   # meters real world per cm on scale This is general scale for path not
having their own scale
    #towerDist = 24.3
    #nSunsVect = (0,25,25,0)
    #distData=   [16.95,17.0, 31.2, 31.25]  #cm of scale #

    #pathID = 'Constant 50KW'
    #pathRemarks = 'Constant 50KW'
    #scale=1500./7.7   # meters real world per cm on scale This is general scale for path not
having their own scale
    #towerDist = 24.3
    #nSunsVect = (0,50,50,0)
    #distData=   [16.95,17.0, 31.2, 31.25]  #cm of scale #

    #pathID = 'Constant 100KW'
    #pathRemarks = 'Constant 100KW'
    #scale=1500./7.7   # meters real world per cm on scale This is general scale for path not
having their own scale
    #towerDist = 24.3
    #nSunsVect = (0,100,100,0)
    #distData=   [16.95,17.0, 31.2, 31.25]  #cm of scale #

    #pathID = 'Constant 150KW'
    #pathRemarks = 'Constant 150KW'
```

```
    #scale=1500./7.7   # meters real world per cm on scale This is general scale for path not
having their own scale
    #towerDist = 24.3
    #nSunsVect = (0,150,150,0)
    #distData=   [16.95,17.0, 31.2, 31.25]  #cm of scale #


    #pathID = 'AASE'
    #scale=1500./7.7   # meters real world per cm on scale
    #pathRemarks = 'closest pass to tower'
    #towerDist = 21.55
    #distData=   [15.3, 19.4, 20.2, 20.4, 21.2, 21.25, 21.3, 21.65, 21.75, 21.85, 21.95, 22.9,
24.5, 29.5]  #cm of scale # path A1 next to tower
    #nSunsVect = (0,5,10,25,50,100,150,150,100,50,25,10,5,0)
# path A1 next to tower

    #pathID = 'ABNE'
    #pathRemarks = '100 m off tower (tangent)'
    #scale=1500./7.7   # meters real world per cm on scale This is general scale for path not
having their own scale
    #towerDist = 20.0
    #nSunsVect = (0,5,10,25,25,10,5,0)                                            # path ABNE 100
m off tower
    #distData=   [11.7, 17.7, 18.5, 19.0, 21.2, 21.7, 22.5, 31.0]  #cm of scale #        path
ABNE 100 m off tower

    pathID = 'ACNE' #
    pathRemarks = '200 m off tower'
    scale=1500./7.7   # meters real world per cm on scale This is general scale for path not
having their own scale
    towerDist = 20.1
    nSunsVect = (0,5,10,10,5,0)                                       # path acNE 200 m off tower
    distData=   [12.2,18.2,19.4,19.7,22.7,29.9]  #cm of scale #        path acNE 200 m off tower

    #pathID = 'ADNE'
    #pathRemarks = '300 m off tower'
    #scale=1500./7.7   # meters real world per cm on scale This is general scale for path not
having their own scale
    #towerDist = 21.0
    #nSunsVect = (0,5,10,10,5,0)                                       # path ADNE 300 m off
tower
    #distData=   [13.7,19.3,22.3,23.,23.5,31.0]  #cm of scale #        path ADNE 300 m off tower

    #pathID = 'AENE'
    #pathRemarks = '400 m off tower'
    #scale=1500./7.7   # meters real world per cm on scale This is general scale for path not
having their own scale
    #towerDist = 24.3
    #nSunsVect = (0,5,5,0)                                       # path AENE 400 m off tower
    #distData=   [17., 22.8, 23.7, 31.2]  #cm of scale #        path AENE 400 m off tower

    if 1:
        distOffSet=distData[0]   # gets subtracted from initial and all values of distData
        towerLocation= (towerDist - distOffSet) * scale
        checkdata = len(distData)== len(nSunsVect)
        print 'Checkdata:  %s'%checkdata
        if not checkdata:
            print 'distData size: %s'%len(distData)
            print 'nSunsVect size: %s'%len(nSunsVect)
            raise Exception( 'Data vector lengths do not match.  Quitting. See output file.'  )
            #sys.exit()
        else:
            for i in zip(distData,nSunsVect):
                print i
            distVect  = tuple( scale * (i - distOffSet) for i in distData)  # in meters
```

```
            #distVect = tuple( scale * (i - towerDist) for i in distData)   # in meters centered
at tower

def userData():
    global Tamb, Tskin, dt, emissivity, offVert, L, V, nSteps, waterFraction,
maxDistance,waterFraction, offVert, RunID, emissivity,Tamb, V ,\
           pathID, Vmph, maxTime, transmissivity,backSideLossesOn
    nSteps= 44000
    dt = .01              # seconds, recheck frequency = clock tick
    Tamb = 49.            # degC
    waterFraction = .15   # mass of water

    offVert = 0.          # degrees  angle of incidence  Usually 0 or 71
    L = 6.                # inches wing length front to back
    Vmph = 18.            # mph bird flight speed
    maxDistance = 3000    # meters
    maxTime =  800        # seconds
    backSideLossesOn = False  # True turns on heatloss through backside as Qcomb + QradBackside

def setConstants():  # initialize

    #initialize   constants  and data vectors
    viewFactor = math.cos(offVert * math.pi/180.)
    L = L / 39.4        # Convert from inches to meters
    Pr = 0.705          # Prandtl number for air (dimensionless)
    heatVapWater = 2257 # kJ/kg Heat of vaporization of water
    V =  Vmph / 2.237   # convert from mph to meters/sec
    airVis = 1.78e-5    # Air kinematic viscosity (m^2/s)
    kAir = .028         # air thermal conductivity (W/(m-degK))
    Qthresh = 4000.     # watts/m^2
    Reynolds = V * L / airVis     # Reynolds number  (dimensionless)
    Nu = 0.664 * Reynolds**0.5 * Pr**(.33333333)    #Nusselt number (dimensionless)
    h = kAir * Nu / L             # convective heat transfer coeff (W/m^2 - K)
    SBSigma = 5.6704e-8           # Stephan-Boltzman constant (W/(m^2-K^4))
    CpWater = 4.1813e3            # heat capacity of liquid water (J/kg-K)
    HvWater = 2257e3              # entalpy of vaporization for water (J/kg)

    # bird plumage characteristics
    Tskin = 41                    #  bird body temperature degC
    transmissivity = 0.0          #  of bird feather (dimensionless)
    emissivity = 0.95             #  of bird feather (dimensionless)
    kPlumage = .074               #  (W/m-K) plumage thermal conductivity
    rhoPlumage = 1.3e3 *.5        #  density in kg/m^3
    thkPlumage =    60e-5         #  meters          ref:
    CpPlumage =     1.53e3        #  J/kg-K          ref:
    abDepth = .5                  # fraction of plumage thickness absorbing the flux (assumed)
    Tsurf =  Tamb                 # start here for initial temp
    mDryFeather = rhoPlumage * thkPlumage   # feather mass in kg/m^2
    mWater = waterFraction * mDryFeather    # water mass per unit area (kg/m^2 )adds mass to
plumage


        t=0               # initialize start time
        timeTo160 = -99
        timeAbove160 = 0
        timeTo300 = -99
        timeAbove300 = 0
        #maxTsurf = 0
        lHit160 =  False
        lHit300 = False
        if mWater > 0:
            lFeatherIsDry = False
        else:
            lFeatherIsDry = True
        doseTotal = 0
```

```
        doseBefore160 = 0
        doseAbove160 = 0
        doseAbove300 = 0
        doseAboveThresh = 0

def qDotIn(d):
    global i, distVect, nSunsVect
    intensity = np.interp(d,distVect,nSunsVect)
    return intensity

def mainLoop():
    # input data
    ## could add 1 sun to backside then add convection and conduction

    for i in range(1,nSteps):  # i is clock ticks
        t = i*dt   #new time
        d = t*V    #new distance


        Qrad = SBSigma * emissivity * ((Tsurf+273)**4 - (Tamb+273)**4)# (Watts/m^2)re-Rad of
                                                                        energy absorption

        Qv =   h * (Tsurf - Tamb)                    # 'Front' surface convection in Watts/m^2
        #Qc =   kPlumage * (Tsurf - Tskin)           # in Watts conduction to body (not used with
                                                       Qcomb)

        if backSideLossesOn:
            Qin = 1000 * (SunsIn+1) * emissivity * viewFactor * (1 - transmissivity) # in Watts
            Qcomb = (Tsurf-Tamb) / (thkPlumage * (1-abDepth)/kPlumage + 1/h) # combined
'backside' conduction + convection in Watts/m^2
            Tbackside = Qcomb/h + Tamb # temperature of back side of feather
            QradBackSide = SBSigma * emissivity * ((Tbackside + 273)**4 - (Tamb + 273)**4)  # in
Watts/m^2  Rad of energy absorption
            Qnet = Qin - Qv  - Qrad - Qcomb - QradBackSide                                 # net
heat gain during clock tick (W/m^2)

        elif not backSideLossesOn:
            Qin = 1000 * SunsIn * emissivity * viewFactor * (1 - transmissivity)           # in
Watts
            Qnet = Qin - Qv - Qrad                                                         # net
heat gain during clock tick (W/m^2)
            Tbackside = Tsurf
            Qcomb = 0

        if Tsurf >= 100. and not lFeatherIsDry:    #evaporate any remaining water and subtract
its mass
            dmWater = Qnet / HvWater               # potential water that could be evaporated off
            if dmWater <= mWater:                  # all remaining heat to be used to remove
water so temp won't rise (i.e. too much water)
                Qnet -= dmWater * HvWater          #Qnet is zeroed
                mWater -= dmWater                  # adjust for water removed

            else:
                Qnet -= mWater * HvWater           # remaining water is evaporated with energy
left over (limited to mWater not dmWater)
                mWater = 0
                lFeatherIsDry = True               # feather is now dry

        dTemp = Qnet * dt / ( CpPlumage * mDryFeather* abDepth + CpWater * mWater * abDepth )
#change in temp of feather surface (front side) during clock tick (assumes all mass participates)
            #fixme

        Tsurf += dTemp  #new temp

        doseTotal += Qin * dt
```

```
        if Tsurf > 160:
            doseAbove160 += Qin * dt
        if Tsurf > 300:
            doseAbove300 += Qin * dt
        if Qin > Qthresh:
            doseAboveThresh += Qin * dt

        #t +=  dt  #new time
        tSecsVect.append(t)
        TsurfVect.append(Tsurf)
        pathDistVect.append(d)
        IntensityVect.append(SunsIn)


        if lHit160 and Tsurf >= 160:
            timeAbove160 +=dt

        if lHit300 and Tsurf >= 300:
            timeAbove300 +=dt


        if Tsurf>=160 and not lHit160:
            lHit160=True
            timeTo160 = t

        if not lHit160:
            doseBefore160 += Qin * dt

        if Tsurf >= 300 and not lHit300:
            lHit300 = True
            timeTo300 = t


        print '%6.1f  , %6.1f,    %6.1f,   %9.1f,   %9.1f,  %9.1f, %9.1f, %9.1f, %9.1f, %9.1f'\
              %(t, d, SunsIn, Tsurf, Tbackside, Qin, Qnet, Qv, Qcomb, Qrad)

    maxSurfTemp =  max(TsurfVect)
    textLines=[]
    textLines.append(['RunID: %s'%runID])
    textLines.append(['PathID: %s'%pathID])
    textLines.append(['PathRemarks: %s'%pathRemarks])
    textLines.append(['Temp(ambient degC): %4.0f'%Tamb])
    textLines.append(['Speed(mph): %3.0f'%Vmph])
    textLines.append(['Emissivity: %4.2f'%emissivity])
    textLines.append(['Angle of Incidence (deg): %3.0f'%offVert])
    textLines.append(['View Factor: %4.2f'%viewFactor])
    textLines.append(['Moisture (%%): %3.0f'%(waterFraction * 100)])

    textLines.append(['PlumageThk (mils): %8.1f'%(thkPlumage * 39400)])  #converting from meters
to mils
    textLines.append(['BackSideLossesOn: %s'%(backSideLossesOn)])  #converting from meters to
mils
    textLines.append(['Max Surface Temp(C): %5.0f'% maxSurfTemp])

    print
    for  line in textLines: #
        print line[0]

    print
    print    'Time to  Time above  Time to  Time above (secs)'
    print    '   160C        160C     300C        300C'
    print    ' %5.0f       %5.0f    %5.0f       %5.0f'%(timeTo160, timeAbove160, timeTo300,
timeAbove300)
    print
```

```
    print 'h (convection coeff)(W/m^2-K): %7.1f'%h
    print 'Reynolds number:              %9.1f'%(Reynolds)
    print 'Max Surface Temp reached:         %5.0f'% maxSurfTemp
    print 'Flight Speed (ft/min):          %7.1f (%7.1f mph)'% (Vmph*5280/60., Vmph)
    print 'Total flight time (secs):       %7.0f'%(t)
    print 'Dose_total (kW-secs/m^2):       %7.1f'% (doseTotal/60000.*60)
    print 'DoseBefore160 (kW-secs/m^2):    %7.1f'% (doseBefore160/60000.*60)
    print 'DoseAbove160 (kW-secs/m^2):     %7.1f'% (doseAbove160/60000.*60)
    print 'DoseAbove300 (kW-secs/m^2):     %7.1f'% (doseAbove300/60000.*60)
    print 'DoseAboveThresh (kW-secs/m^2):  %7.1f'% (doseAboveThresh/60000.*60)


def makePlot():
    global pathDistVect, IntensityVect, TsurfVect, tSecsVect, towerLocation,
distVect,waterFraction, offVert, runID,emissivity,Tamb, V ,\
           pathID,Vmph,pathRemarks, viewFactor, timeTo160, timeAbove160, timeTo300,
timeAbove300,maxSurfTemp, fname, textLines


    newIntensity = [a for a in IntensityVect]
    pathDistVectMod = [a- towerLocation for a in  pathDistVect]
    distVectMod = [a- towerLocation for a in  distVect]  # these are the markers for the field
map countour measurements
    #tSecsVectMod =  [a- towerLocation/V for a in  tSecsVect]
    maxIntensity = max(newIntensity)
    plt = matplotlib.pyplot

    host = host_subplot(111, axes_class=AA.Axes)
    plt.subplots_adjust(right=0.75)
    plt.subplots_adjust(bottom= 0.180)

    par1 = host.twinx()
    par2 = host.twiny()

    offset = 60
    new_fixed_axis = par2.get_grid_helper().new_fixed_axis
    par2.axis["bottom"] = new_fixed_axis(loc="bottom",
                                        axes=par2,
                                        offset=(0, -35))

    par2.axis["bottom"].toggle(all =  True)
    par2.axis["top"].toggle(all =  False)


    host.set_ylim(0, maxSurfTemp*1.05)
    par1.set_ylim(0,1.05*maxIntensity)
    host.set_xlabel("distance (m)")
    host.set_ylabel("Surface Temp (degC) (dashed line)")
    par2.grid(True)
    par1.set_ylabel("Field Intensity (kw = #Suns) (solid line)")
    par2.set_xlabel("time(seconds)")

    p1, = host.plot(pathDistVectMod, TsurfVect,'r--')
    p2, = par1.plot(pathDistVectMod,newIntensity)# , label="kW (= Suns)")
    p3, = par2.plot(tSecsVect, TsurfVect, alpha=0)# ,label="time")
    p4, = par1.plot(distVectMod, nSunsVect, 's', markersize=4,
markerfacecolor='blue',markeredgecolor='blue')
    if timeTo160 > 0:
        jjl=host.axhspan(160,160,0.0,0.75,color='r', linewidth=.5)
        jj2=par2.text(tSecsVect[int(len(tSecsVect)*.83)],156,'%4.0f secs to reach 160
degC'%timeTo160,color='r', horizontalalignment='left',
                verticalalignment='top', fontsize = 'x-small')#,transform = host.transAxes)
        jj2=par2.text(tSecsVect[int(len(tSecsVect)*.83)],164,'%4.0f secs
above'%timeAbove160,color='r', horizontalalignment='left',
                verticalalignment='bottom', fontsize = 'x-small')#,transform = host.transAxes)
```

```
    if timeTo300 > 0: #p = plt.axhspan(0.25, 0.75, facecolor='0.5', alpha=0.5)
        Tval=300
        jjl=host.axhspan(Tval,Tval,0.0,0.75,color='r', linewidth=.5)
        jj2=par2.text(tSecsVect[int(len(tSecsVect)*.83)],Tval-4,'%4.0f secs to reach
300degC'%timeTo300,color='r', \
                      horizontalalignment='left',
            verticalalignment='top', fontsize = 'x-small')#,transform = host.transAxes)
        jj2=par2.text(tSecsVect[int(len(tSecsVect)*.83)],Tval+4,'%4.0f secs
above'%timeAbove300,color='r', horizontalalignment='left',
            verticalalignment='bottom', fontsize = 'x-small')#,transform = host.transAxes)

    #par1.set_ylim(0, 4)
    #par2.set_ylim(1, 65)


    host.axis["left"].label.set_color(p1.get_color())
    par1.axis["right"].label.set_color(p2.get_color())

    par2Span=(host.axis()[1]-host.axis()[0])/V
    par2.set_xlim(0,par2Span)

   ##plt.title(r'$\mathrm{Histogram\ of\ IQ:}\ \mu=100,\ \sigma=15$')
    plt.title(r'$\mathrm{Feather\ Surface\ Temperature\ along\ Flight\ Path\ }$')



    for  line in enumerate(textLines): #
        ##incr x, incr y
        host.text(0.01, .98-line[0]*.036,line[1][0], \
            horizontalalignment='left',
            verticalalignment='top',
            fontsize = 9,
            transform = host.transAxes)


    fullFname=str('c:\\mypython\\birds\\%s.png'%fname)
    myStr='saved to '+ fullFname
    print myStr
    plt.savefig('c:\\mypython\\birds\\%s.png'%fname)
    #plt.show()
    appfile= "c:\\program files\\quicktime\\pictureviewer.exe "

    subprocess.Popen([appfile, fullFname] )
    #plt.show()  #Tk causes prolems? after second plot won't close!

if __name__ == "__main__":

    try:
        import math
        import sys
        import datetime
        import math
        import numpy as np
        import matplotlib
        import matplotlib.pylab
        from mpl_toolkits.axes_grid1 import host_subplot
        import mpl_toolkits.axisartist as AA
        from datetime import datetime
        import subprocess
        runID = '%20s'%str(datetime.now())[:19] #'Dummy' #fixme
        fname=runID.replace(':','')
        fname2=fname.replace('.','')
        fname='Bird'+fname2
```

```
        textFileName=str('c:\\mypython\\birds\\%s.txt'%fname)
        print 'output is being redirected to : %s'%textFileName
        sys.stdout = open(textFileName,'w')

        print datetime.now().ctime()
        print 'This text file: %s'%textFileName
        print 'program: sys.argv[0] = %s'%sys.argv[0]



        userData()
        setConstants()
        pathData()
        mainLoop()
        sys.stdout = sys.__stdout__
        print 'Time(s)   Dist(m)    Tsurf(C)     Intensity(suns)'
        for a in zip(tSecsVect,pathDistVect,TsurfVect, IntensityVect):
            print '%6.1f  , %6.1f  , %6.1f  ,   %5.1f'%a # (a[0],a[1],a[2])

        print

        for  line in textLines: #
            print line[0]

        print
        print    'Time to  Time above  Time to  Time above (secs)'
        print    '   160C        160C     300C        300C'
        print ' %5.0f       %5.0f    %5.0f       %5.0f'%(timeTo160, timeAbove160, timeTo300,
timeAbove300)
        print
        print 'Max Surface Temp(C):             %5.0f'% maxSurfTemp
        print 'Reynolds number:               %9.1f'%(Reynolds)
        print 'h (convection coeff)(W/m^2-K): %7.1f'%h

        print 'Flight Speed (ft/min):           %7.1f (%3.1f mph)'% (Vmph*5280/60., Vmph)
        print 'Total flight time (secs):     %7.0f'%(t)
        print 'Dose_total (kW-secs/m^2):       %7.1f'% (doseTotal/60000.*60)
        print 'doseBefore160 (kW-secs/m^2):    %7.1f'% (doseBefore160/60000.*60)
        print 'DoseAbove160 (kW-secs/m^2):     %7.1f'% (doseAbove160/60000.*60)
        print 'DoseAbove300 (kW-secs/m^2):     %7.1f'% (doseAbove300/60000.*60)
        print 'DoseAboveThresh (kW-secs/m^2):  %7.1f'% (doseAboveThresh/60000.*60)
        print 'BackSideLossesOn: %s'%(backSideLossesOn)

        makePlot()
        print 'This text file: %s'%textFileName

        print 'program: sys.argv[0] = %s'%sys.argv[0]

    finally:
        sys.stdout = sys.__stdout__  #restore stdout back to normal
        print "done."
```

APPENDIX A

Geomorphic Assessment and Sand Transport Impacts Analysis of the Palen Solar Power Project, Appendix C (Biology Report), dated August 18, 2010

Geomorphic Assessment and Sand Transport Impacts Analysis of the Palen Solar Power Project

Appendix C (Biology Report)

Prepared for | CALIFORNIA ENERGY COMMISSION & ASPEN ENVIRONMENTAL

Prepared by | PWA Philip Williams & Associates, Ltd.

August 18, 2010

Geomorphic Assessment and Sand Transport Impacts Analysis of the Palen Solar Power Project Appendix C (Biology Report)

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1. OBJECTIVES OF THIS APPENDIX

The Palen Solar Power Project (Project or Proposed Project) is a proposed energy plant that will use solar arrays to focus sunlight and generate electricity through steam turbines (Solar Millennium 2009a). The array and associated infrastructure will be built in the Chuckwalla Valley of the Mojave Desert. This area supports a series of sand dune habitats that are reliant on the delivery of fine sand from wind (aeolian) and water (fluvial) sources. The objectives of this Appendix are as follows:

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. Provide a discussion of potential direct and indirect impacts of the Proposed Project and its two alternatives (attached) on the existing sand dune system and the processes that support them.

3. Describe mitigation for those impacts, or a well-supported conclusion that those impacts cannot be mitigated.

Note on this Appendix Version

This appendix has been modified and consolidated from several earlier PWA reports to reflect a new sand transport model that we have used to analyze alternatives, as well as new Project alternatives. This is the version that will form the basis of Dr. Andrew Collison's expert testimony in the CEC Hearing for Palen Solar Power Plant. The earlier versions are as follows:

Collison, A. 2010a Appendix A (Soil & Water Report) Geomorphic Assessment of Genesis Solar Project Site.
Collison, A., Nilsen, C., and Gregory, J. 2010 Revised wind shadow calculations for Palen Solar Energy Project, June 2nd 2010

2. SUMMARY OF KEY FINDINGS

The Proposed Project area covers several different land units including (from southwest to northeast) a currently stable coarse gravel alluvial fan surface with some relict sand dunes that have largely deflated (blown away), a more active wind-blown sand area with relatively shallow sand deposits, and an area of deeper and more active vegetated sand dunes that is Mojave Fringe Toed Lizard (MFTL) habitat. The northeastern portion of the Project site lies within the Chuckwalla sand transport corridor, a regionally-significant geomorphic feature that provides sand necessary to support sand dune habitat including MFTL habitat both on and off site. The sand corridor stretches down the Chuckwalla Valley to Blythe and the Colorado River. The Project site is crossed by a series of small distributary alluvial fan channels, and two large wash complexes formed by concentrated drainage under I-10.

The Applicant's Proposed Project as described in their Application for Certification (Solar Millennium 2009a) intrudes into the Chuckwalla sand transport corridor by more than a mile, cutting its width in half, and would create a "sand shadow" downwind. **Sand shadows are areas where the upwind supply of sand is cut off by wind fences and other infrastructure, but where existing sand can be eroded downwind, resulting in the loss of the fine sand upon which dune habitats are dependent.** Previous studies have shown that such sand shadows result in dune deflation, substrate coarsening and complete loss of MFTL habitat within a few years (4-17 years) (Griffith et al. 2002; Turner et al. 1984). If fully implemented the Proposed Project would create a total of 970 acres of direct impact to dune areas within the sand transport corridor and 1,113 acres of indirect (sand shadow) impacts downwind of the Project where we would expect to see deflation and dune loss within the life of the Project. This is considered to be a regionally-significant impact to sand transport processes that support sand dunes downwind in the Chuckwalla Valley.

As described in the Staff Assessment/Draft Environmental Impact Statement (SA/DEIS) (CEC-BLM 2010) staff analyzed two alternatives to the Proposed Project, a 2,987-acre Reconfigured Alternative developed by the Applicant and a 2,106-acre Reduced Acreage Alternative developed by staff. Impacts to sand dunes and the sand transport corridor were actually increased with the Reconfigured Alternative 1 (1,150 acres of indirect impact and 1,120 acres of direct impact to the sand transport corridor/MFTL habitat) and while staff's Reduced Acreage Alternative minimized impacts to sand dunes and the sand transport corridor (292 acres of indirect and 299 acres of direct impact to the sand transport corridor) it also reduced the output of the Project to 375 MW rather than 500 MW. Note that the staff Reduced Acreage Alternative does not include a disturbance area around the solar arrays as the other alternatives do, so the direct impact is likely somewhat higher than this number and the indirect impact is somewhat lower, but the total impact is correct.

Subsequent to publication of the SA/DEIS the Applicant developed two new reconfigured alternatives, Reconfigured Alternative 2 and Reconfigured Alternative 3 (Solar Millennium 2010l) to reduce the degree of Project intrusion into the most active part of the sand transport corridor. This report analyzes and compares the impacts of these two new reconfigured Project alternatives with the Proposed Project, the original Reconfigured Alternative and the staff Reduced Acreage Alternative. The Applicant's Reconfigured Alternative 2 has 144 acres of indirect impact and 680 acres of direct impact to the sand transport corridor if both phases are implemented. The Applicant's Reconfigured Alternative 3 has less indirect impact that Alternative 2 (94 acres) but more direct impact (790 acres) in the sand transport corridor if both phases are implemented. The impacts of the different alternatives are shown graphically in Figure 29, page 37.

The Proposed Project and the original Reconfigured Alternative 1 would have extremely high impacts to the sand transport corridor and Mojave fringe-toed lizard habitat that was judged to be significant and non-mitigable in the SA/DEIS. The staff Reduced Acreage Alternative and the

Reconfigured Alternatives 2 and 3 are superior to the Proposed Project in terms of direct and indirect impacts to sand transport and to sand dune habitat. The staff Reduced Acreage Alternative has the lowest total impacts, but with a lower power generating capacity. Selecting between the two Applicant Reconfigured Alternatives is also difficult from a sand transport and dune impact perspective since Alternative 2 offers the lowest direct impact but the highest indirect impact, whereas Alternative 3 offers a lower indirect impact and a higher direct impact. All three alternatives, the staff Reduced Acreage Alternative, and the Reconfigured Alternatives 2 and 3, reduce the impacts to sand transport and sand dunes to less than half of the Proposed Project.

Conceptual approaches have been put forwards by the applicant to mitigate for off-site sand shadow impacts by collecting and trucking sand around the Project and releasing it into the area downwind. However, the applicant has not been able to point to examples of such approaches working in other desert areas and at present the plan appears experimental rather than grounded in established practice. While such a plan has the potential to work more information would need to be provided to assess its potential for success.

3. 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.

Sand dune fauna such as MFTL rely on a regular supply of fine wind blown sand for their 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 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 many dune-dependent species. For example, Turner et al (1984) conducted experiments on paired plots of sand dunes up and downwind of wind barriers to look at abundance of MFTL. They showed that downwind sand dunes experienced deflation within 4-17 years of the erection of a relatively small wind barrier (a single line of tamarisk trees) and that while MFTL were abundant upwind of the barriers they were virtually absent downwind. Thus barriers pose a direct threat to sand transport and habitat.

Maintaining MFTL habitat requires the regular addition of wind-blown sand from a reliable source. Most of the sand dune habitat in the Mojave Desert follows discrete pathways referred to as sand transport corridors. These have been approximately mapped by Muhs et al. (2003) and are shown relative to the Project site in Figures 4 and 5. The presence and location of sand transport corridors are controlled by the availability of sand that can be eroded and transported by wind, the prevailing wind direction, and topography (especially the presence of fault-controlled troughs). Most sand corridors trend approximately northwest to southeast along troughs. Additional sand is added to corridors from local wind corridors that can be thought of as ‘sand corridor tributaries’ and by fluvial sources. Alluvial fan channels transport sand from the mountain fronts to the troughs. With increasing distance away from the mountain front the sand is preferentially sorted[1] and reduced in size by abrasion. At a sufficient distance down fan sediment becomes fine enough to be picked up and transported by wind action. This both creates local dune habitat around ephemeral channels and supplies material downwind to accumulate in larger sand corridors.

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1 “Preferential sorting”. Alluvial fans are made up of distributary drainage systems that spread water into increasing numbers of smaller channels as water moves downstream (the opposite of most temperate drainage networks). As water spreads out down fan the channels lose sediment transport capacity and the coarsest particles are deposited first, with successively smaller particles being passed downstream.

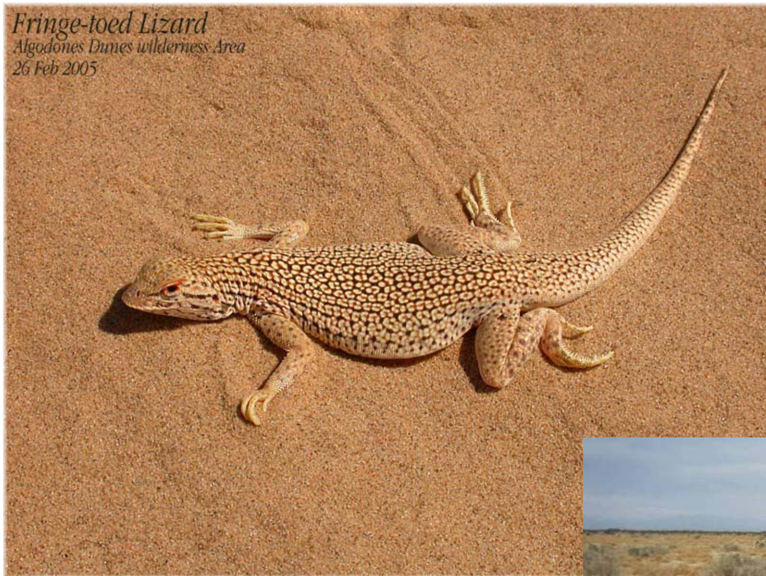

Figure 1. Mojave Fringe Toed Lizard showing its preferred habitat of fine, loose sand. Source: Southwest Images.

Figure 2. Good MFTL habitat showing 'plump', vegetated dunes connected by relatively deep, loose sand sheets.

Figure 3. Deflated former vegetated dune showing remnants of eroding dune under creosote bushes surrounded by an armored lag of coarse gravel and shallow, compacted sand. This habitat does not support MFTL.

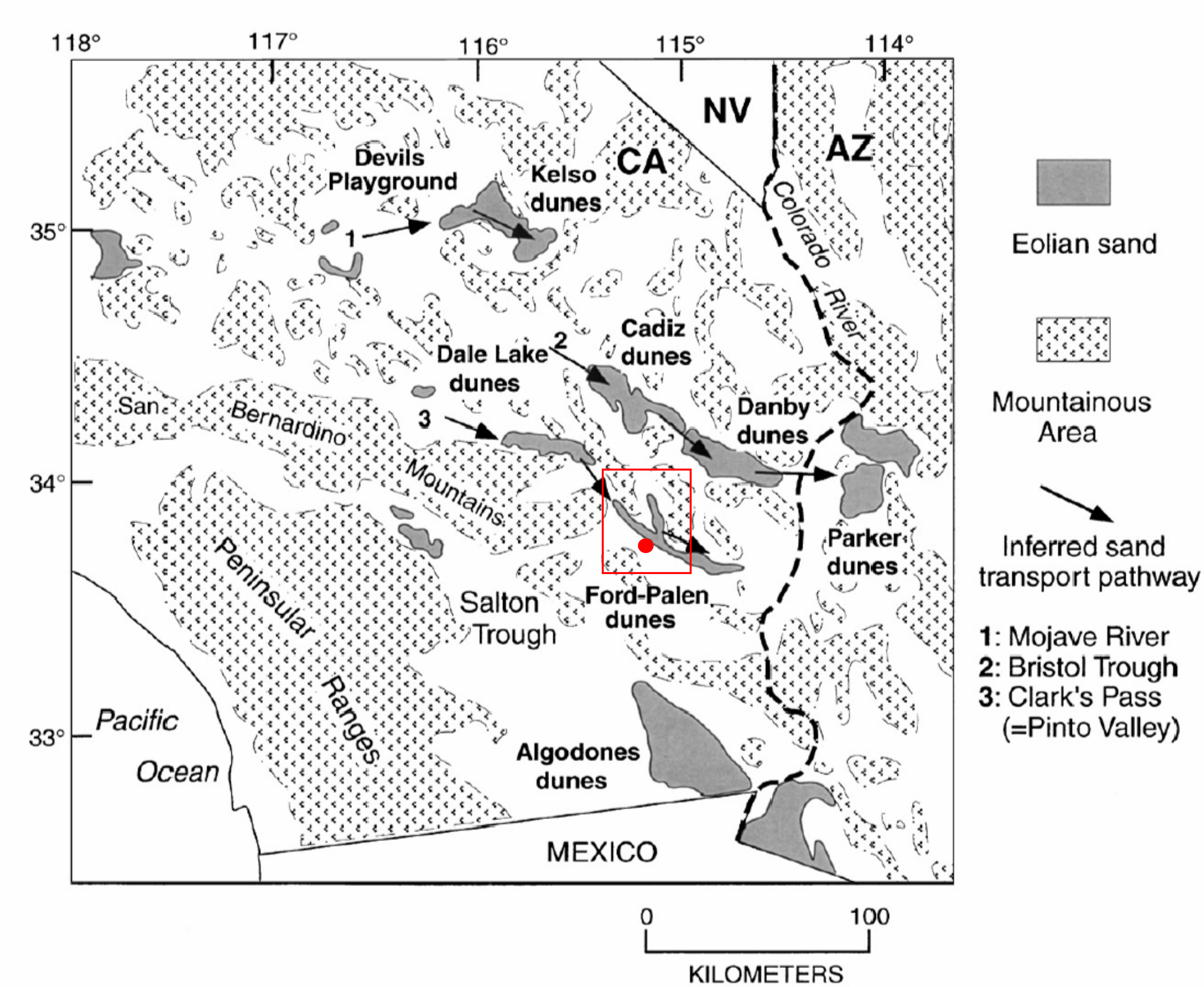

Figure 4. Eolian sand transport corridors of southern California (original figure from Muhs et. al., 2003). Approximate Project location shown by red dot. Area shown in Figure 5 illustrated by red box.

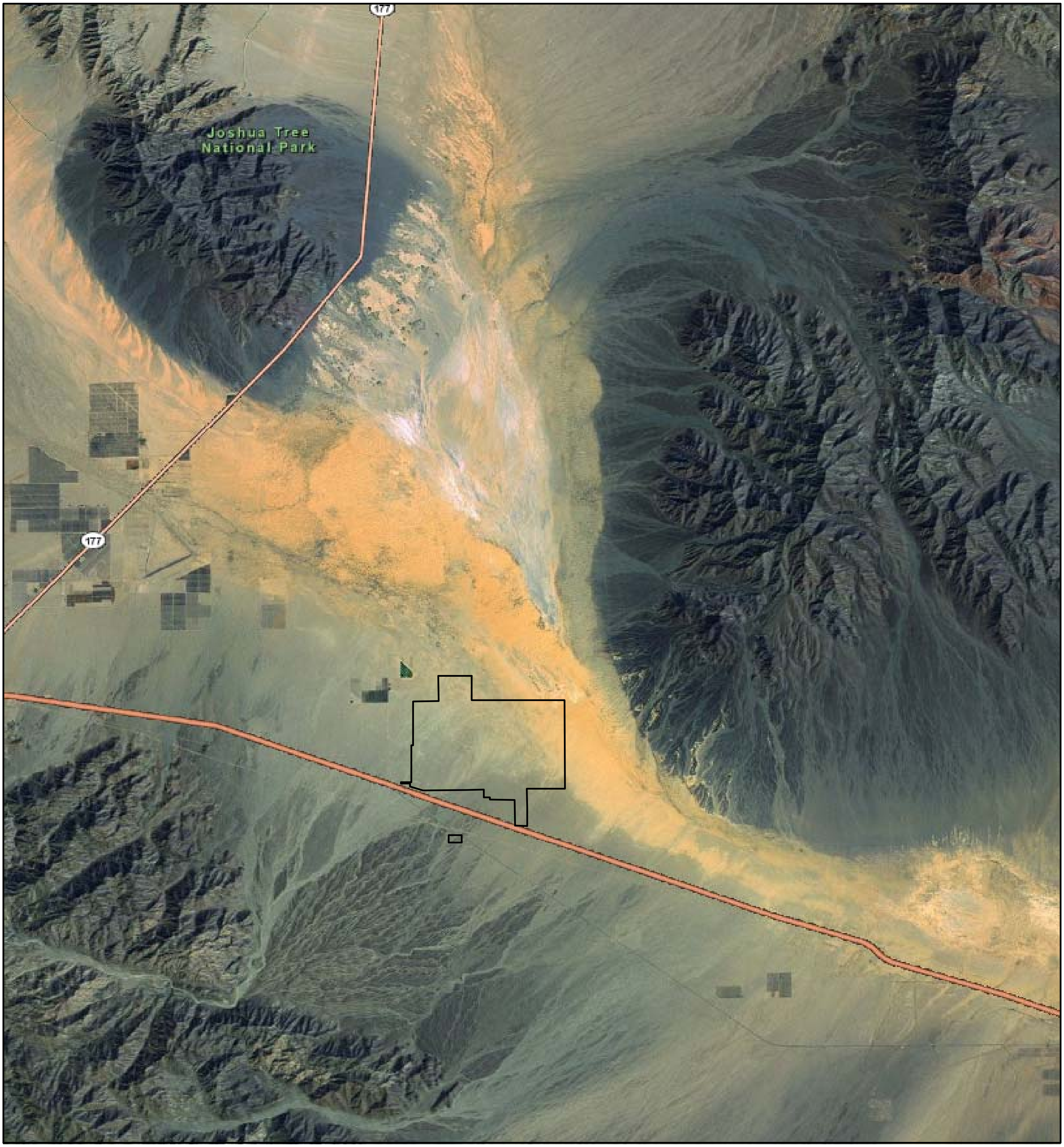

figure 5

CEC Palen

Overview of the project site showing the sand transport corridor

PWA Ref# - 2006.02

PWA

The activity and location of sand transport corridors is not fixed in time or space. Fluvial delivery of sediment from mountain fronts to the alluvial fans, troughs and playas tends to occur in wet winters associated with El Niño events that occur on average every 3-5 years. Due to the wet conditions wind transport may be less active during these years, so sediment may be temporarily stored in downstream channel areas or playas. During La Niña events (also approximately every 3-5 years) winters tend to be drier, promoting wind transport and aeolian processes. Fluvially-delivered sand deposited in channels or playas during an El Niño event can be transported by the wind during a subsequent La Niña event. In an analogous manner, sand corridors can expand, contract or migrate with changing weather and climate. Wetter than average conditions may allow vegetation to encroach on the edges of a sand transport corridor, thinning it. Dryer or windier condition may add more sand to the corridor and bury vegetation, widening the corridor. Changes in prevailing wind direction or strength may change the location or intensity of sand transport.

The Proposed Project is located close to or inside of a major sand transport corridor identified by Muhs et. al. (2003), referred to as the Chuckwalla sand corridor. Muhs et al. also show a smaller 'tributary' sand corridor immediately east of the Project site. The sand corridors are prominent in aerial photos (see Figures 6 and 7). Sand delivered from upwind passes through dune areas including MFTL habitat and is deposited, replenishing sand that has been lost downwind. In addition to the obvious 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.

4. DESCRIPTION OF THE PALEN PROJECT SITE

I visited the Project site for a day on February 5th 2010, following a reconnaissance visit on January 12th 2010. I made a third field visit on April 29th 2010. Conditions on January 12th were warm and dry, with no recent rain. The February 5th visit was conducted the morning following a rainstorm, while the April 29th visit was conducted immediately after a sand storm. On the February 5th visit I drove the western boundary of the property along the BLM dirt road up to the northwest corner making stops at points of interest, and hiked a loop of approximately 6 miles along the northern Project boundary to the northeast corner of the proposed impact area, returning westwards along a more southerly alignment. After this I drove the BLM road from the northwest corner southeast to the southern site boundary near I10. Finally I visited a large ephemeral wash that passed under I-10 to assess the effects of concentrating several small washes into a single channel. During the visit I logged my position on an aerial photo using a GPS linked to Google Earth, made field observations and took photos.

The site is located on an alluvial fan that drains from southwest to northeast towards Palen Dry Lake. The average slope across the site is 2 percent. There is a gradient of three major desert surfaces progressing from southwest to northeast that I detected on foot and confirmed by aerial photo. The boundaries between these areas are somewhat interwoven and gradual, but can be seen on aerial photos and in the field. There is broad agreement between the major units I mapped and the units as delineated by Dr. Kenney (Kenney 2010a, 2010b) for the Project applicant, as can be seen in our respective figures. The main area of disagreement is over the eastern boundary of Zone 1, and the degree of difference in sand transport activity between Zones 1 and 2. In addition to mapping the major units I mapped a series of smaller land units related to fluvial drainage features.

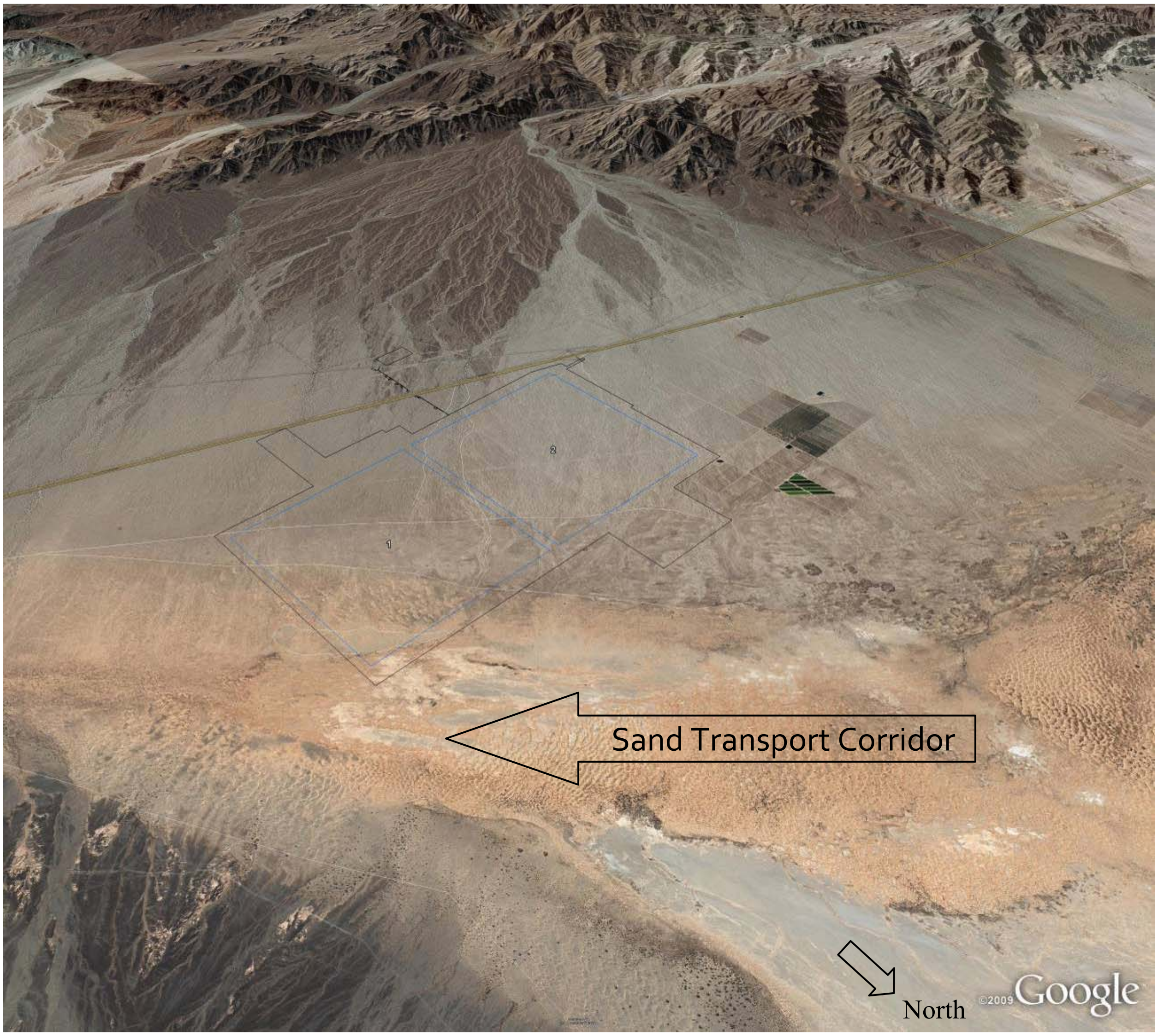

Figure 6. Setting of the Palen Project site showing the major topographic units. Project boundary shown in gray, proposed solar arrays shown in blue, pale lines are the authors land unit boundaries. The intrusion of the eastern array into the sand transport corridor (red dunes and surrounding grey dunes) can clearly be seen.

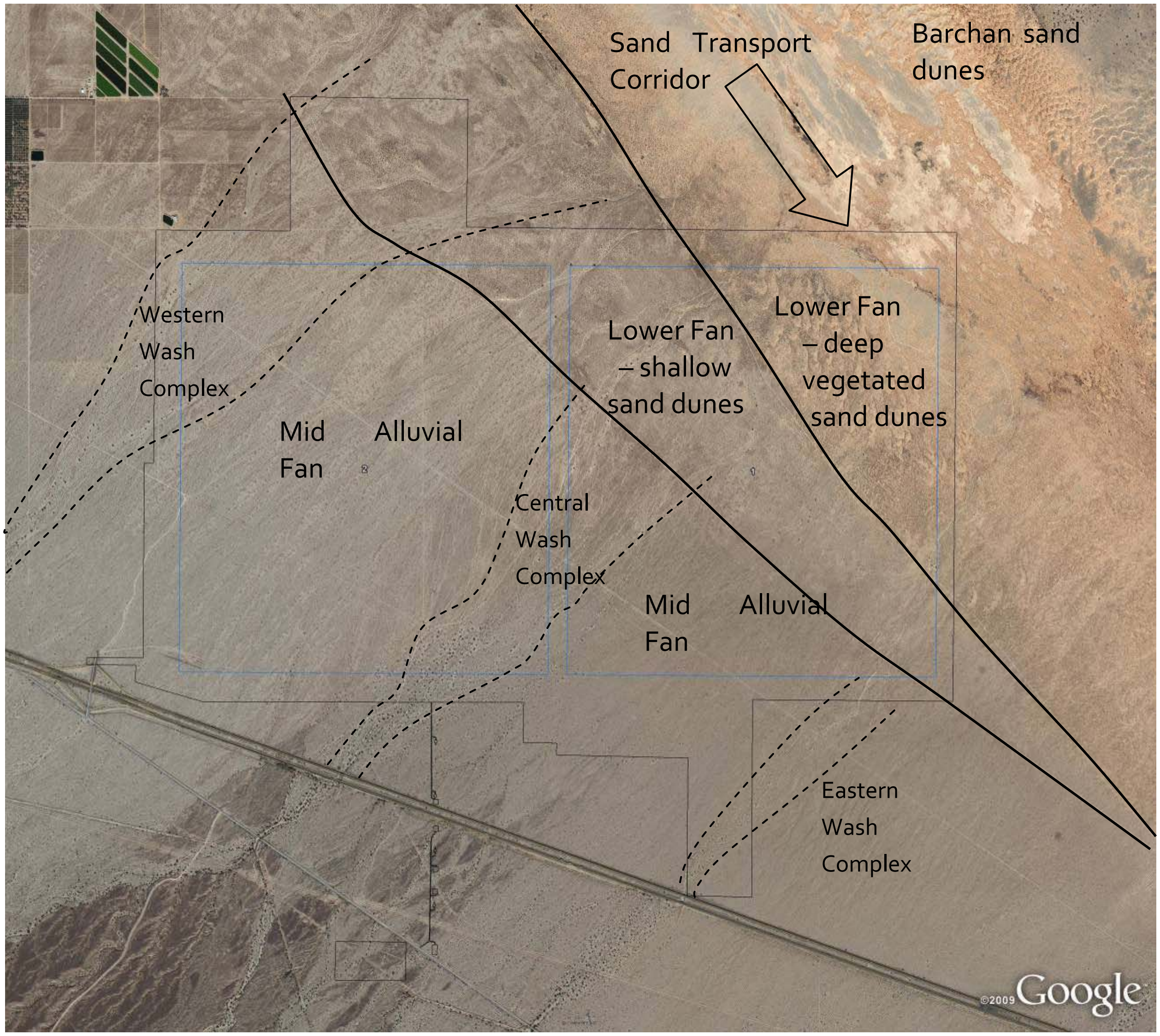

Figure 7. Distribution of major and minor land units on the Palen site. Proposed Project Alternative boundary shown in gray, proposed solar arrays shown in blue.

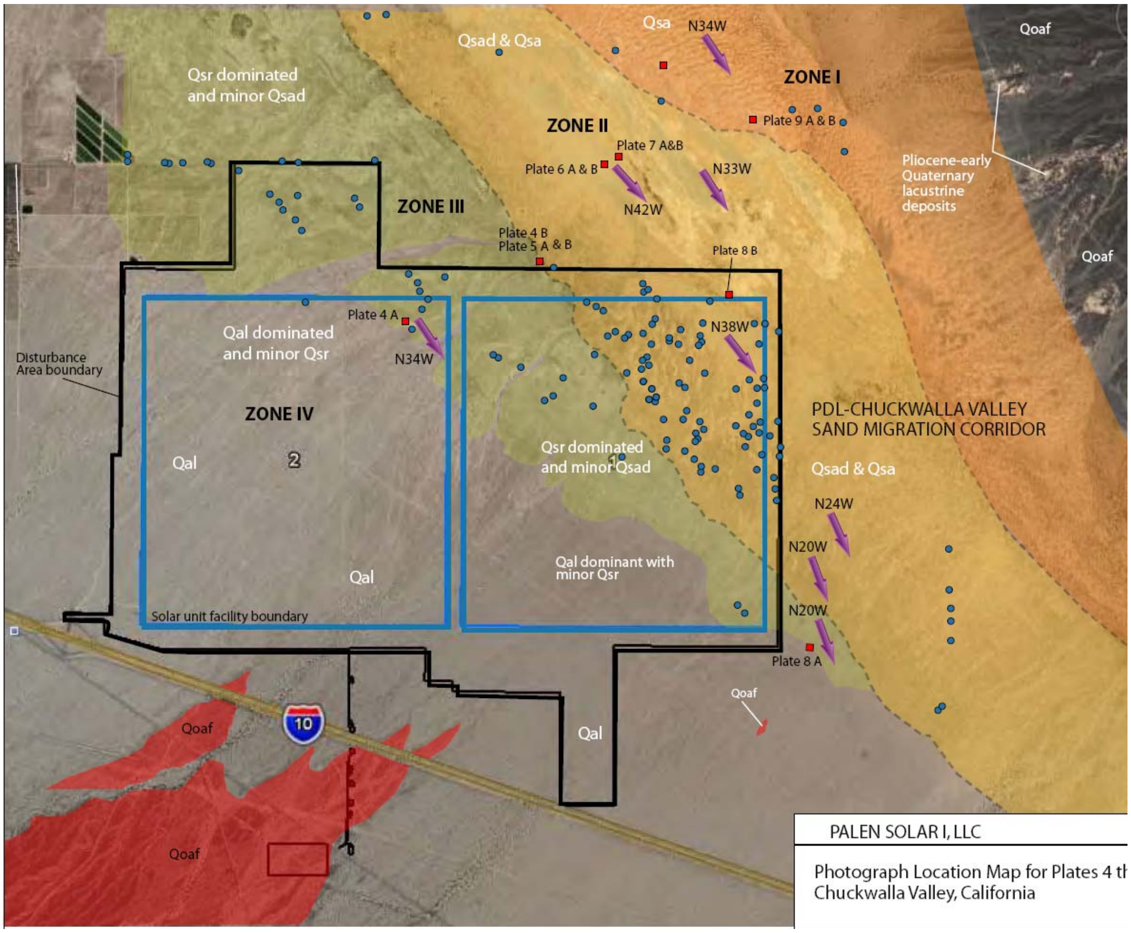

Figure 8. Sand Migration Corridor Zones and the association with MFTL observations (blue dots), from Kenney, Plate 3, 2010a.

4.1 MAJOR LAND UNITS

4.1.1 Mid Alluvial Fan Area – Degraded Vegetated Dunes with Coarse Alluvial Surfaces (corresponds to Zone 4 of Figure 8)

(Note that the Project is relatively low on the alluvial fan, and that the mid fan is the highest part of the alluvial fan occupied by the Project site. The High Alluvial Fan area is found southwest of I-10.)

In the southern and western sector of the Project site the surface is a mixture of degraded vegetated dunes with thin coarse sand, and patches of alluvial gravel and desert varnish. This surface has been formed primarily by deposition of sand and gravel from alluvial fans (fluvial action) over hundreds of thousands of years, overlain with patches of vegetated sand dunes that formed from wind action during periods of greater sand availability. The sand dunes on the mid fan have subsequently degraded due to wind erosion and deflation (sand is being removed by the wind but not replaced). Deflation of the relict dunes is leaving behind the more resistant alluvial deposits as a protective lag of gravel[2]. In many places the lag has formed desert varnish (a black coloration on the exposed surface of gravel particles). The presence of desert varnish suggests that parts of this surface have been stable and exposed in its current condition for many hundreds to thousands of years. There is little available fine loose sand for either transport to dunes down wind or to support MFTL habitat. What sand is present is coarse (1-2 mm) and there is abundant fine gravel (2 mm and larger). The vegetation cover is largely sparse creosote bushes and degraded dunes, with ironwood trees in the larger washes. This surface has a relatively stable current condition and is likely to have fewer off-site impacts compared with other parts of the site. A potential exception to this is wind erosion of the freshly exposed soil once the coarser material is removed during grading, though standard dust abatement techniques should be able to mitigate for this.

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2 An alternative explanation for the formation of gravel pavements is that particles rise to the surface of alluvial fans as fine sand and dust are deposited around them and washed below them by rainfall. While the formation mechanisms are different it is widely agreed that areas mapped as Quaternary alluvial fans are geomorphically old features formed primarily from water-borne alluvium that have changed little in the last few thousand years.

Figure 9. Typical degraded dune and coarse gravel lag on the mid fan surface. View is from the west looking across the proposed western solar array site to Palen Dry Lake.

Figure 10. Close up of dune and lag mixture

Figure 11. Stable mid fan area with gravel lag

4.1.2 Lower Alluvial Fan – Shallow Vegetated Sand Dunes and Sand Transport Corridor (Zone 3 of Figure 8)

Moving north and east the fan surface has sandier conditions and transitions from creosote bushes to grasses. This area has shallow vegetated sand dunes and sand sheets that are less degraded and that have more abundant sand than the dunes in the mid fan. The dunes appear to be in relative equilibrium – losses of sand due to wind erosion are matched by deposition of sand from upwind. The sand is finer than in the mid fan area, with some areas that appear suited to MFTL habitat (confirmed by the presence of MFTL as shown in the Applicant's figure (Figure 8, and Kenney 2010a, Plate 3). There are abundant large rodent holes in the sand, unlike in the Mid Fan, implying that there is sufficient depth of sand for burrows. There is evidence of moderate levels of wind-borne sand transport, and this surface appears to form the outer zone of the sand transport corridor (as shown in Kenney, 2010a, reproduced here in Figure 8). Its southwest boundary appears to coincide with the southwest boundary of the Chuckwalla sand transportation corridor drawn by Dr. Miles Kenney in his assessment of sand transport and deposition in the Chuckwalla Valley. (Note that while the western boundary of the sand transport corridor coincides with the boundary between the Mid and Lower Alluvial Fan, the wind transport corridor extends east into the Lower Fan – Deep Vegetated Sand Dunes and Dry Lake areas as well, and is not confined to the Lower Alluvial Fan.) The boundary was mapped in the field in two locations which appear on the aerial photo to trace a line of different vegetation and topography. This surface is less stable than the mid fan, appears to have a higher potential habitat value for MFTL, and appears less well suited for development of infrastructure.

Figure 12. Vegetated dunes in the shallow vegetated sand dune and sand transport corridor area

Figure 13. Sandier conditions showing rodent burrows and fine surface sand. View is from center of proposed eastern solar array looking east towards Palen Lake.

4.1.3 Lower Alluvial Fan – Deeper Vegetated Sand Dunes and Sand Transport Corridor (Zone 2 of Figure 8)

Moving north and east the vegetated dunes become deeper and the sand more abundant. This area has hummocky vegetated dunes with greater topographic expression than the zone to the west, implying that they are more actively supplied by sand. This area appears very well suited for MFTL habitat, and coincides with observed MFTL activity (see Figure 8). This zone of the sand transport corridor is more active than the Shallow Vegetated Sand Dunes, though less active than the area of unvegetated barchan[3] dunes to the east (off the Project area).

Figure 14. Conditions in the Lower Fan – deeper vegetated sand dune surface showing potential Fringe Toed Lizard habitat. View is from center of proposed eastern solar array looking north.

[3] Barchans are very large, active, crescent shaped sand dunes without vegetation

Figure 15. More abundant sand showing in the side of the dirt road.

5. ASSESSING THE IMPACTS OF THE PROJECT ON SAND TRANSPORT TO DUNE HABITAT

5.1 BACKGROUND AND DEFINITION OF SAND SHADOWS

The applicant has assumed that all areas within the Project boundary are directly impacted, so this Appendix has focused primarily on off-site indirect impacts. The primary off-site impact is disruption of sand transport to the sand transport corridor. The Project has the potential to disrupt the Chuckwalla wind transport corridor because it includes a perimeter sand fence that is 30 feet high and that is designed to stop sand from entering the solar array. Most sand transport (as opposed to dust transport) occurs close to the ground through the processes of rolling and saltation (bouncing of sand particles). For example, Bagnold (1941) found that the mean elevation of saltating sand grains with a diameter of 0.25 mm was less than 1 cm off the ground, and more recent research has found that 90% of sand transport occurs within 30 cm of the ground surface. We would therefore expect the sand fence to pose an effective barrier to sand transport, and create a sand shadow downwind.

A sand shadow is an area downwind of a sand barrier where the wind is able to remove fine sand but there is no replacement by sand from upwind. Over time existing sand dunes in a shadow area will be deflated – they will shrink and become thinner and coarser as the fine sand is blown away by the wind. Deflated dunes have little or no habitat value for MFTL and other fine sand dependent species.

5.2 DESCRIPTION OF THE PWA SAND TRANSPORT MODEL

In order to quantitatively assess the area of sand shadow associated with different Project alternatives PWA developed a numerical model of sand transport. The model predicts areas of sand shadow in response to inputs of prevailing wind direction, distribution of wind around that mean, and the location of sand barriers.

5.2.1 Model Theory

Sand transport occurs when wind speed exceeds a threshold velocity that varies with material size but is often assumed to be around 14 mph. Sand is transported in whatever direction the wind is traveling once it exceeds the threshold velocity. Over time a prevailing direction emerges, and sand dunes reflect that prevailing direction (for example, coppice[4] dunes develop tails that are oriented away from the prevailing wind that transports sand). However, the prevailing wind is the resultant vector of numerous wind events with different orientations. This is illustrated in Figure 16, which shows the distribution of wind with differing speeds and the resulting prevailing wind transport direction for Blythe. Because of the variations in wind direction over a year sand transport can be thought of as two processes: primary sand migration that follows the prevailing wind direction, and sand diffusion on either side around that main direction. Sand diffusion means that the edge of a wind shadow will not be sharply defined into zones of complete sand transport and zones of zero transport; it will have a gradation from areas where there is a complete loss of sand to areas where there will be no reduction in sand.

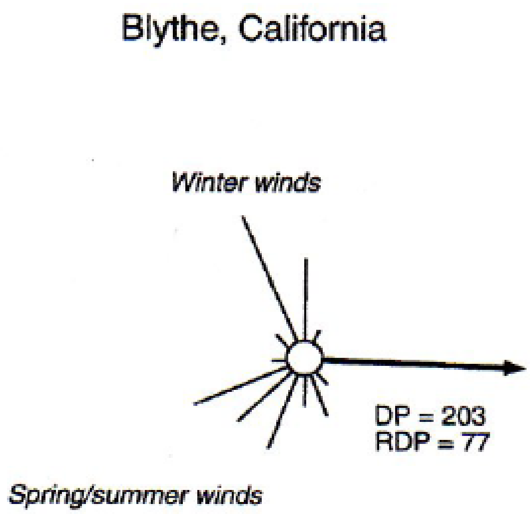


Figure 16. Example wind vectors for Blythe airport. Dominant winds (lines without arrows) are mostly from the northwest in winter and the southwest in summer, but the resulting prevailing wind for sand transport (bold arrow) is to the east. Source: Muhs et. al. (2003). DP stands for "Drift Potential", the sum of winds from a given direction that exceed the threshold velocity. RDP stands for "Resultant Drift Potential" which is the vector (direction and magnitude) that results from summing all the DPs.

5.2.2 Computational Framework for the Sand Transport Model

We have developed a sand transport model for the Palen site to simulate this combination of downwind transport and lateral diffusion. The model superimposes a 200 x 200 cell framework over the Project site and its surroundings and calculates the percentage of sand that will move from each cell to its neighbors based on the distribution of effective wind directions (Figure 17).

[4] Coppice dunes are small dunes that form around vegetation with a 'teardrop' shape that is oriented with the blunt end facing into the prevailing wind. They indicate the prevailing direction of wind transport.

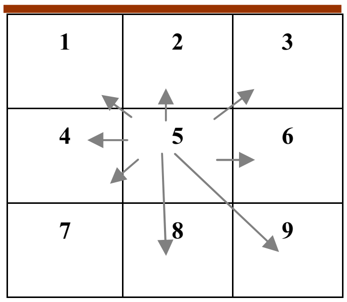


Figure 17. Calculation matrix for sand transport model. Length of arrows indicates proportion of sand moving to each cell from cell 5. In the example shown wind transport is mostly from the north and the northwest, but some diffusion occurs in other directions to represent occasional winds in these directions. The calculation is carried out for each cell in turn traveling downwind (north to south). The brown line is the upwind boundary condition.

Sand is added to the cells at the upwind boundary (brown line in Figure 17). Sand is transported from each cell in turn to each of its eight surrounding cells based on the intensity and duration of winds >14 mph in each direction. For example, if 50% of the effective wind energy is from the northwest, 50% of the sand in cell 5 will be transferred to cell 9 in the example above.

5.2.3 Assigning primary and secondary sand transport directions to the model

There is no weather station at the Palen site to parameterize the model, but we have conducted simulations that combine the Applicant's field evidence on the primary sand transport directions (Kenney 2010a) with a distribution of secondary wind directions based on the data for Blythe airport Muhs et. al. (2003). We assigned two primary wind directions to the model to reflect conditions at the Palen site, with sand primarily coming from the northwest and the north. Thus the primary sand transport is to the south and southeast (from cell 5 to cells 8 and 9 for the example in Figure 17). We analyzed the Blythe airport weather station wind drift potential data to estimate a diffusion function to account for wind transport in other directions. We measured all the drift potential[5] vectors and calculated the percentage that were in the two primary wind directions and the percentages that were in all other directions. For Blythe airport the split is 69% from the two primary directions (northwest and southwest in the case of Blythe) with 29% of the drift potential being made up of wind from other directions. Blythe and Palen have different prevailing wind directions due to topographic influences from their respective valleys, but we assumed the same approximate split between the duration and intensity of primary wind transport and secondary transport. We adopted these proportions to the cells in the Palen model so that approximately 70% of sand is transported to the two cells representing the two primary wind directions with approximately 30% going to the surrounding 6 cells – see Figure 18.

[5] Drift potential is the duration of wind transport multiplied by the velocity for times when the velocity exceeds 14 mph (the typical transport threshold of sand).

5%	**5%**	**5%**
5%	**0%**	**10%**
5%	**16%**	**49%**

Figure 18. Example calculation matrix for the sand transport model showing sand proportions transported in each direction. The black arrow shows the resultant transport vector of 114 degrees (N38W) representing conditions at the north end of the Project site.

By changing the sediment split between cells the model can simulate any prevailing sand transport direction (see examples in Figure 18 and 19) while maintaining a sediment diffusion process around that mean to account for sand transport on days when the wind comes from a different direction.

5%	**5%**	**5%**
5%	**0%**	**5%**
8%	**27%**	**39%**

Figure 19. Example calculation matrix with resultant vector of 160 degrees (N20W) representing conditions at the south end of the Project site.

The prevailing wind direction in the sand transport corridor appears to bend around the site in response to topographic effects from the Palen Mountains to the east and the Chuckwalla Mountains to the southwest, being a mixture of northerly and northwesterly winds at the northern part of the site, becoming more dominated by northerly winds in the south part of the site, and picking up westerly winds again south of the Project site as the sand corridor bends east towards Blythe. Rather than assume a single average prevailing wind direction across the entire site we divided it onto five sectors from north to south, each with a different prevailing wind direction. The prevailing sand transport direction was estimated by taking the nearest indicator from the Worley Parsons report (based on the orientation of sand dunes). Where there was more than one indicator in a sector we took the average direction of all the nearby indicators, and between groups of indicators we interpolated the average of the neighboring groups. The prevailing sand transport directions for each sector are shown in Figures 20a and 20b along with the data on which they are based (Kenney, 2010a). For each sector we assigned matrix weights based on the approach shown in Figures 18 and 19 above, calculating the mixture of east, southeast and south sediment transport values that resulted in the observed prevailing transport direction and assigning values of approximately 5% to all other cells (some individual cells were set up to 10% to achieve the desired resultant vector).

The sand transport values used in the model are as follows:

Sector	**Prevailing direction**	**Evidence for prevailing direction (all data from Kenney, 2010a)**	**Primary sand directions in model (% of sand traveling in each direction)‡**
Sector 1	N38W	Mean of three closest indicators (N38W, N33W and N42W)	49% SE 16% S 10% E
Sector 2	N31W	Mean of two closest values (N38W and N24W)	51% SE 19% S
Sector 3	N24W	Single closest indicator N24W	43% SE 24% S 7% SW
Sector 4	N20W	Two adjacent indicators (both N20W)	39% SE 27% S 8% SW
Sector 5	N46W	Closest adjacent indicator (N46W)	43% SE 19% E 13% S

Table 1. Prevailing sand transport directions assumed in the model

‡ sand is sent evenly to the remaining cells (not shown in the table) so that the total adds up to 100%

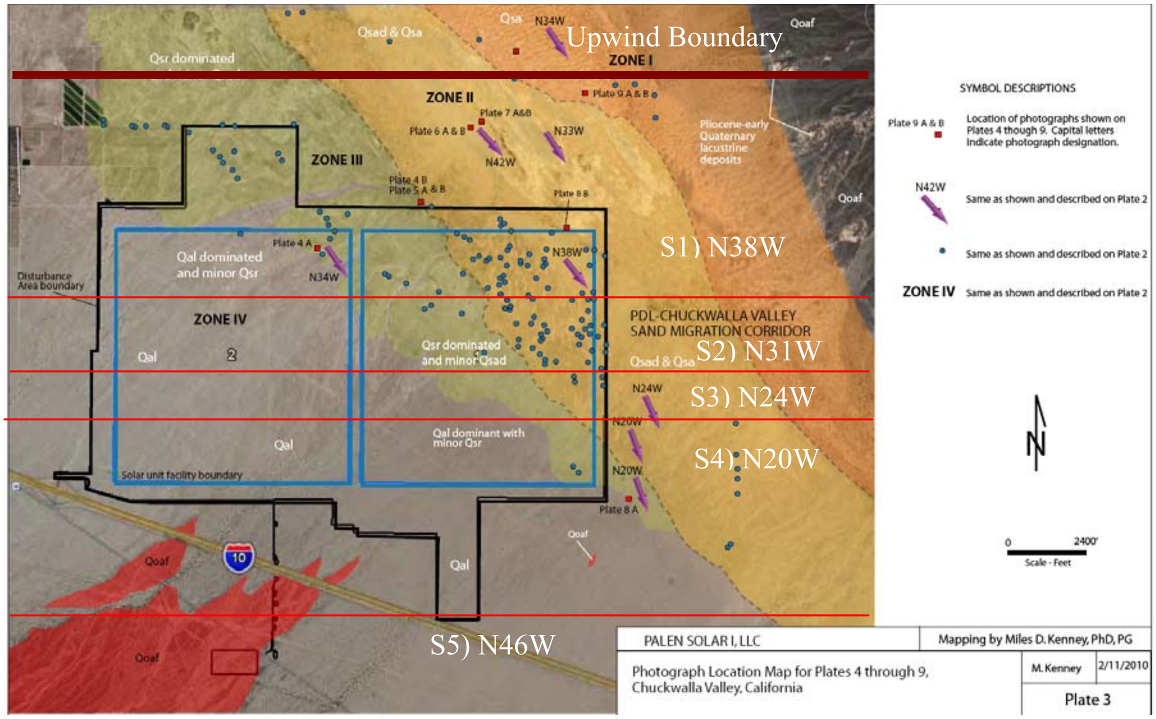


Figure 20a. Sand transport corridor and wind direction indicators (Kenney, 2010a, Plate 3). Lines in red show sectors used in the wind transport model to define different prevailing wind directions, and values in white show assumed dominant wind direction for each sector (S1-S5). Note: some vector indicators are shown in Kenney, 2010a, Plate 1, (Figure 20b of this report).

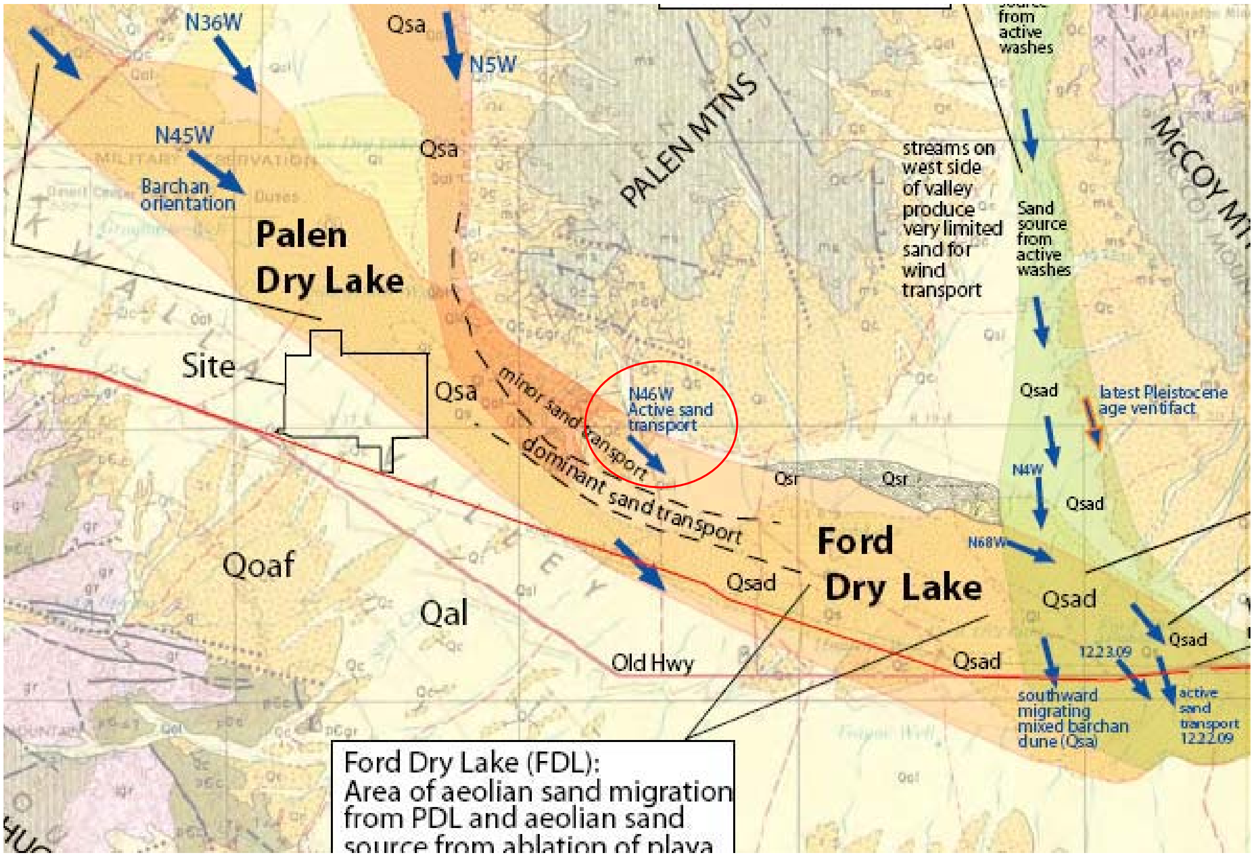


Figure 20b. Sand transport corridor and wind direction indicators (Kenney, 2010a, Plate 1). Vectors shown in red were used in the model.

5.2.4 Upwind boundary condition

We simulated a uniform input of sand across the northern (upwind) edge of the model to assess the percentage reduction in sand once the wind encountered an obstacle. Although the actual volume of sand will vary across the boundary, this simulation is concerned with the *percentage* reduction downwind, not the actual volume of sand. We assume that in the pre-project condition sand is transported across the site without obstruction, to establish a base condition.

5.3 SIMULATION OF PROJECT ALTERNATIVES

We simulated five Project alternatives: the Proposed Project, the original Reconfigured Alternative and staff's Reduced Acreage Alternative, as well as the two new alternatives developed by the applicant, Reconfigured Alternative 2 and Reconfigured Alternative 3. The latter two reconfigured alternatives as well as the staff Reduced Acreage Alternative were developed to reduce both the direct and indirect impacts of the project on biological resources including the sand dunes and Mohave fringe-toed lizard habitat. The Proposed Project and Reconfigured Alternatives 2 and 3 were further assessed in two phases. For all scenarios we imported the Project footprint into the model in GIS. The wind fences at the project boundaries were assumed to be a complete barrier to sand transport, with zero sand being transported across a project cell. We assumed no movement of sand along a fence oblique to wind movement. Direct impacts are considered to be impacts from the project footprint, or sand shadows from the wind fences that lie within the project disturbance boundary. Indirect impacts are considered to be sand shadows that extend beyond the project disturbance boundary. In all cases the model predicted a sand transport shadow downwind of the Project based on the prevailing wind directions, with diffusion gradually transporting sand into the shadow (due to variations around the prevailing wind direction). At a certain point downwind the shadow disappears because diffusion is able to bring sediment back into the area downwind of the obstruction. We calculated the percentage of sand reduction between pre-project and post-project conditions. By overlying the percent sand reduction on the Sand Transport Zones map (Kenney, 2010a) we are able to calculate both an area of impact and a percentage of impact for each alternative. This is shown in detail in Table 2. We further subdivided the MFTL habitat based on the sand transport zones devised by Dr. Miles Kenney (shown in Figure 8) where Zone 1 has the greatest rate of sand transport and Zone 3 the lowest rate. We did not consider Zone 4 in the analysis since both Energy Commission staff and the Applicant concur that wind transport is not a significant process in this zone, and MFTL habitat does not appear to be found in this zone. The greatest abundance of MFTL has been observed in Zone 2 due to the combination of active wind transport and vegetation cover, with fewer MFTL in Zones 1 (abundant sand but little vegetation) and 3 (plentiful vegetation but less active sand transport). We also excluded from the analysis areas where the reduction in sand delivery was less than 25%. We included the direct impact to the sand dunes associated with each Project footprint. It should be noted that in some alternatives the indirect impact in Zone 3 increases compared with the proposed project. This is because the alternatives generally pulled the project footprint out of Zone 2 and into Zones 3 and 4. Thus some reductions in direct impact to Zone 2 were partially offset by increases in indirect impacts in Zone 3. It should also be noted that in the two phase alternatives that we analyzed, some portion of the indirectly impacted area in Phase 1 is often subsequently occupied and directly impacted in Phase 2. The different alternatives and their predicted sand shadows are shown visually in Figures 21-28.

	Percentage reduction of sand input	Impact Area (acres)			
		Zone I	Zone II	Zone III	Sum of Impacts
Proposed Project Alternative Phase 1	25 - 50%	-	-	64	191
	50 - 75%	-	-	55	
	75 - 100%	-	-	72	
	Direct Impact	-	-	51	51
Proposed Project Alternative (Phases 1&2)	25 - 50%	-	310	-	1,113
	50 - 75%	-	260	-	
	75 - 100%	-	490	53	
	Direct Impact	-	430	540	970
Staff Reduced Alternative	25 - 50%	-	38	49	292
	50 - 75%	-	12	48	
	75 - 100%	-	5	140	
	Direct Impact	-	9	290	299
Applicant's Reconfigured Alternative 1	25 - 50%	-	260	-	1,150
	50 - 75%	-	230	-	
	75 - 100%	-	380	280	
	Direct Impact	-	520	600	1,120
Applicant's Reconfigured Alternative 2 Phase 1	25 - 50%	-	-	46	117
	50 - 75%	-	-	36	
	75 - 100%	-	-	35	
	Direct Impact	-	-	84	84
Applicant's Reconfigured Alternative 2 (Phases 1&2)	25 - 50%	-	80	3	144
	50 - 75%	-	39	6	
	75 - 100%	-	11	5	
	Direct Impact	-	140	540	680
Applicant's Reconfigured Alternative 3 Phase 1	25 - 50%	-	-	81	280
	50 - 75%	-	-	69	
	75 - 100%	-	-	130	
	Direct Impact	-	-	51	51
Applicant's Reconfigured Alternative 3 (Phases 1&2)	25 - 50%	-	68	6	94
	50 - 75%	-	10	9	
	75 - 100%	-	1	1	
	Direct Impact	-	150	640	790

Table 2. Direct and indirect impacts to the sand transport corridor/MFTL habitat areas under the Proposed Project and alternatives. Indirect impacts (white cells) are due to reduced sand transport from upwind. Direct impacts (grey cells) are due to project footprint in the dune areas.

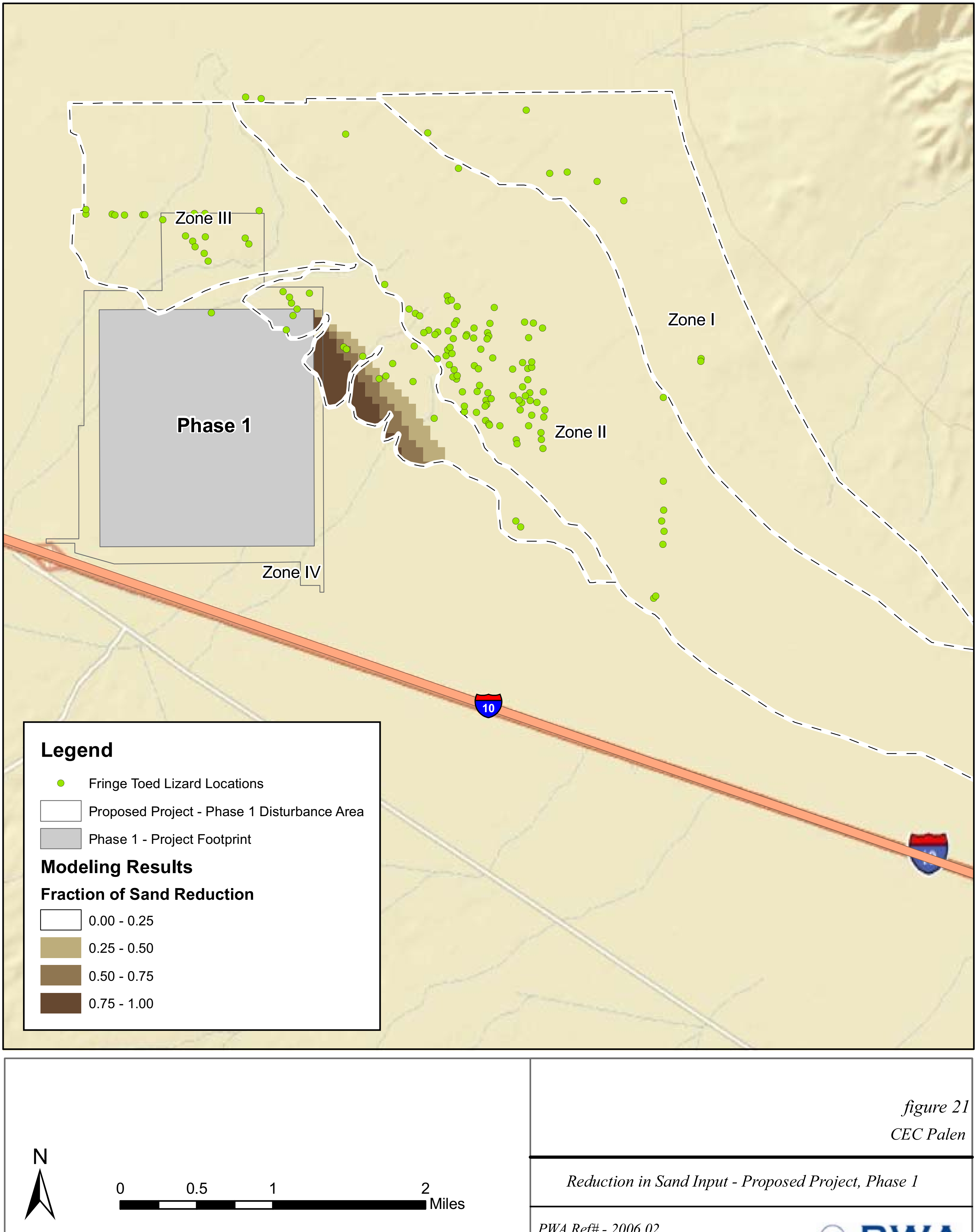


figure 21

CEC Palen

Reduction in Sand Input - Proposed Project, Phase 1

PWA Ref# - 2006.02

PWA

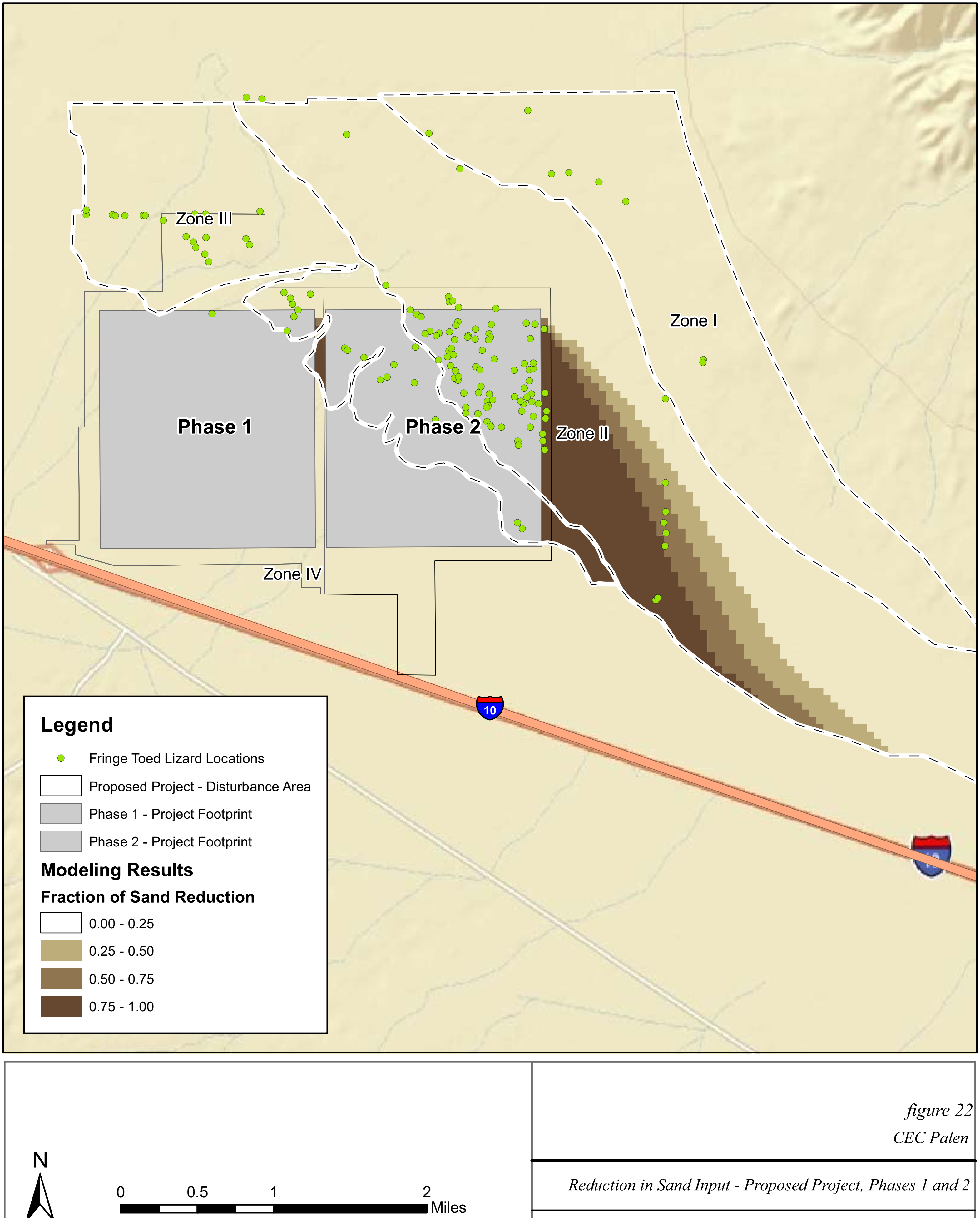


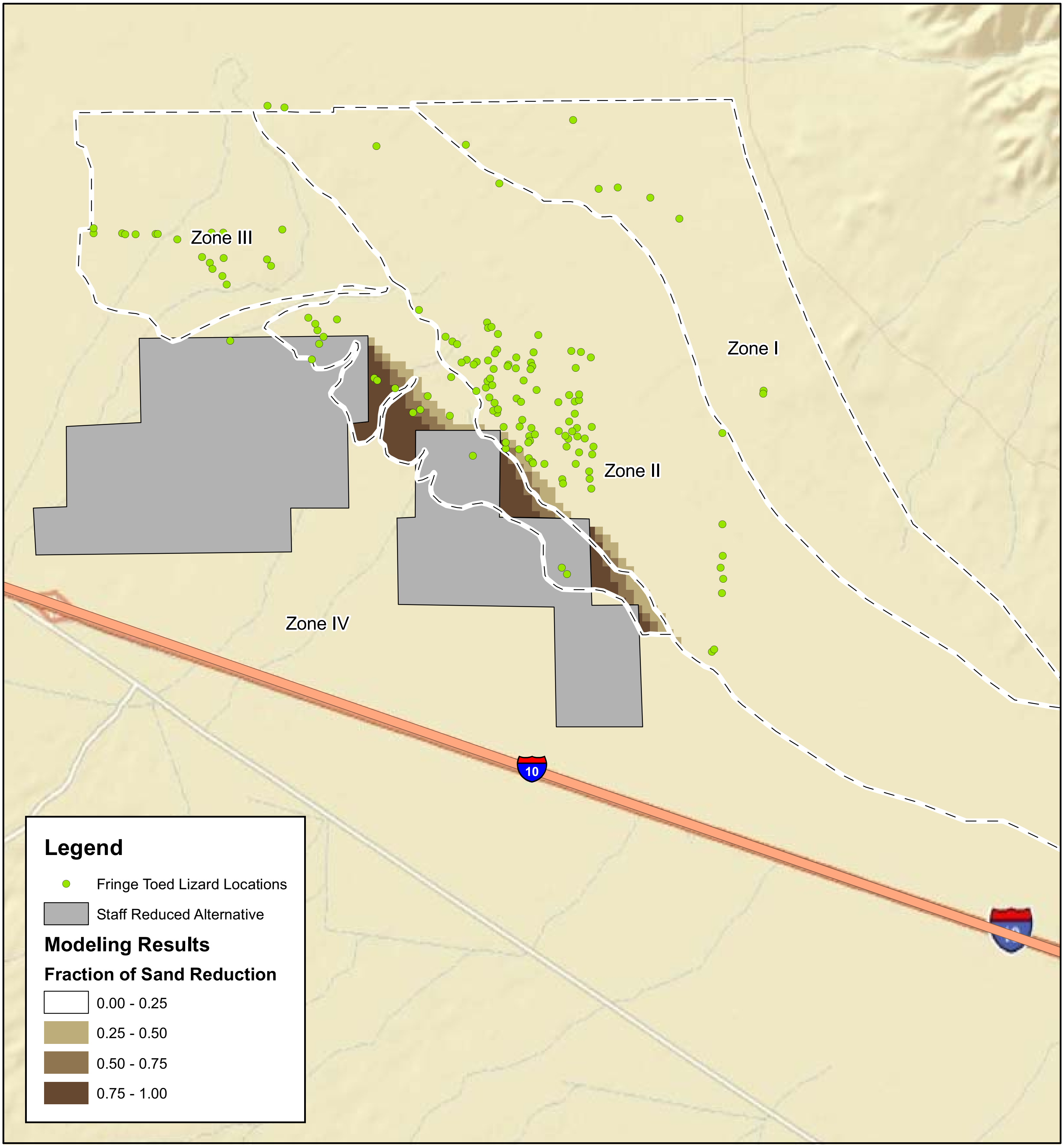
figure 22

CEC Palen

Reduction in Sand Input - Proposed Project, Phases 1 and 2

PWA Ref# - 2006.02

PWA



N

0 0.5 1 2 Miles

figure 23

CEC Palen

Reduction in sand input - Staff Reduced Alternative

PWA Ref# - 2006.02

PWA

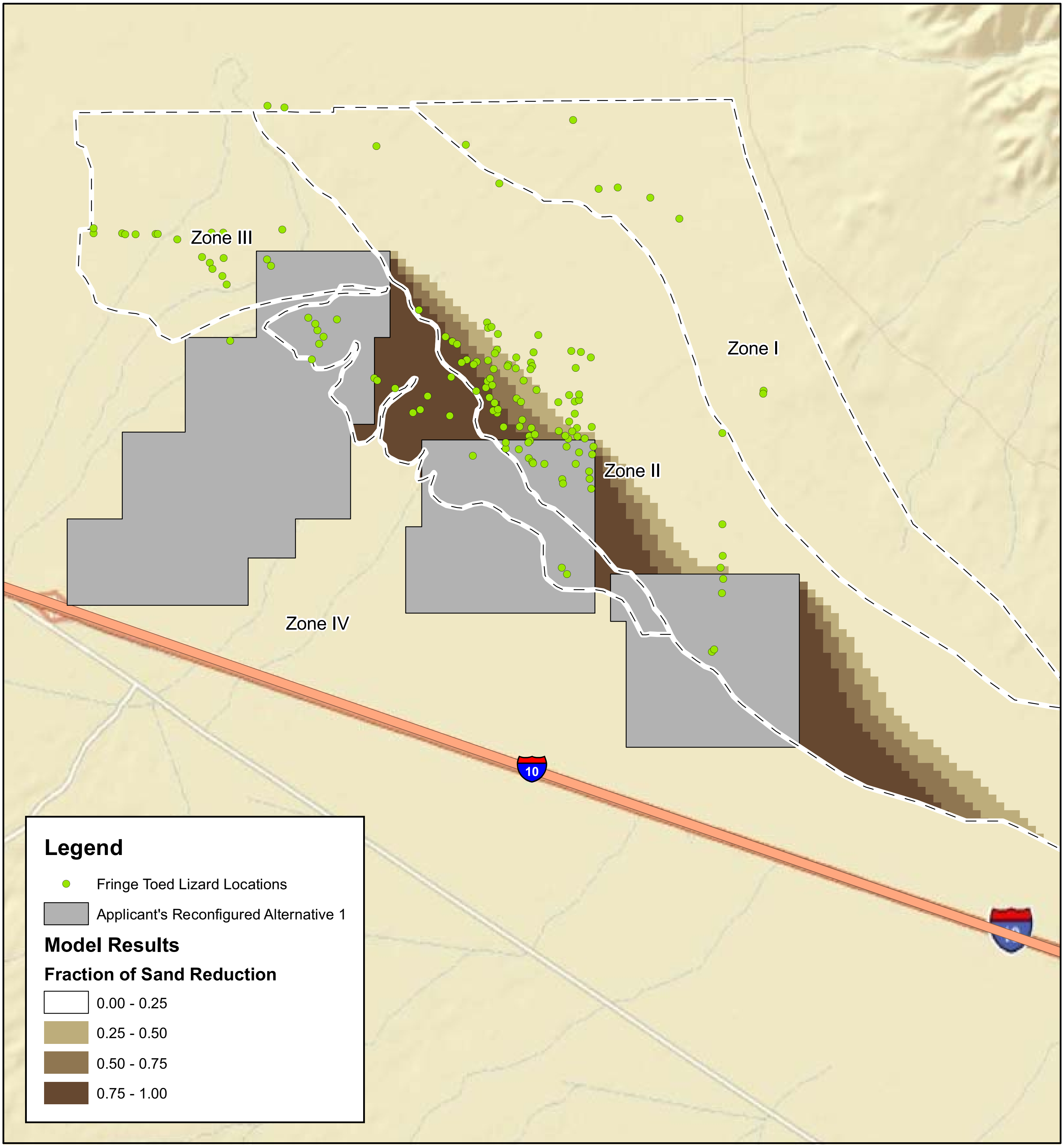


figure 24

CEC Palen

Reduction in sand input - Applicant's Reconfigured Alternative 1

PWA Ref# - 2006.02

PWA

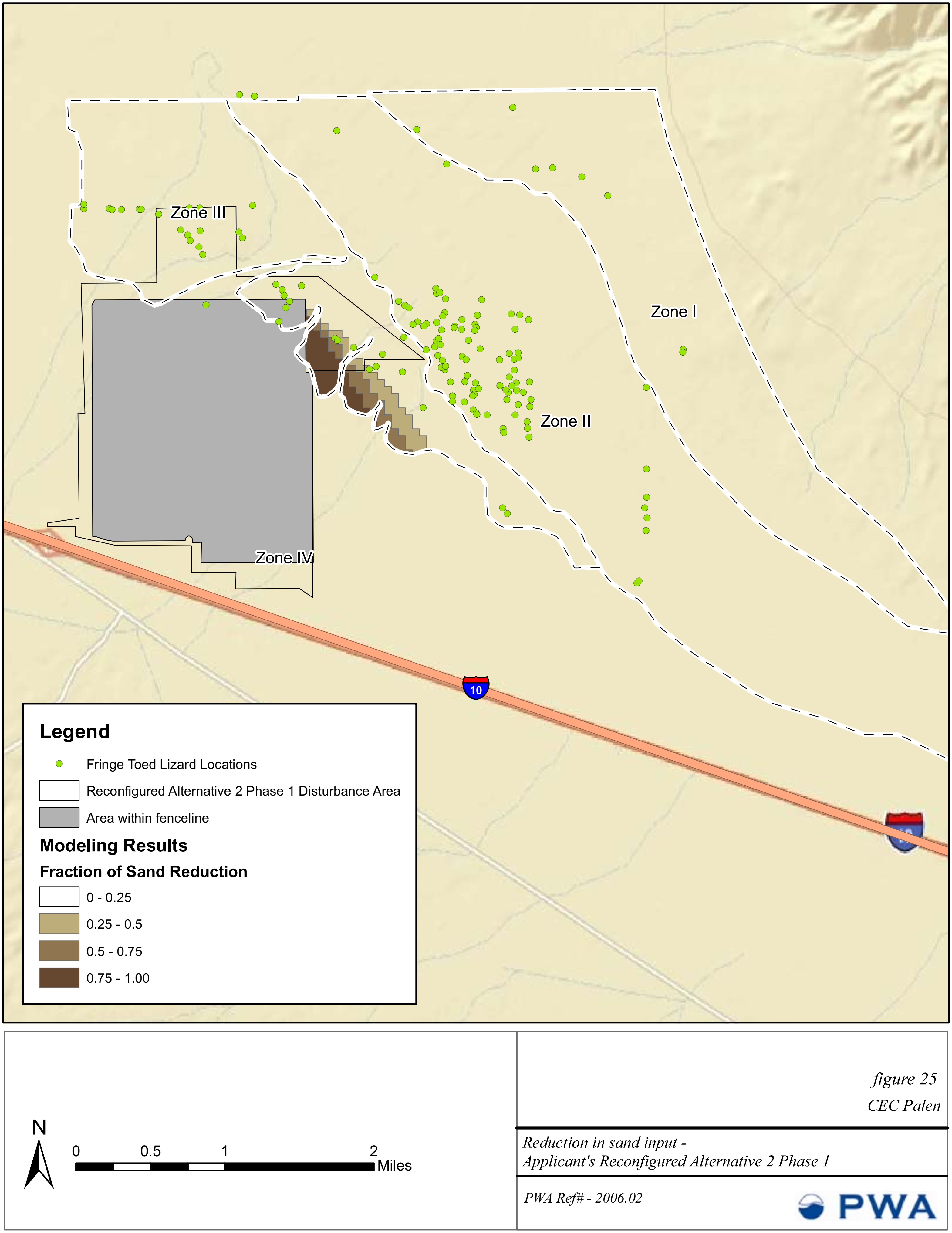


figure 25

CEC Palen

Reduction in sand input -
Applicant's Reconfigured Alternative 2 Phase 1

PWA Ref# - 2006.02

PWA

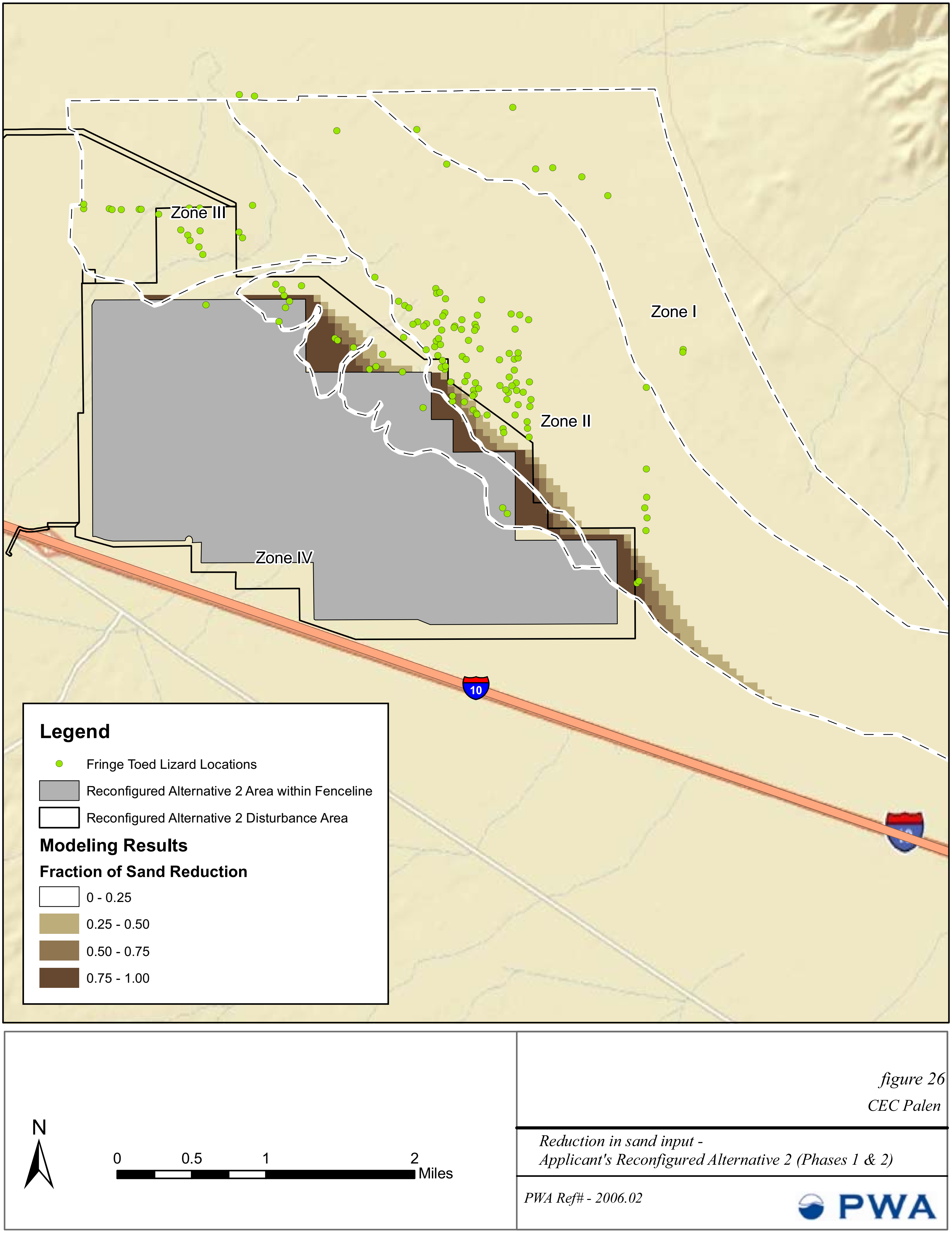


figure 26

CEC Palen

Reduction in sand input -
Applicant's Reconfigured Alternative 2 (Phases 1 & 2)

PWA Ref# - 2006.02

PWA

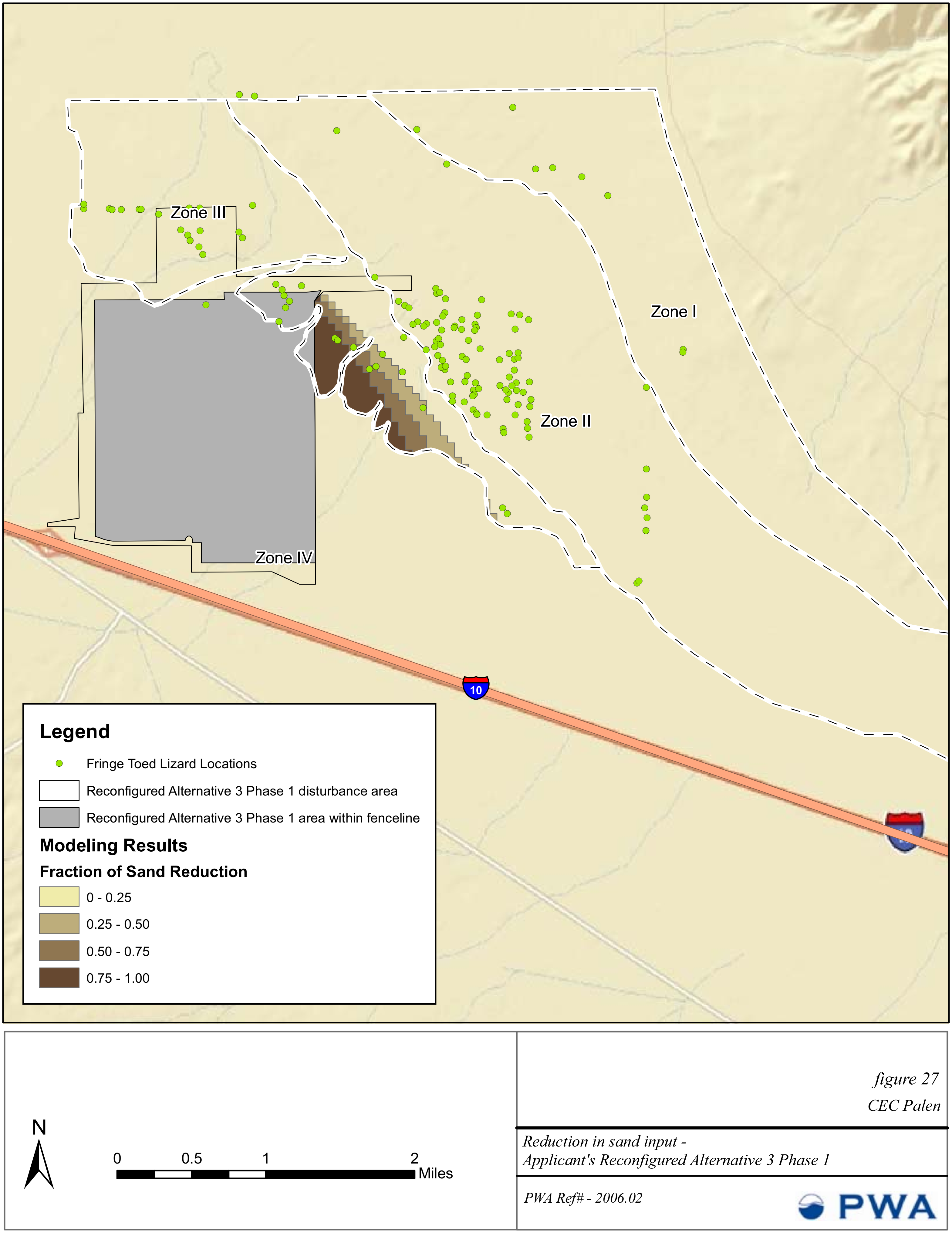


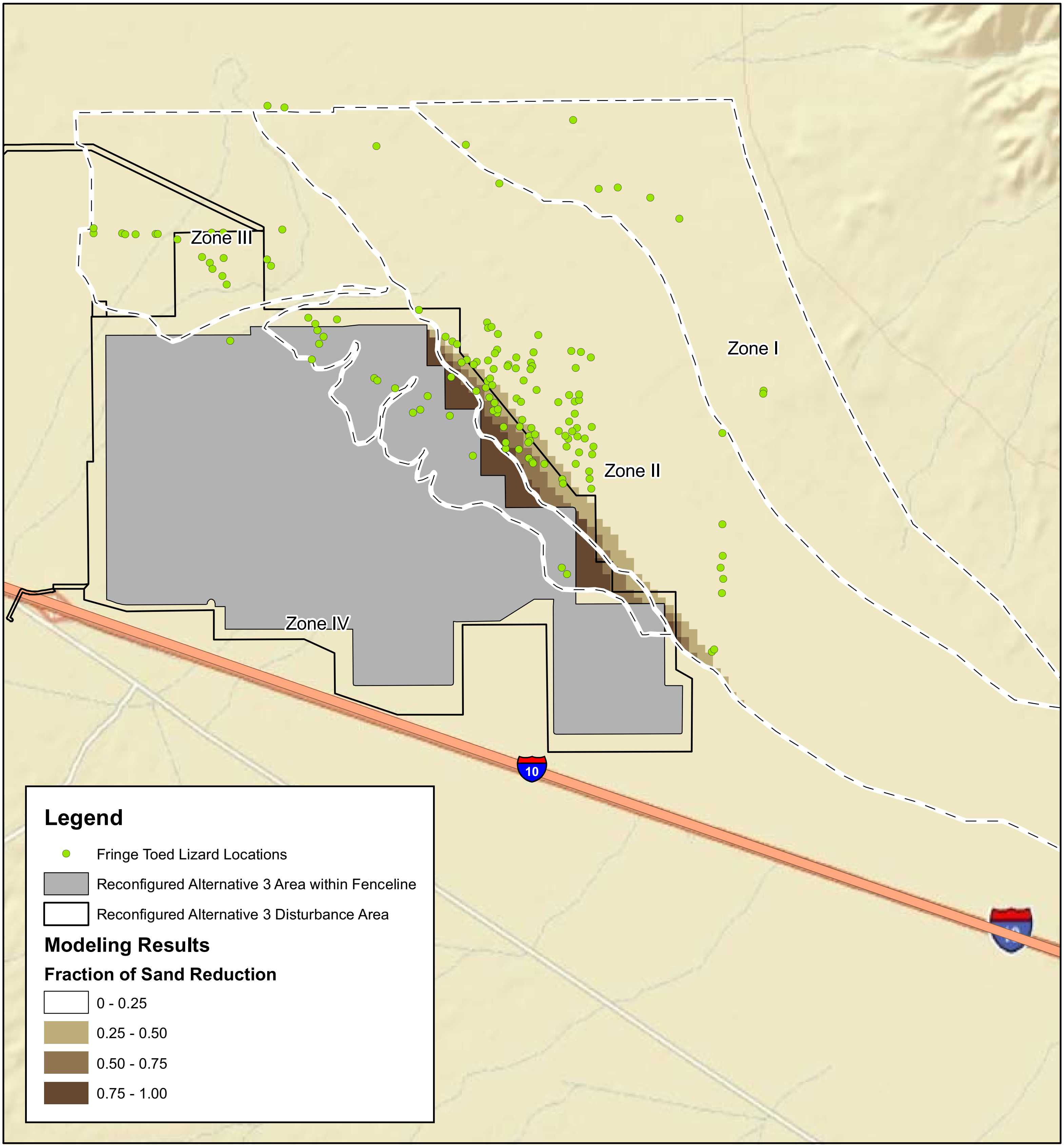
figure 27

CEC Palen

Reduction in sand input -
Applicant's Reconfigured Alternative 3 Phase 1

PWA Ref# - 2006.02

PWA



N
0 0.5 1 2 Miles

figure 28

CEC Palen

Reduction in sand input -
Applicant's Reconfigured Alternative 3 (Phases 1 & 2)

PWA Ref# - 2006.02

PWA

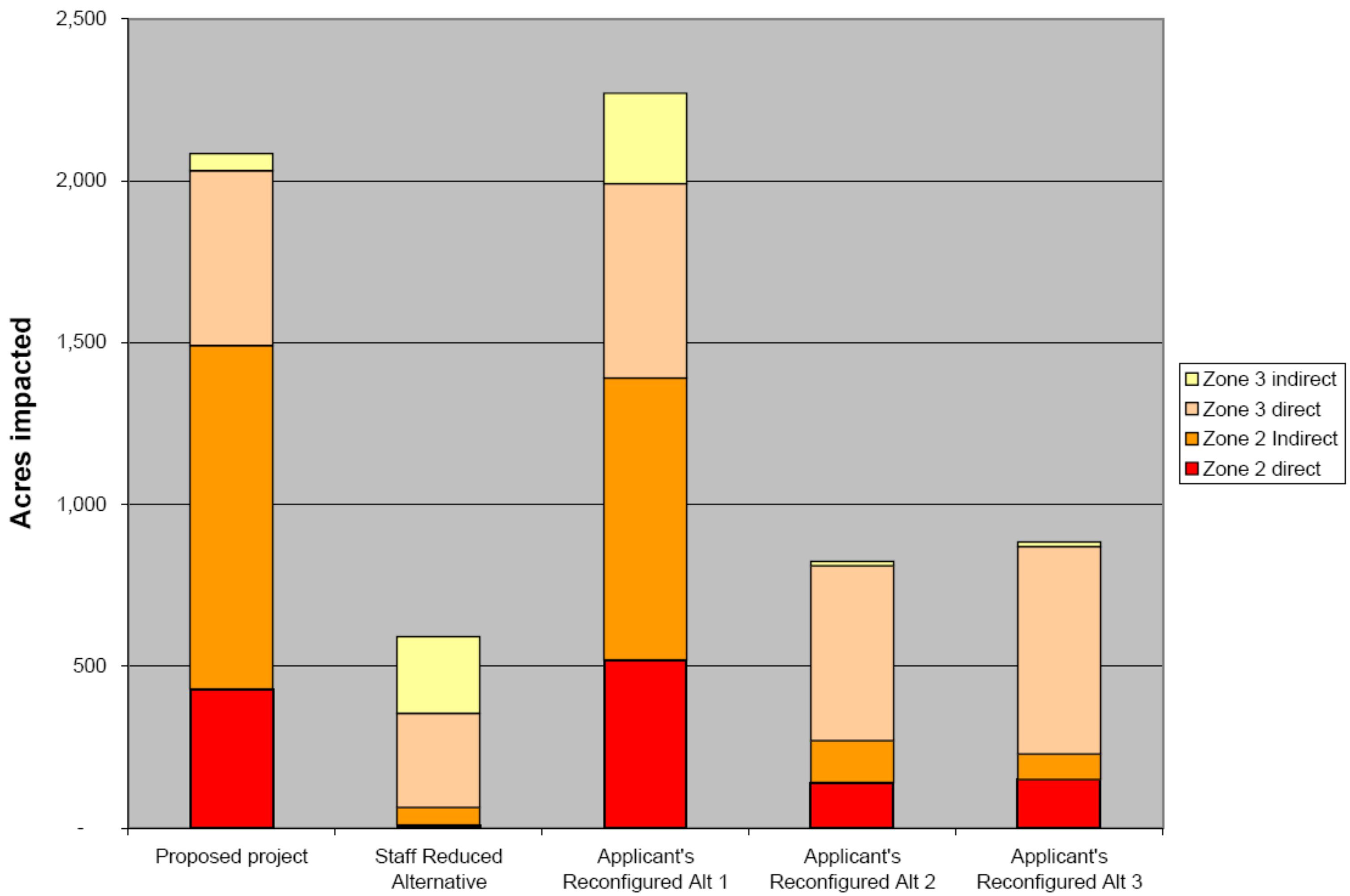


figure 29
CEC Palen

Summary of Alternatives' Impacts on Sand Transport Corridor

PWA Ref# 2006.02

PWA

5.4 DISCUSSION OF RESULTS

Table 2 provides a detailed break down of the direct and indirect impacts of the project alternatives. Note that comparing the Staff Reduced Acreage Alternative with the other alternatives is challenging because it only includes the solar arrays and does not include a disturbance area between the arrays and the property line, as the Proposed Project and the Applicant's Reconfigured Alternatives 2 and 3 do.

The proposed project was analyzed in two phases. Phase 1 (Figure 21) directly impacts 51 acres of sand corridor and indirectly impacts 191 acres. Phase 2 of the Proposed Project (Figure 22) has the highest indirect and direct impacts of any complete project in Zones 2-3, with a total of 970 acres of direct impact and 1,113 acres of indirect (sand shadow) impacts. Most of the indirect impacts are in the most sensitive Zone 2 (where the greatest population of MFTL is found).

The Staff Reduced Acreage Alternative (Figure 23) has the lowest direct or indirect impact on the sand transport corridor of any of the alternatives, with 292 acres of indirect and 299 acres of direct impact. Most of the indirect impacts are focused in the less sensitive Zone 3. Note that if the Staff Reduced Acreage Alternative was assessed with a disturbance area around the solar arrays (as the Proposed Project and the Applicants Reconfigured Alternatives 2 and 3 have been) the direct impact area would increase slightly and the indirect impact area would decrease (because some areas shown in our assessment as indirect impact would lie within the disturbance boundary). The total impact area would be the same.

The Applicant's Reconfigured Alternative 1 (Figure 24) has lower impacts than the Proposed Project, but retains high direct (1,120 acres) and indirect impacts (1,150 acres). Most of the indirect (sand shadow) impacts are in the more sensitive Zone 2 with the direct impacts split almost evenly between Zones 2 and 3.

In response to Staff feedback on the proposed project the Applicant developed two further Reconfigured Alternatives. These alternatives were assessed in two phases. Though not as low in impacts as the Staff Reduced Acreage Alternative, both applicant alternatives represent a substantial improvement over the proposed project, with greatly reduced direct and indirect impacts to the sand transport corridors. Phase 1 of the Applicant's Reconfigured Alternative 2 (Figure 25) has 117 acres of indirect impact and 84 acres of direct impact to the sand transport corridor, with Phase 2 (Figure 26) bringing this to 144 acres of indirect impact and 680 acres of direct impact. Most of the indirect impact is in the more sensitive Zone 2. Most of the direct impact is in the less sensitive Zone 3.

Phase 1 of the Applicant's Reconfigured Alternative 3 directly impacts 51 acres of the sand transport corridor and indirectly impacts 280 acres (Figure 27). Adding Phase 2 lowers the indirect impact to 94 acres but raises the direct impact to 790 acres (Figure 28). The shift between direct and indirect impact between Phases 1 and 2 is because much of the indirectly impacted area in Phase 1 is subsequently built on (directly impacted) in Phase 2. Most of the indirect impact is in Zone 2, but most of the direct impact is in Zone 3.

The alternatives are summarized in Figure 29 which shows impact by Zone of the sand transport corridor. The Proposed Project and the Applicant's Reconfigured Alternative 1 have extremely high impacts that have been judged to be significant and non-mitigable in the Draft Staff Assessment. The Reduced Acreage, Reconfigured Alternative 2 and Reconfigured Alternative 3 are all superior to the proposed project in terms of direct and indirect impacts. The Reduced Acreage Alternative has the lowest impacts and is the superior alternative based purely on impacts to dune habitat. There is little difference between the two applicant reconfigured alternatives from a sand transport and dune impact perspective since Alternative 2 offers the lowest total impact but the highest impact in the most sensitive Zone 2, whereas Alternative 3 offers a lower total impact but a higher impact to Zone 2.

5.5 COMPARISON OF THE STAFF-CALCULATED INDIRECT IMPACT AREAS AND THE APPLICANT'S INDIRECT IMPACT AREAS

In response to a data request from CEC dated July 9th 2010 the applicant submitted their own estimate of indirect impacts from wind transport (Kenney, July 20th 2010b, "Geomorphic evaluation of aeolian sand mitigation for reconfigured alternatives 2 and 3"). The resulting sand shadows are shown in Figure 30 and 31 and are somewhat smaller than the areas calculated in this report. Dr. Kenney's analysis used the same prevailing wind data that this report relies upon (his own data), but is different from our analysis in several ways. Firstly it sets the bar for impact much lower than our analysis. Figures 32 and 33 show the wind shadows estimated by Dr. Kenney superimposed on the sand reduction calculations we produced. This shows that Dr. Kenney's threshold for a shadow registering as an impact is approximately an 85% sand reduction or greater, whereas we consider an area impacted if it experiences a reduction in sand of 25% or more. Secondly, measuring the orientation of Dr. Kenney's sand shadows relative to the closest wind vectors (Figure 34) shows that in many cases he used orientations that are more northerly (making the shadow smaller) than the orientation of his field data.

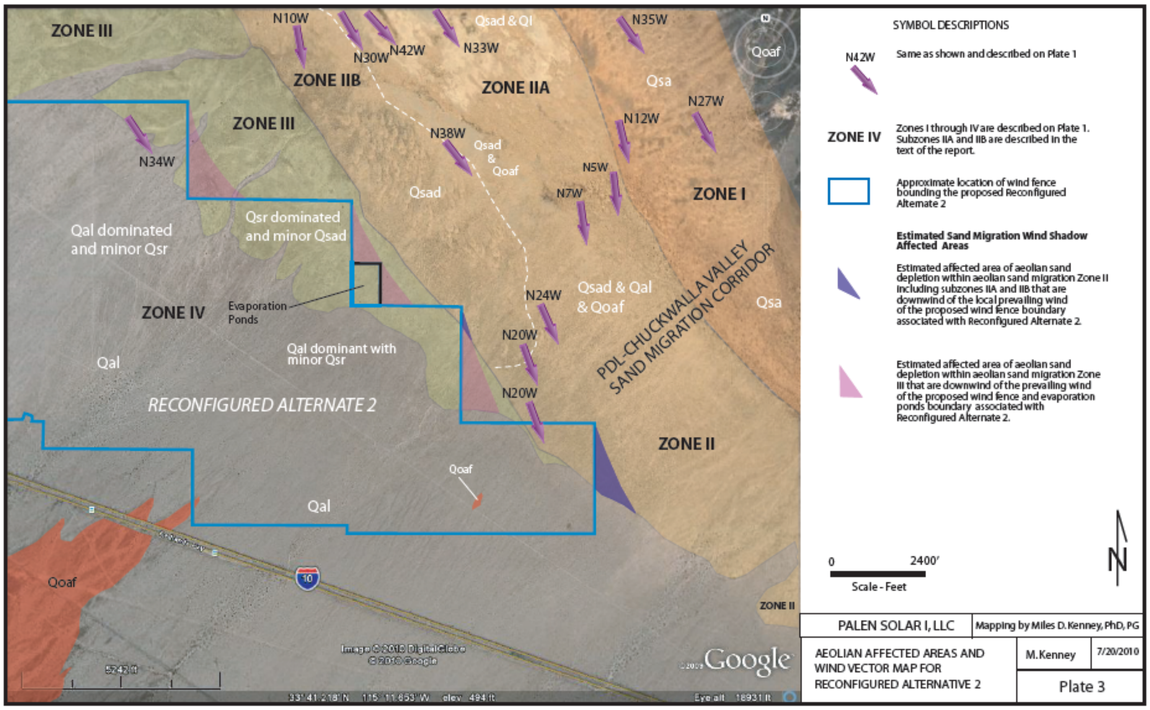


Figure 30. Indirect sand shadow impacts for Applicant's Alternative 2 as calculated by the applicant (Kenney, 2010b)

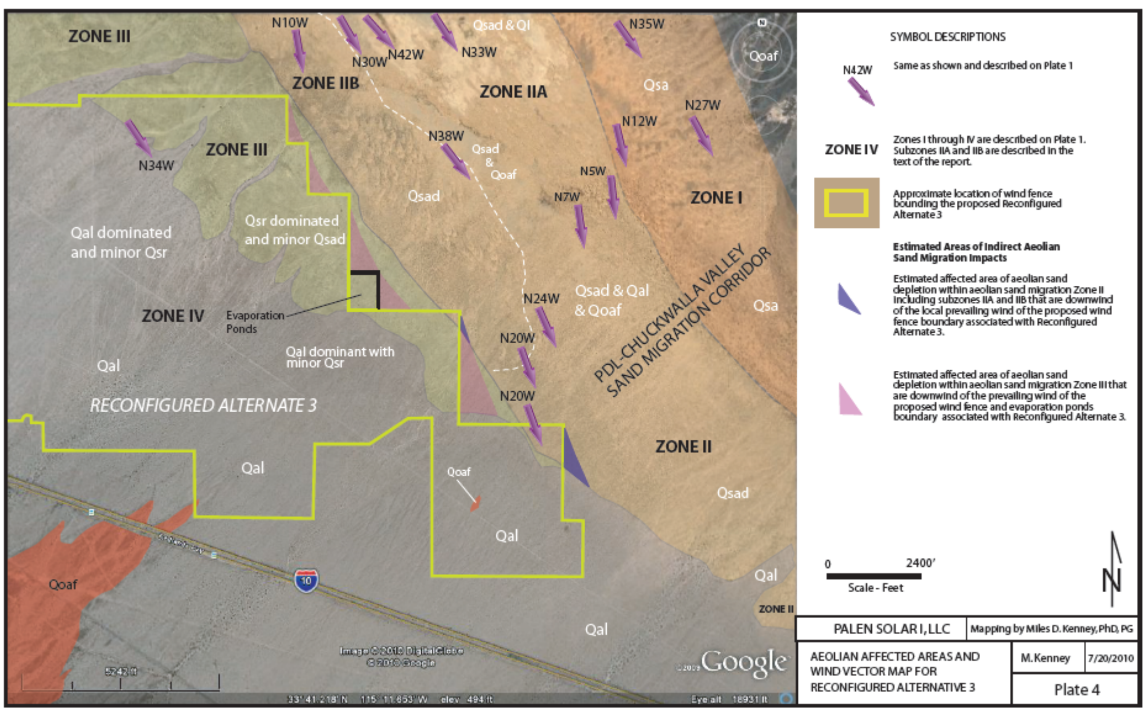


Figure 31. Indirect sand shadow impacts Applicant's Alternative 3 as calculated by the applicant (Kenney, 2010b)

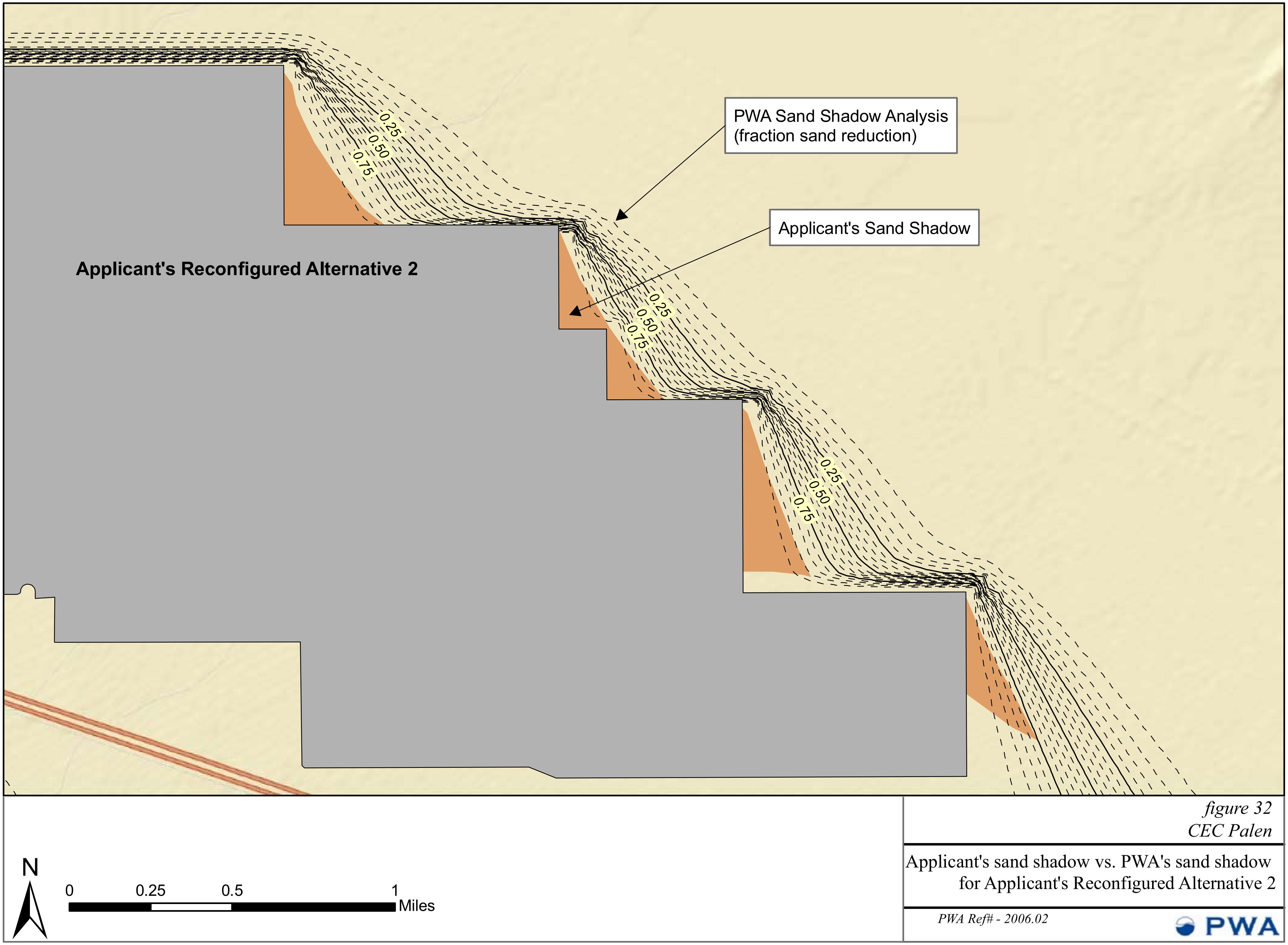


figure 32
CEC Palen

Applicant's sand shadow vs. PWA's sand shadow for Applicant's Reconfigured Alternative 2

PWA Ref# - 2006.02

PWA

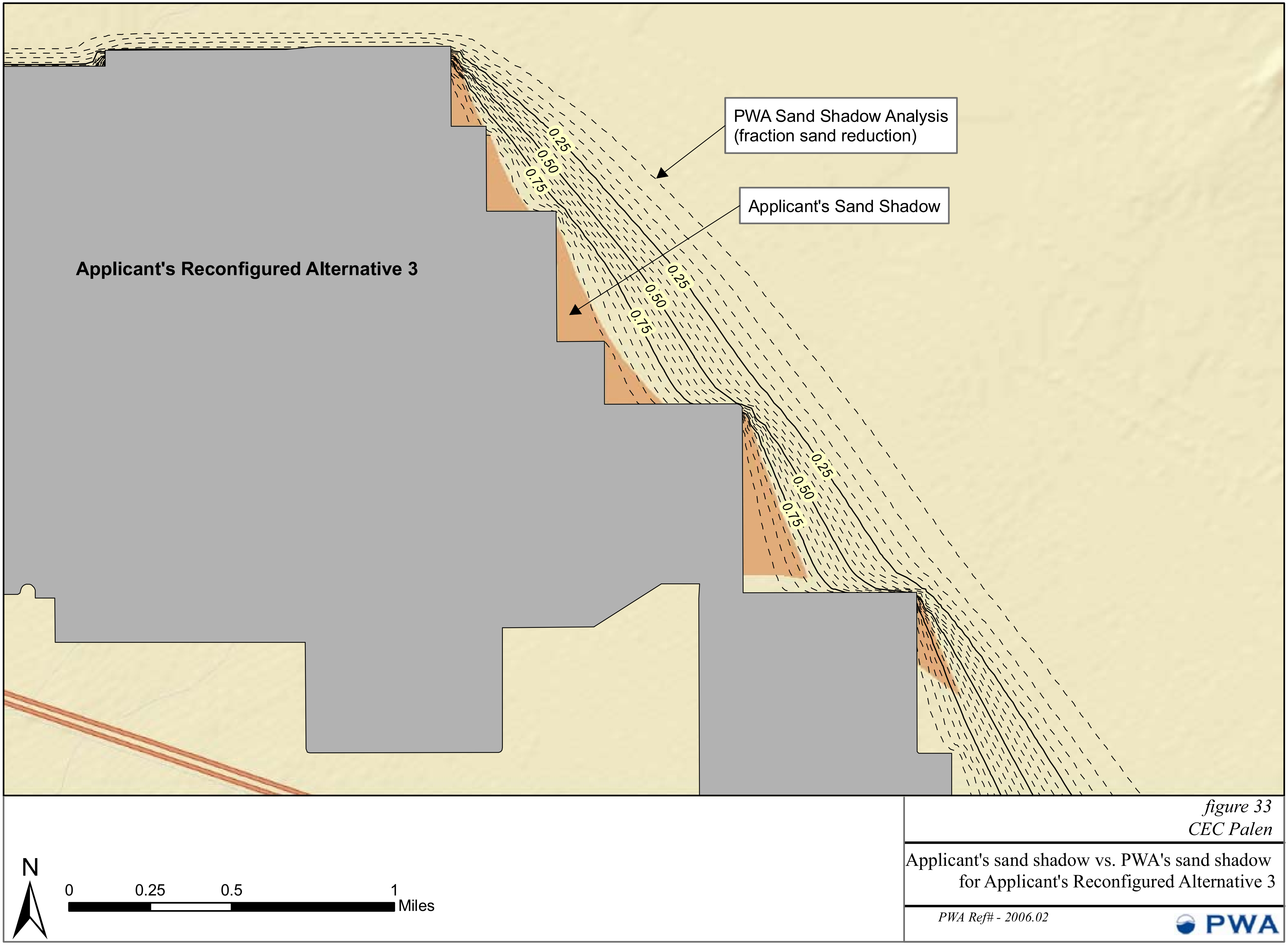
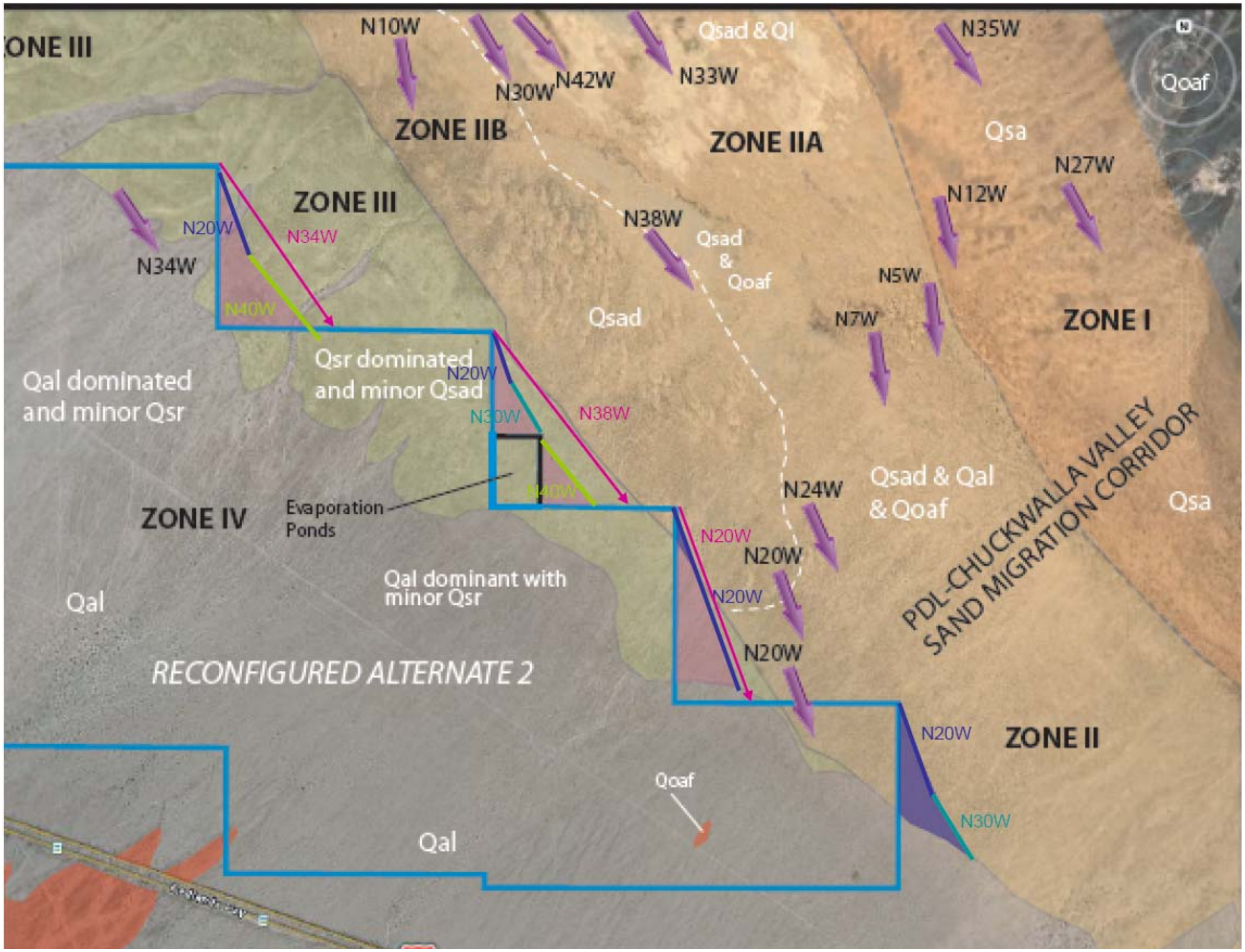


figure 33
CEC Palen

Applicant's sand shadow vs. PWA's sand shadow for Applicant's Reconfigured Alternative 3

PWA Ref# - 2006.02

PWA



Source: Kenney, 2010b Geomorphic evaluation of aeolian sand mitigation for reconfigured alternatives 2 and 3

Note: Applicant's sand shadow mitigation areas are shown in pink. Colored lines and labels are the orientations of the applicant's shadows. Wide purple arrows with black text are the applicant's measured sand dune orientations (surrogate for prevailing wind direction). Thin purple arrows are the orientation of the applicant's nearest sand dune overlain on the sand shadow.

figure 34
CEC Palen

Applicant's wind shadows showing underlying data

PWA Ref# 2006.02

PWA

In several submissions (e.g. Galati & Blek 2010j) and at staff workshops the Applicant has contested the wind shadow area estimates produced by PWA. The Applicant has asserted that PWA overestimated the area for two reasons: assuming a single prevailing wind direction that was from a more westerly direction that actually occurs, and ignoring the greater concentration of sand coming down Zone 1. The first claim is incorrect, as explained in the model description above. The model assumes the same prevailing wind direction as recorded by the applicant, primarily with a north and northwesterly direction. Furthermore, Figures 5 and 35 show that the dominant sand corridor is approaching the site from the northwest rather than the north as the Applicant claims. Regarding the second reason, neither the applicant nor staff have measured sand transport rates across the field site so the applicant's assertion that 80-90% of sand transport occurs in Zone 1 is speculative and impossible to verify. However, analysis of aerial photos from different years suggests that the boundary between Zones 1 and 2 is variable and that the width and the activity level of the sand transport corridor is more variable than the Applicant has considered. For example, Figures 5 and 35 show more sand activity in Zone 2 than is apparent on current images in Google Earth, and suggests that the eastern edge of Zone 1 was further west than conditions when mapped by the applicant (Kenney, 2010a). The differences in the apparent sand activity rate and location may reflect changes in the sand transport corridor in response to El Nino and La Nina events. It is erroneous to assume that the wind corridor as observed by the applicant in Winter 2010 (an El Nino winter with wetter conditions than average and therefore less wind activity) will have the same width and level of sand transport in a drier than average La Nina. Within the lifetime of the project there are likely to be five or six wetting and drying cycles of this nature, with associated expansion and contraction of the corridor. Finally, the distribution of levels of sand activity across the different zones is not the issue, since MFTL habitat is not correlated to increasing sand transport rates. MFTL favor a mixture of vegetation (to provide food and cover) and sand dunes. This mixture is most prevalent in Zone 2 (Zone 2B of Kenney 2010b). Dr. Kenney presumably believes that the combination of much greater sand concentrations in Zone 1 with stronger winds from the north would push more sand from Zone 1 into Zone 2, offsetting the losses sand from the project. However, if large volumes of sand were being pushed from Zone 1 to Zone 2 the boundary, and indeed the whole corridor, would bulge further south than it does. As can be seen in Figure 35, the corridor trends approximately northwest to southeast across the project site and then curves more to the east at the southern project boundary.

figure 35

CEC Palen

Aerial photo from springtime suggesting that Zone 1 may be further west than mapped by the applicant.

PWA Ref# - 2006.02

PWA

5.6 POTENTIAL MITIGATION OF INDIRECT IMPACTS TO THE CHUCKWALLA WIND TRANSPORT CORRIDOR

The Applicant has proposed in staff workshops and elsewhere (Galati & Blek 2910j) mitigating the indirect impacts to sand transport by collecting sand on the upwind (northern) sand fence and transporting it to a location where it can be entrained near the downwind (eastern) sand fence. Staff requested specific information about any proposed sand management activities such as clearing accumulated sand from the base of wind fencing (CEC 2010a) but has not yet received information on this subject from the Applicant. In descriptions of the proposed sand replenishment programs (Galati & Blek 2010j) the Applicant has not provided specific examples of sand replenishment schemes in the Mojave Desert or similar environments that are considered successful (or unsuccessful examples from which we can learn lessons) so assessing the likelihood of such a scheme working is difficult. We are conscious from talking to biologists with experience of sand mitigation projects that there are many practical issues that would need to be resolved before implementing such an experimental program (e.g. preventing vegetation from stabilizing sand piles, weed management, direct impacts to Mojave fringe-toed lizards and other dune-dependent species). If the Applicant were to propose such a program staff would need additional information to assess potential impacts to biological resources, including an estimate of the anticipated frequency and volume of sand removal, the location proposed for receipt of the accumulated sand, and descriptions of measures that would be taken to protect surrounding biological resources from impacts associated with such a sand removal program.

6. IMPACTS TO DRAINAGE FEATURES

Overlain on the major landscape units of the project site are a series of drainage lines that cross the site from southwest to northeast. I-10 is an important local control on drainage across the project site since it intercepts a large number of ephemeral washes draining southwest towards the site from the upper alluvial fan. These channels are captured by a series of berms and interceptor channels that run parallel with I-10, periodically funneling the collected water under I-10 at bridges and creating larger washes that pass onto the mid-fan. Thus the site has two types of wash: ‘undersized’ minor washes whose headwaters have been captured by the I-10 interceptor drains and that only drain a small area of their former drainages between I-10 and the project boundary, and two major wash complexes that have been ‘oversized’ by capturing additional flow from all the small drainages upslope of I-10 and that pass under the freeway and onto the Project site.

6.1 MINOR EPHEMERAL WASHES

Approximately a hundred minor washes cross the site from southwest to northeast, draining the area down-fan of I-10 towards Palen Dry Lake (many channels do not reach the lake but dissipate out on the vegetated sand dune surface). 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. There are sinuous and braided channels, with many channels showing evidence of recent flow on February 5th. Evidence of flow and small amounts of sediment transport included dampness, washed out dirt roads where they crossed channels, fresh veneers of sediment deposits, and small knickpoints and scour features of a few inches depth indicating local erosion. Based on the position of the damp ground flow was probably in the order of 1-2 inches deep through the small channels.

Figure 36. Minor ephemeral wash

6.2 MAJOR EPHEMERAL WASHES

There are 2 major ephemeral wash complexes that cross the site from southwest to northeast, draining the area down-fan of I-10 towards Palen Dry Lake. A third wash complex lies just to the southeast. Both major washes were traced from the western project boundary to Palen Dry Lake. The major washes are found as complexes of 10-20 braided channels, with each channel being approximately 10-50 feet wide. The wash complexes widen out from their constriction at I-10 and are approximately 1,500 feet wide after a mile, after which they become very dispersed, lose definition and resemble minor washes. Within a mile of I-10 the major washes have created sandy zones approximately 1,500 feet wide overlain on the less sandy alluvial gravel or thin sand sheets. These areas appear to be potential MFTL habitat, with vegetated dunes. The washes appear to be a local, smaller version of the regional wind-borne sand transport corridors discussed earlier, supplying sand to a narrow surrounding zone. The northern wash travels further between its construction on I-10 and the project site (1.4 miles) and is more dispersed than the central wash, which crossed into the proposed solar array blocks within 0.7 mile from I-10. Thus the central wash carries more sand and has created a wider sand corridor around it in the project area than the northern wash.

Figure 37. One of the main channels in the northern major wash complex. Photo is from close to the western project boundary looking east across the project site towards Palen Dry Lake.

Figure 38. The same major wash as Figure 37 in the middle of the proposed western solar array, showing the channel losing capacity as it flows towards Palen Dry Lake.

Figure 39. The central major wash complex in the center of the site has generated a corridor of sandy dune conditions around it, and supports trees.

6.3 PROJECT IMPACTS TO THE ALLUVIAL DRAINAGES

The minor washes on the project site have already likely been degraded compared with their original condition by the loss of headwater area when I-10 was constructed. They presumably transport water and sediment in smaller volumes and at lower frequencies than before, reducing the habitat quality for organisms that rely on water and fine sediment and favoring more drought tolerant species. On the other hand flow concentration into a smaller number of larger channels has likely improved conditions for water and fine sediment-loving species in the major wash complexes, which have probably become wetter and more sediment rich since I-10 was constructed (see Figure 39). This combination of 'winning' and 'losing' habitat patterns is likely to be somewhat repeated with the proposed project, with the drainage plan capturing the minor drainages, passing them through or around the solar arrays, and dissipating the concentrated flow on the alluvial fan downslope. In the immediate area downslope of the project site it is likely that there will be some disruption to the drainage plan and sediment supply, with flow being initially more concentrated near the dissipaters until it has a chance to spread out and resume a more natural drainage pattern. There is also the potential for sediment to be trapped in the channels or dissipaters where they pass round sharp corners. However, if properly executed and maintained the drainage plan should restore pre-project water and sediment delivery patterns to levels below a significant impact within a few hundred feet of the dissipaters. For most of the project site this distance lies within the disturbance limits and should not be a significant impact to habitat off-site.

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8. LIST OF PREPARERS

This report was prepared by the following PWA staff:

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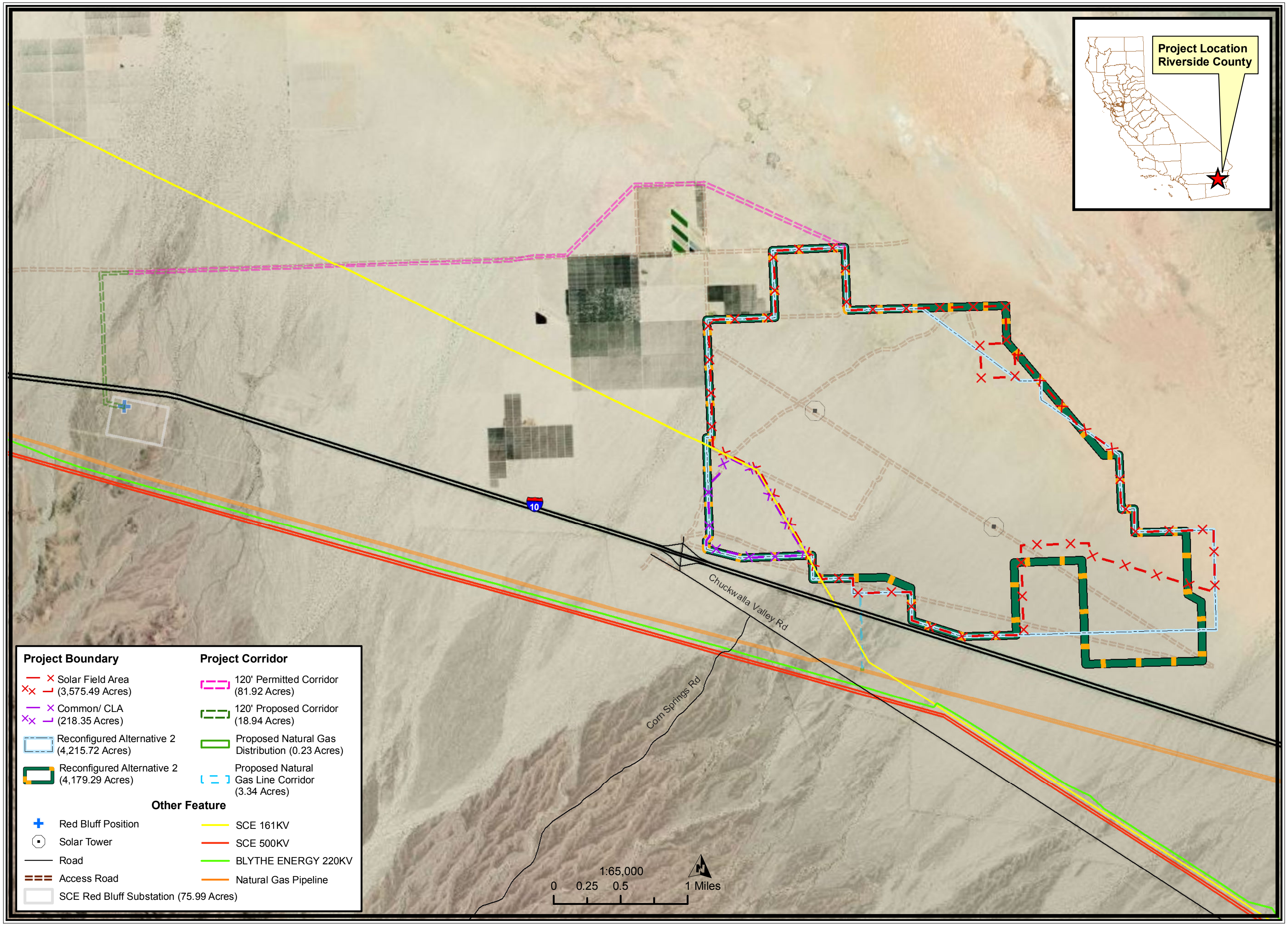
BIOLOGICAL RESOURCES - FIGURE 1

Palen Solar Electric Generating System - Boundary of Approved and Modified Projects



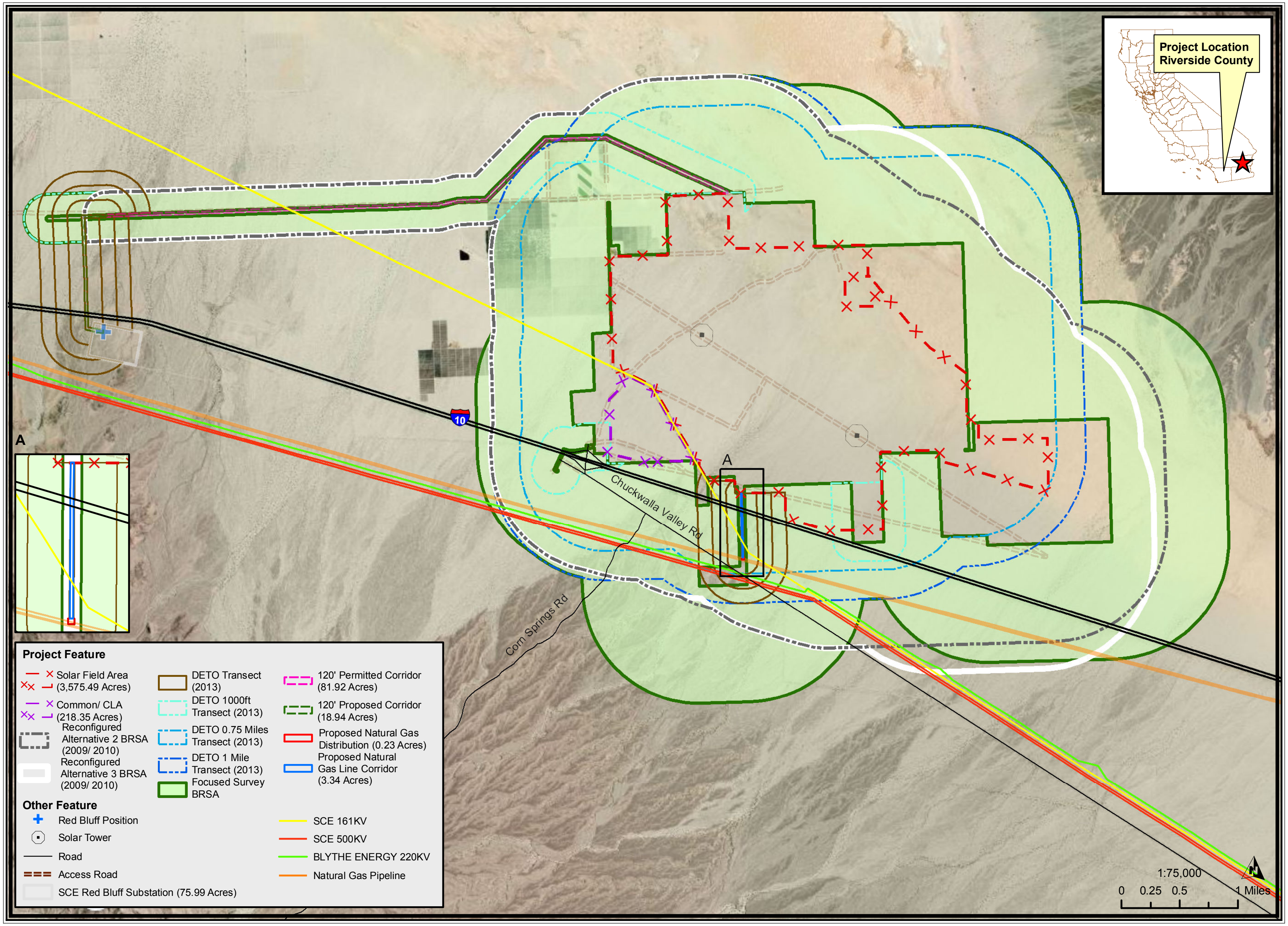
BIOLOGICAL RESOURCES

CALIFORNIA ENERGY COMMISSION - SITING,TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: SOURCE: Bing Aerial, BrightSource - May 2013, OpenStreetMap - May 2013, CEC Transmission Line, Natural Gas Line - June 2013

BIOLOGICAL RESOURCES - FIGURE 2

Palen Solar Electric Generating System - Biological Resources Survey Areas for Approved and Modified Projects

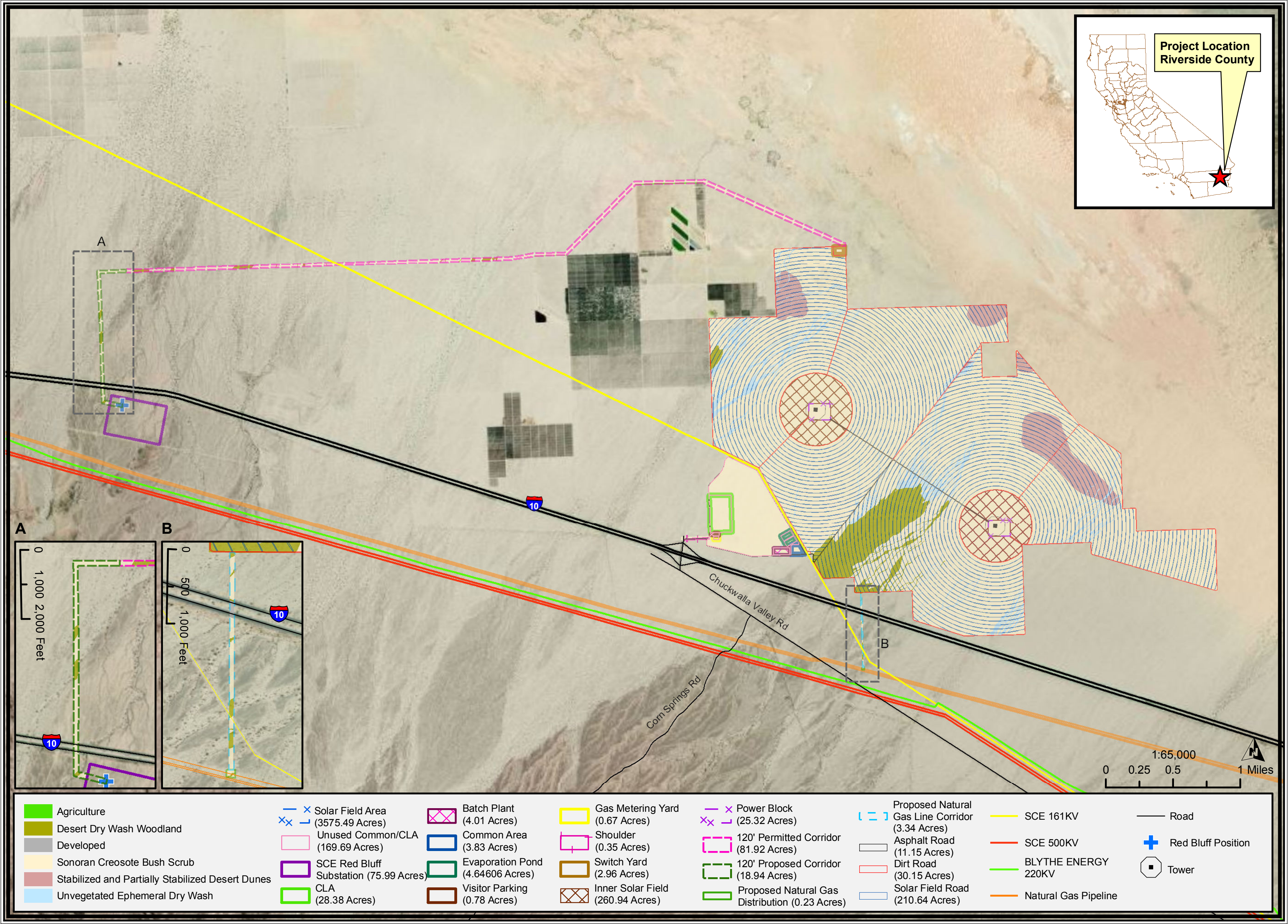


CALIFORNIA ENERGY COMMISSION - SITING,TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: SOURCE: Bing Aerial, BrightSource - May 2013, OpenStreetMap - May 2013, CEC Transmission Line, Natural Gas Line - June 2013

BIOLOGICAL RESOURCES - FIGURE 3

Palen Solar Electric Generating System - Vegetation Communities

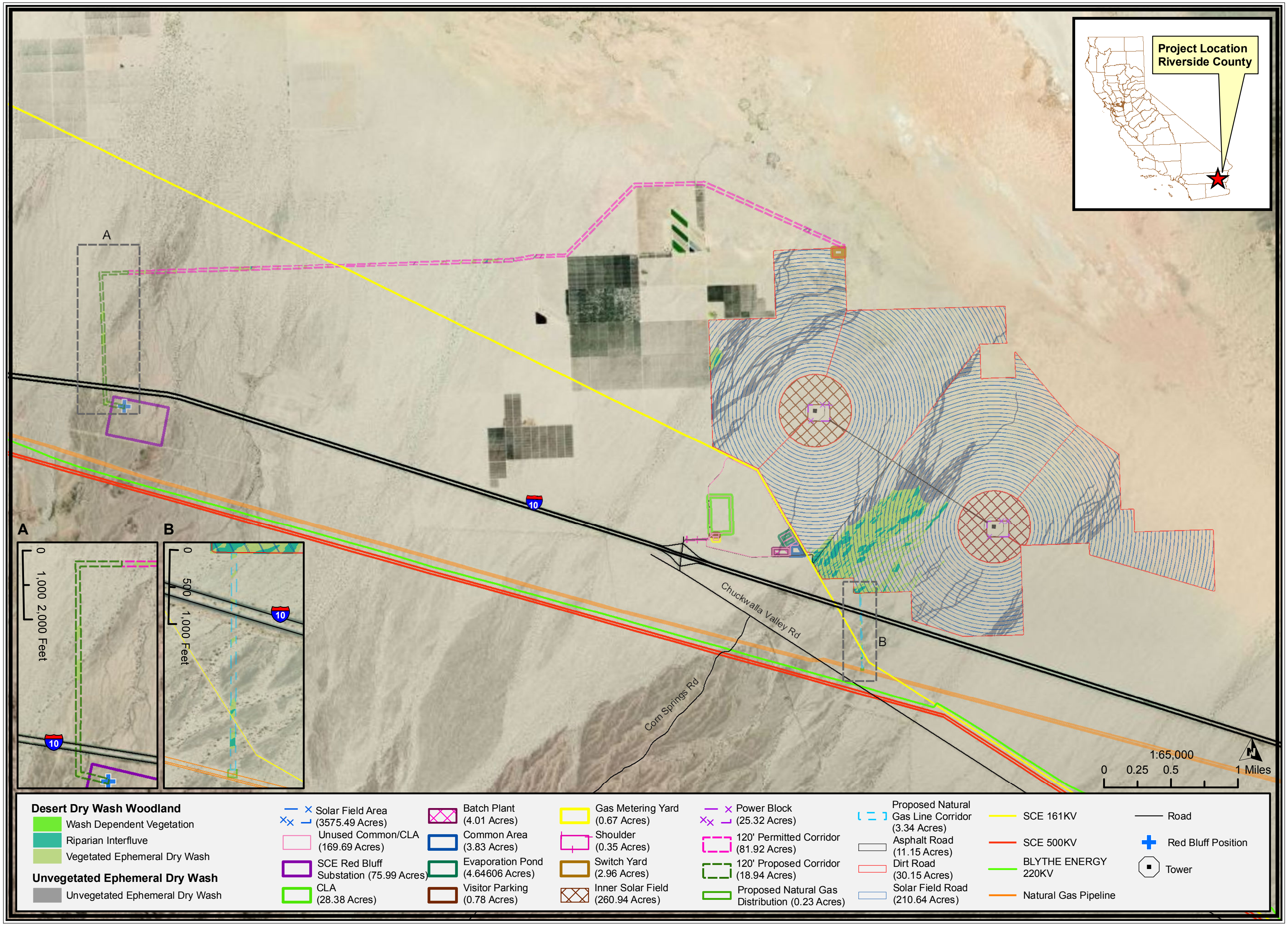


BIOLOGICAL RESOURCES

CALIFORNIA ENERGY COMMISSION - SITING,TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: SOURCE: Bing Aerial, BrightSource - May 2013, OpenStreetMap - May 2013, CEC Transmission Line, Natural Gas Line - June 2013

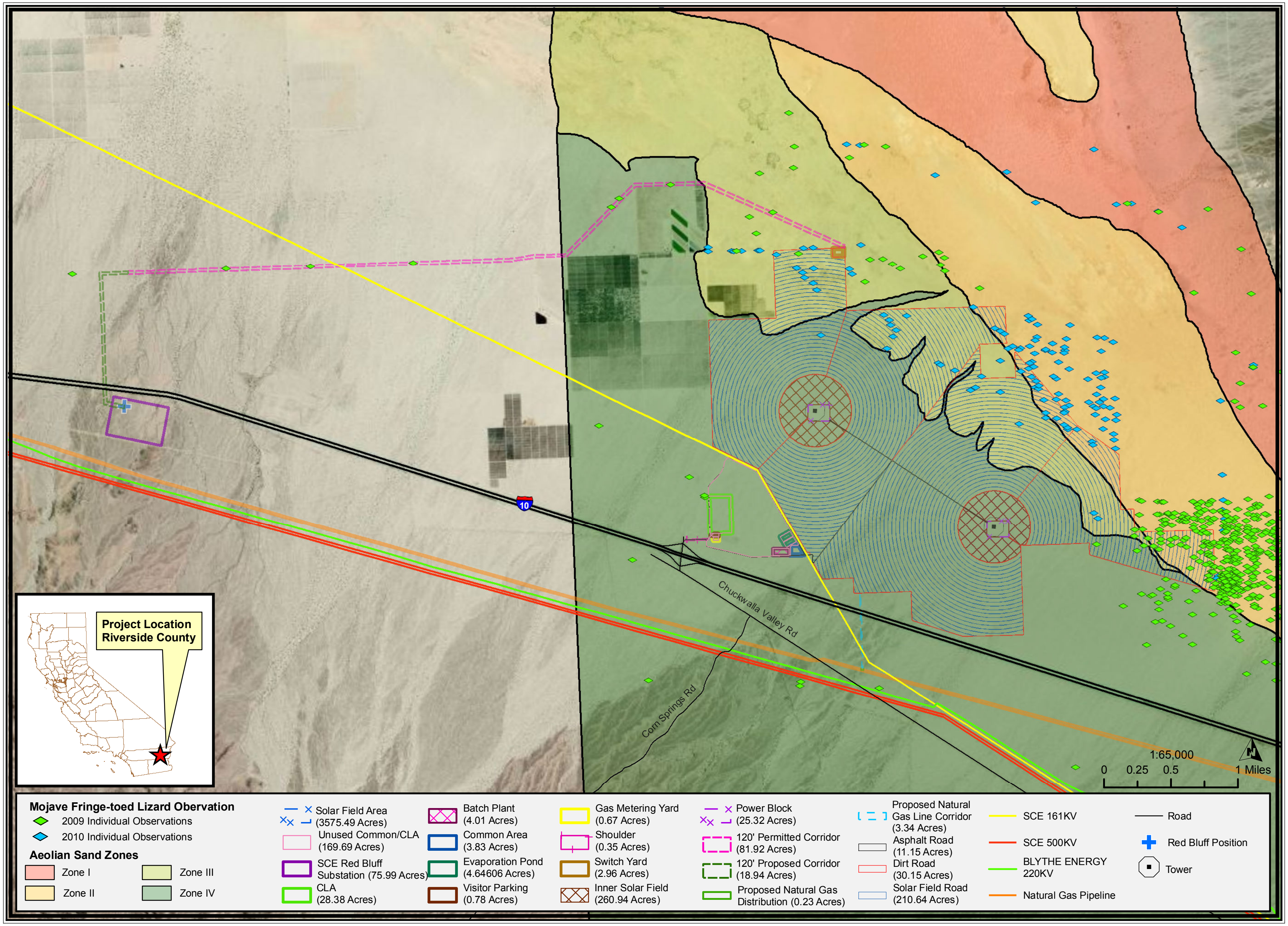
BIOLOGICAL RESOURCES - FIGURE 4
Palen Solar Electric Generating System - State Jurisdictional Waters



CALIFORNIA ENERGY COMMISSION - SITING,TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION
SOURCE: SOURCE: Bing Aerial, BrightSource - May 2013, OpenStreetMap - May 2013, CEC Transmission Line, Natural Gas Line - June 2013

BIOLOGICAL RESOURCES - FIGURE 5

Palen Solar Electric Generating System - Mojave Fringe-toed Lizard Observation & Aeolian Sand Zones



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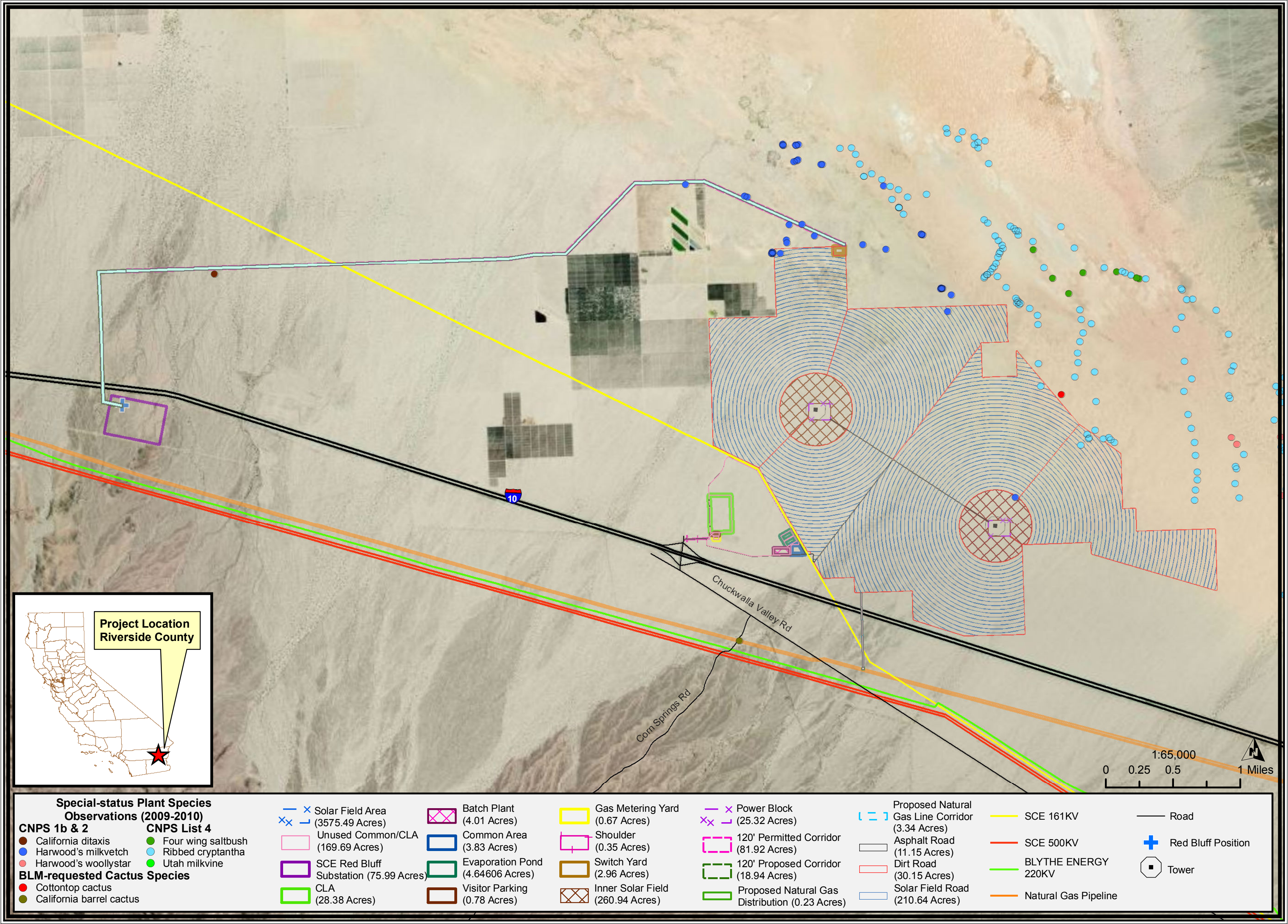
SOURCE: SOURCE: Bing Aerial, BrightSource - May 2013, OpenStreetMap - May 2013, CEC Transmission Line, Natural Gas Line - June 2013

BIOLOGICAL RESOURCES - FIGURE 6

Palen Solar Electric Generating System - Special-status Plant Species



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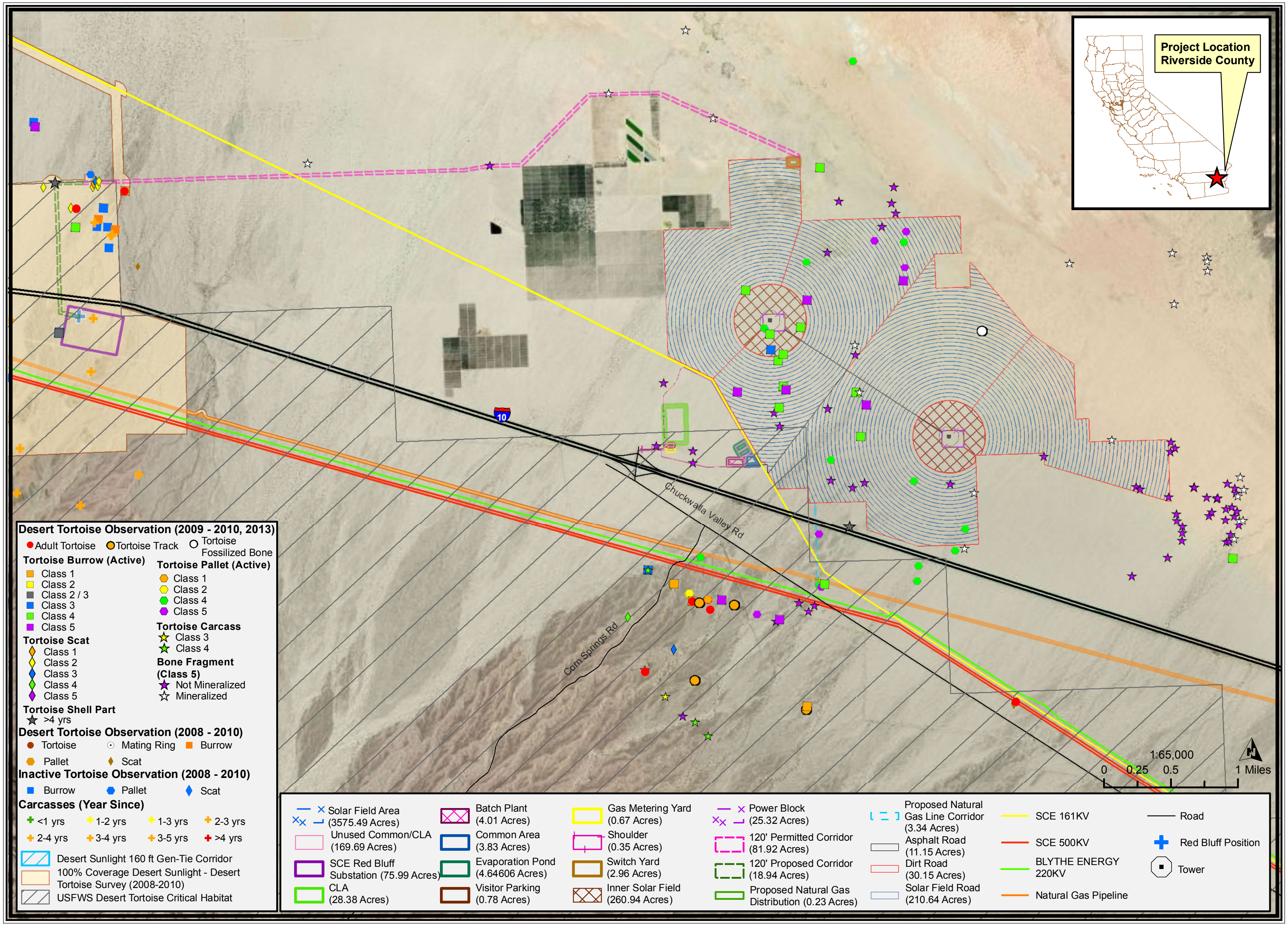
SOURCE: SOURCE: Bing Aerial, BrightSource - May 2013, OpenStreetMap - May 2013, CEC Transmission Line, Natural Gas Line - June 2013

BIOLOGICAL RESOURCES - FIGURE 7

Palen Solar Electric Generating System - Desert Tortoise



BIOLOGICAL RESOURCES

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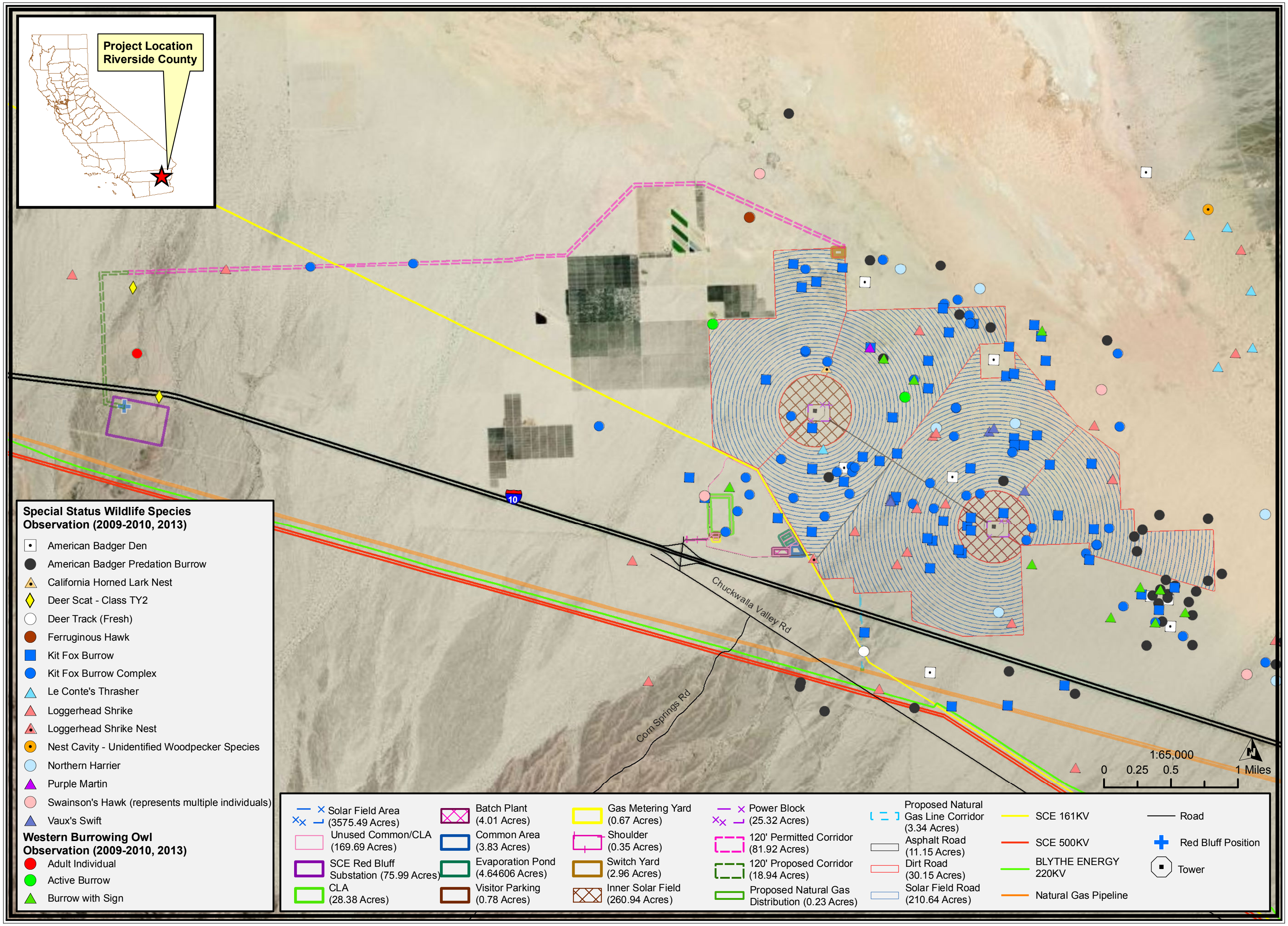
SOURCE: SOURCE: Bing Aerial, BrightSource - May 2013, OpenStreetMap - May 2013, CEC Transmission Line, Natural Gas Line - June 2013

BIOLOGICAL RESOURCES - FIGURE 8

Palen Solar Electric Generating System - Special-status Wildlife

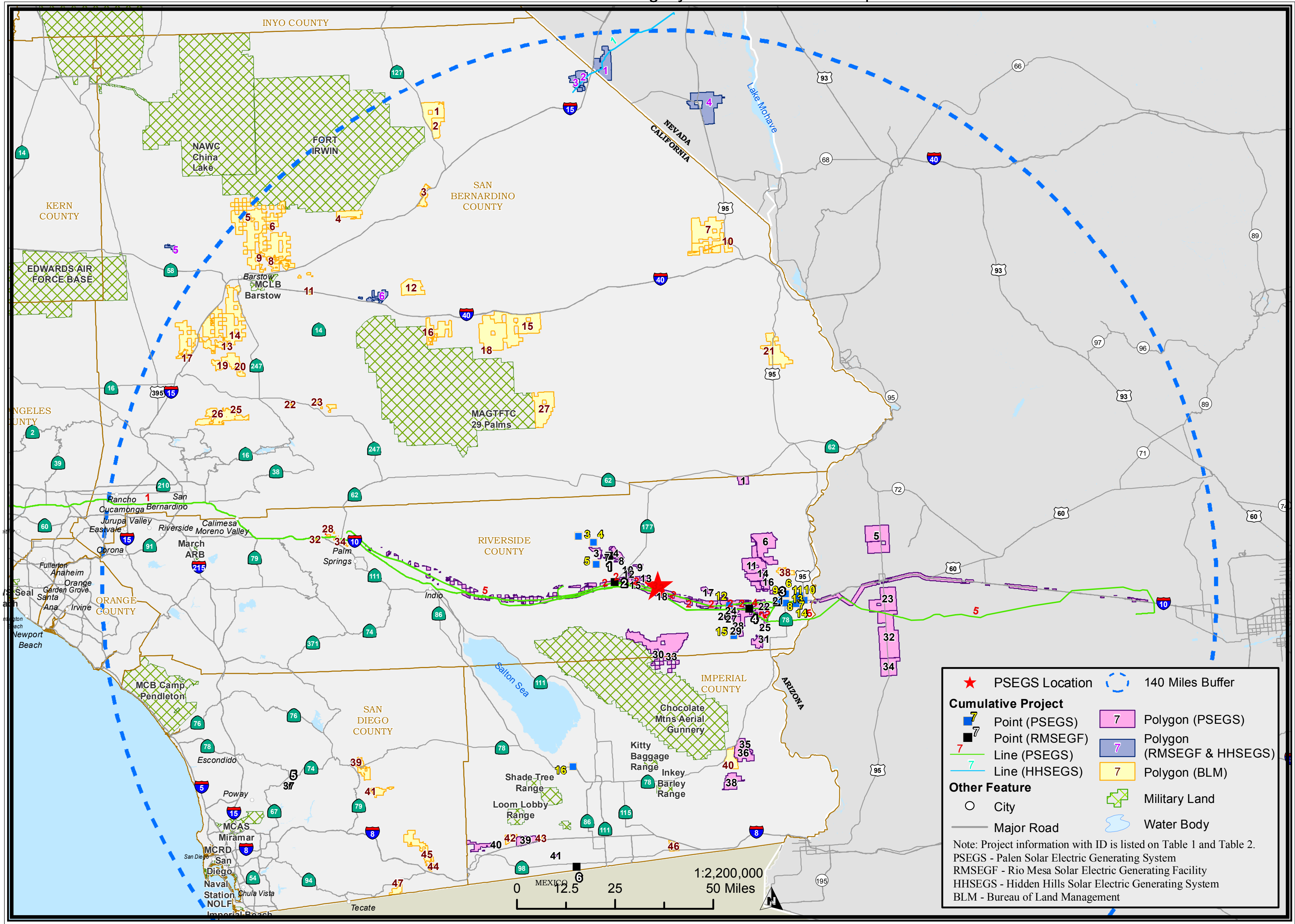


CALIFORNIA ENERGY COMMISSION - SITING,TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: SOURCE: Bing Aerial, BrightSource - May 2013, OpenStreetMap - May 2013, CEC Transmission Line, Natural Gas Line - June 2013

BIOLOGICAL RESOURCES - FIGURE 9

Palen Solar Electric Generating System - Cumulative Impacts



BIOLOGICAL RESOURCES

CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: Microsoft Bing Aerial, BrightSource, OpenStreetMap - May 2013, Bureau of Land Management - May 2013

CULTURAL RESOURCES

Matthew Braun, Thomas Gates, Amber L. Grady, and Michael D McGuirt[1]

SUMMARY OF CONCLUSIONS

On December 17, 2012, Palen Solar Holdings, LLC (PSH) filed a Petition to Amend (Palen 2012A) with the Energy Commission requesting to modify the Palen Solar Power Project (PSPP).The PSPP, is a 500-megawatt (MW) solar thermal power generating facility utilizing parabolic trough technology. The modifications proposed in the Petition to Amend include replacing the parabolic trough solar collection system and associated heat transfer fluid with BrightSource's solar tower technology. Heliostats, pylon-mounted mirrors guided by a single tracking system, focus the sun's rays on a solar receiver steam generator (SRSG) atop a 750-foot tower near the center of each heliostat field to create steam which drives a turbine to generate electricity. The modified project is called the Palen Solar Electric Generating System (PSEGS).

The original analysis of the PSPP's potential to physically damage cultural resources on the facility site and along the linear infrastructure largely stands, as do the conditions of certification that were meant to mitigate for that damage. The principal focus of the present analysis is the assessment of the potential visual effects that the PSEGS project would have on cultural resources away from the facility site.

In 2010, Energy Commission cultural resources staff analyzed cultural resources data for the then proposed PSPP and concluded that that project would have a significant direct effect on 49 resources either recommended eligible or assumed eligible for either the National Register of Historic Places or California Register of Historical Resources. These effects included:

- Physical damage to nine prehistoric archaeological sites, all potential contributors to a prehistoric cultural landscape (historic district) identified by staff and designated as the Prehistoric Trails Network Cultural Landscape (PTNCL);
- Physical damage to 40 historic-period archaeological sites, some of which are potential contributing elements to a historic-period cultural landscape (historic district) identified by staff and designated as the World War II Desert Training Center California-Arizona Maneuver Area Cultural Landscape (DTCCL); and
- Cumulative effects to the PTNCL and the DTCCL, resulting from the PSPP's physical damage to contributors to these assumed register-eligible resources.

Conditions of Certification were recommended in order to reduce and to mitigate for the anticipated physical damage to cultural resources; however, staff determined that cumulative effects would not be reduced to a less than significant level. The Commission Order 10-1215-19, adopted in December 2010, found that the benefits of the PSPP outweighed the immitigable significant direct, indirect and cumulative impacts which may result from its construction and operation.

[1] The text of the present analysis borrows liberally from the *Cultural Resources* section of the September 2010 Revised Staff Assessment, Part 2 (Tremaine and Bastian 2010). Staff decided to bring a lot of the contextual material forward from that document into this one primarily as a convenience to the reader in order to avoid excessive cross-references to another document.

Staff's original analysis found that the physical effects of PSPP's construction, when combined with similar effects from past, present, and reasonably foreseeable future projects, would be cumulatively considerable for cultural resources at both the local I-10 Corridor and regional levels. The original staff analysis estimated that more than 800 sites within the I-10 Corridor, and 17,000 sites within the Southern California Desert Region, could potentially be damaged or destroyed by these projects. Mitigation can help compensate for such destruction, but often not to a less-than-significant level. To reduce, but not fully-mitigate, the anticipated physical damage to cultural resources, staff recommended the adoption of Conditions of Certification **CUL-1** and **CUL-2**. The purpose of **CUL-1** and **CUL-2** was to reduce PSPP's cumulative physical effects by setting up programs to define, document, and nominate to the National Register of Historic Places two cultural landscapes that PSPP shared with two other nearby solar projects (Blythe Solar Power (09-AFC-6C) and Genesis Solar Energy (09-AFC-8C)) that were also before the Energy Commission at that time. The cost of these programs was to be shared by the three projects based on the acreage that they would utilize, and, in the future, by any other renewable energy projects that would adversely affect either of those landscapes.

To mitigate PSPP's physical effects on the original facility site and along the linear infrastructure, staff recommended in September 2010 that the Energy Commission adopt cultural resources Conditions of Certification **CUL-3** through **CUL-15**. **CUL-3** identifies the people who would implement all of the conditions (except for **CUL-1** and **CUL-2)**, and **CUL-4** specifies the information the project owner would supply to them. **CUL-5** provides for the preparation and implementation of the Cultural Resources Monitoring and Mitigation Plan (CRMMP), which would structure and govern the implementation of the broader treatment program. **CUL-6** provides for the preparation of a final report to analyze, interpret, and document the ultimate results of the entire PSPP cultural resources management program. **CUL-7** would train project personnel to identify, protect, and provide appropriate notice about known and new potential cultural resources in the project construction area. **CUL-8** through **CUL-10** would provide construction monitoring and cultural resources avoidance and discovery protocols. **CUL-11** through **CUL-15** in the approved conditions of certification include staff's recommended mitigation treatment of historic-period and prehistoric resources in a manner that would reduce the severity of PSPP's direct effects to a less than significant level.

These conditions have been revised to reflect alterations to the physical footprint of the proposed amended project. Research and analysis is ongoing concerning the expanded project area of analysis (PAA) and potential visual impacts to these resources from the amended project. As such, additional conditions may be added in the FSA to mitigate for impacts to resources discovered in this area.

Staff's review of the Petition to Amend (Palen 2012A) and multiple visits to the facility site and vicinity lead staff to conclude that the geographic scope of the original analysis for the project is insufficient to analyze the amended project's substantially greater visual intrusion in the Chuckwalla Valley. Staff believes that the proposed change to the project's technology, from a solar trough to a very bright, 750 foot-tall solar power tower facility, would significantly increase the distance from which the project would have the potential to compromise key elements of the integrity of historical resources that rely, in part, on relatively pristine natural landscapes to convey their association with important prehistoric and historic themes. As a consequence of this belief, staff has determined that an adequate evaluation of the more far-reaching visual effects of the amended project requires the revision of the original PAA (see *Project Area of Analysis (PAA)* subsection, below) to include all areas visible within approximately 15 miles of the two proposed solar power towers (see **Cultural Resources Figure 1**).

Staff's research on and analysis of the geographic area encompassed by staff's draft revision to the PAA is incomplete as of the date of the preparation of the present section. Staff, variously in collaboration and consultation with the project owner, the California Desert District and Palm Springs-South Coast Field offices of the BLM, Joshua Tree National Park, and a number of local Native American communities, has been steadfastly engaged in an effort to identify and to evaluate the historical significance of the cultural resources in the draft revised PAA since early January of 2013. However, as a result of protracted deliberations about the scope and character of the investigations necessary to produce an adequate resource inventory and evaluation data, the responsive data were not available in time for staff to prepare the present section. The present section therefore addresses only the broad contextual framework for the supplemental cultural resources analysis of the amended project. Staff anticipates being able to develop this analysis for the Final Staff Assessment.

ARCHAEOLOGY

The archaeological analysis in the **CULTURAL RESOURCES** section of the September 2010 Revised Staff Assessment, Part 2 primarily took into account the potential physical effects of the originally proposed project on archaeological resources that staff had either recommended as eligible for the California Register of Historical Resources (CRHR) or assumed to be eligible for the purpose of staff's CEQA analysis. These resources included two cultural landscapes with portions that include the physical footprint of the original project, nine prehistoric archaeological sites, and 36 historical archaeological sites. Measures to mitigate the original project's anticipated construction damage to these resources are found in **CUL-1**, **CUL-2**, and **CUL-11** through **CUL-15**, in addition to Energy Commission's Conditions of Certification **CUL-3** through **CUL-10**. The intent of these latter conditions is to ensure that physical effects to any significant archaeological resources found during project construction and operation are taken into account, and, where those effects are severe, they are to be mitigated to a less than significant level.

In staff's opinion, the difference in the visual profiles between the original project and the amended project is significant and is, consequently, the primary focus of the cultural resources analysis for the present amendment. The September 2010 archaeological analysis largely does not take into account the potential effects of the original project's visual intrusion in Chuckwalla Valley due, primarily due to the relatively low vertical profile of the solar trough project. The archaeological analysis for the proposed amendment will take into account whether, and the degree to which, the amended projects' solar power towers and the SRSGs may compromise the ability of archaeological resources to convey the significance of their associative or design values. Research to identify and to evaluate the historical significance of archaeological resources beyond the facility site but within relatively close sight of the solar power towers has been developed, but fieldwork was only recently authorized by the BLM. Staff anticipates working in conjunction with the project owner to complete and compile some level of field research in time for inclusion in the Final Staff Assessment (FSA). Staff presently has no new information on archaeological resources to analyze for the Cultural Resources section of the present PSA, and can therefore not provide informed comment on the potential or the character of the amended project to visually degrade the integrity of significant archaeological resources. If the project owner is able to submit, or staff is otherwise able to acquire, results of the new field research beyond the facility site, staff's analysis of any such visual effects will be incorporated into the FSA for the amendment.

ETHNOGRAPHY

The preliminary ethnographic analysis for the PSEGS project has identified at least 11 possible ethnographic resources in varying proximity to the project vicinity that could be adversely impacted by the construction, operations, and decommissioning of the PSEGS facility:

1. Palen Dunes/Palen Lake
2. Ford Dry Lake
3. McCoy Spring (CA-Riv-0132) National Register District
4. Mule Tank (CA-Riv-0504 and CA-Riv-0773) Area of Critical Environmental Concern (ACEC)
5. Corn Spring (CA-Riv-032)
6. North Chuckwalla Mountains Petroglyph District (CA-Riv-01383)
7. North Chuckwalla Mountains Prehistoric Quarry District (CA-Riv-01814)
8. Long Tank
9. Alligator Rock
10. Dragon Wash (CA-Riv-049)
11. San Pascual Well

Staff is not able to evaluate these resources for eligibility to the CRHR because of missing data; i.e., information related to trails in the PAA, results of a field reconnaissance survey for archaeological ethnographic resources, and ethnographic interviews with Native Americans. However, this data will be available for staff to evaluate these resources for CRHR eligibility in the FSA. Once the resources have been evaluated, impacts to these resources and potential mitigation measures will be addressed.

HISTORIC-PERIOD BUILT-ENVIRONMENT

The September 2010 Revised Staff Assessment, Part 2 concluded that no built-environment historical resources would be significantly impacted by the PPSP. However, as previously stated, due to proposed modifications to the PPSP, the PAA has been expanded and additional historic-age resources are being examined. Known historic-age resources in the vicinity that are being examined include the Community of Desert Center and agricultural complexes in the Chuckwalla Valley. Other potential resource types include roads/trails, transmission lines, and mining operations. This should not be considered an exhaustive list as research is ongoing. Resources related to the military history of the area are contained under historic archaeological resources. The research and evaluation of historic-age, built-environment resources are ongoing and this information will be included in the FSA. At this time staff cannot determine if the project modifications would result in additional impacts to built-environment.

INTRODUCTION

This environmental assessment attempts, to the degree possible based on present information, to identify the potential impacts of the PSEGS project on cultural resources. The term “cultural resource” means any tangible or observable evidence of past human activity, regardless of significance, found in direct association with a geographic location, including tangible properties possessing intangible traditional cultural values. Historical resources are defined under California state law as including, but not necessarily limited to, any object, building, structure, site, area, place, record, or manuscript that is historically or archaeologically significant, or is significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California, provided the agency’s determination is supported by substantial evidence in light of the whole record” (Cal. Code Regs., tit. 14, § 15064.5(a)). Three kinds of cultural resources, classified by their origins, are considered in this assessment: prehistoric, ethnographic, and historic-period. Under federal and state historic preservation law, generally cultural resources must be at least 50 years old to have sufficient historical importance to merit consideration of eligibility for listing in the CRHR. A resource less than 50 years of age must be of exceptional historical importance to be considered for listing.

Prehistoric archaeological resources are associated with the human occupation and use of California prior to prolonged European contact. These resources may include sites and deposits, structures, artifacts, rock art, trails, and other traces of Native American human behavior. In California, the prehistoric period began over 12,000 years ago and extended through the eighteenth century until 1769, when the first Europeans settled in the California.

Ethnographic resources represent the heritage of a particular ethnic or cultural group, such as Native Americans or African, European, Latino, or Asian immigrants. They may include traditional resource-collecting areas, ceremonial sites, value-imbued landscapes and related features, cemeteries, shrines, or ethnic neighborhoods and structures. Ethnographic resources are variations of natural resources and standard cultural resource types. They are subsistence and ceremonial areas, places, sites, structures, and objects assigned cultural significance by traditional users. The decision to call resources "ethnographic" depends on whether associated peoples perceive them as traditionally meaningful to their identity as a group and the survival of their lifeways.

Historic-period resources, both archaeological and architectural, are associated with Euro-American exploration and settlement of an area and the beginning of a written historical record. They may include archaeological deposits, sites, structures, traveled ways, artifacts, or other evidence of human activity. Groupings of historic-period resources are also recognized as historic districts and as historic vernacular landscapes.

For the PSEGS project, staff provides an overview of the environmental setting and history of the project area from a cultural resources perspective, an inventory of the cultural resources identified in the project vicinity, and an analysis of the project's potential impacts to significant cultural resources in the PAA, using criteria from the California Environmental Quality Act (CEQA) and CEQA Guidelines.

If cultural resources are identified, staff identifies which are historically significant (defined as eligible for the CRHR or by other significance criteria) and whether the PSEGS would have a substantial adverse impact on those that are determined or assumed to be historically significant. Staff's primary concern is to ensure that all potentially significant cultural resources are identified, all potential project-related impacts to those resources are identified and assessed, and conditions are recommended that ensure that all significant impacts that cannot be avoided are mitigated to a less than significant level or to the extent feasible as required by CEQA.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

Projects subject to the Energy Commission's licensing process are reviewed and conditions of certification are imposed, as needed, to ensure compliance with all laws, ordinances, regulations, and standards (LORS) that are applicable to the proposed project and related facilities, or would be applicable but for the Energy Commission's exclusive authority.

Cultural Resources Table 1
Laws, Ordinances, Regulations, and Standards

Applicable LORS	Description
Federal	
BLM-Cal SHPO-Project Owner Programmatic Agreement (PA)	Instrument adopted in 2010 between the BLM, the California State Historic Preservation Officer (SHPO), and Palen Solar I, LLC (owner) outlining protocols and obligations for treatment of historic and cultural resources on the PSPP, and coordination for compliance with Section 106 of the National Historic Preservation Act (NHPA).

Applicable LORS	Description
State	
Government Code, section 62544.10 – California Public Records Act	Provides for non-disclosure of records that relate to archaeological site information and reports maintained by, or in the possession of, the Department of Parks and Recreation, the State Historical Resources Commission, the State Lands Commission, the Native American Heritage Commission, another state agency, or a local agency, including the records that the agency obtains through a consultation process between a California Native American tribe and a state or local agency.
Local	
Riverside County General Plan, Multipurpose Open Space Element, Policies O.S. 19.2-19.4	OS 19.2 requires that review of all proposed development for archaeological sensitivity; OS 19.3 employs procedures to protect the confidentiality and prevent inappropriate public exposure of sensitive archaeological resources when soliciting the assistance of public and volunteer organizations. OS 19.4 requires a Native American Statement as part of the environmental review process on development projects with identified cultural resources.
Riverside County General Plan, Multipurpose Open Space Element, Policies O.S. 19.5-19.7	OS 19.5 allows the History Division of the Riverside County Regional Park and Open Space District to evaluate large project proposals for their potential preservation or destruction of historic sites; requires projects to provide feasible mitigation for impacts to historic sites prior to county approval. OS 19.6 enforces the California State Historic Building Code so that historic buildings can be preserved and used without posing a hazard to public safety. OS 19.7 endorses the allocation of resources and/or tax credits to prioritize retrofit of historic structures.
Riverside County General Plan, Exhibit A, CEQA Findings of Fact and Statement of Overriding Considerations, Section 4.7, Mitigation Monitoring Program, Measures 4.7.1A, 4.7.1B, and 4.7.1C.	Outlines mitigation measures for cultural resources monitoring programs.

SETTING

Information provided regarding the setting of the proposed project places it in its geographical and geological context and provides the context for the evaluation of the historical significance of any identified cultural resources within the PAA (see “Project Area of Analysis (PAA)” subsection, below).

REGIONAL SETTING

The project site is in the southeastern Mojave Desert in the Sonoran section of the Basin and Range geomorphic province (California Geological Survey 2002, Fenneman and Johnson 1946). The region consists of broad, low-elevation, largely internally-draining basins, filled with alluvium, separated by isolated mountain ranges. The local sources of alluvium in these basins are typically the mountain ranges that bound them. The Colorado River slices through these basins approximately 42 miles to the east of the proposed facility site, and introduces characteristic features of riverine landscapes where it meanders among the local mountain ranges. Elevations in the region range from approximately 1,210 to 6,700 feet above sea level along mountain range ridges, from 610 to 830 feet above sea level on the bottoms of internally-draining basins, and from 230 to 540 feet above sea level along the Colorado River floodplain. The largely alluvial parent material of the region's alluvial fans, valley bottoms, and riverine terraces and floodplains, in conjunction with the desert climate of the region, generally support more weakly developed soil orders (Entisols and Aridisols) where a Colorado Desert Creosote Bush Scrub vegetation type often predominates (BS 2011a:5.2-44).

The project area falls in a region where, on the basis of different technical perspectives, it can be said to lie both in the Mojave Desert and the Colorado Desert. From a physiographic or geomorphic perspective, the project area is in the Mojave Desert, a subpart of the Basin and Range geomorphic province, where the desert boundary to the north is the Garlock Fault and the boundary to the south is the San Andreas Fault (California Geological Survey 2002, Fenneman and Johnson 1946). From a floristic perspective, the proposed project area is in the Sonoran Desert region of the Desert floristic province, also known as the Colorado Desert, where the bases for the region's classification are the distributions of particular vegetation associations (Baldwin et al. 2002). The composition and distribution of Colorado Desert vegetation associations are dynamic and fluctuate through time, in and out of the geomorphic area that has been defined as the Mojave Desert. References below, then, to the Mojave Desert largely concern the geology and geomorphology of the region, while references to the Colorado Desert reflect more concern for the present climate and the present distribution of index vegetation associations.

The present climate of the hot and arid Colorado Desert is classified as sub-humid or sub-tropical with evaporation greatly exceeding precipitation. Summer temperatures in July through September average above 86 degrees Fahrenheit with daytime maximum temperatures often nearing 110 degrees Fahrenheit and ground temperatures exceeding 140 degrees Fahrenheit. Winter temperatures are mild, averaging 50–70 degrees Fahrenheit in December through February. Precipitation is around three inches per year with substantial yearly variability between locations. The range of variability is from 0–10 inches. The weather patterns responsible for bringing rain to the California deserts are a combined result of two global-scale weather systems and a rain shadow effect by the major surrounding mountains (Peninsular, Transverse, and Sierra Nevada ranges). The dominant weather system during the winter months is the frontal pattern of the Pacific High. This brings generally clear skies with only occasional rain. The summer months are characterized by fluctuations between that high-pressure system and a tropical water laden convectional system coming off the Gulf of California. This system sometimes brings very localized late afternoon and early evening thunderstorms.

PROJECT, SITE, AND VICINITY DESCRIPTION

The project site is in the northern Colorado Desert of eastern Riverside County. The following description is largely excerpted from McCarty (1980). The Colorado Desert covers approximately 11,000 square miles, divided among nine Bureau of Land Management units, including the Palen Planning Unit[2]. These units are almost entirely in a low, hot desert below 2,000 feet elevation. It is one of the harshest and most arid environments in North America (McCarty 1980, p. 4). The terrain consists of a number of broad shallow valleys that, in a general sense, trend to the southeast, draining into the Colorado River. These valleys contain five playas or closed basin sinks formed by the low-lying obstructions in the valley floor.

Valleys in the interior of the Colorado Desert planning units have been characterized morphologically as pediments, pediment plains, and base level plains with complicated geology of schists, granites, rhyolites, and basalts that make up the alkaline and often calcareous gravels and soils (McCarty 1980, p. 7). These valleys surround and isolate a number of small, severely weathered mountain ranges. These ranges, often barren exposures of rock outcrop, talus slopes, and steep dissected canyons, run generally north-south in the northern areas and northwest-southeast in the southern portions. Peaks range to 4,000 feet in the north and 2,000 feet in the south.

The Chuckwalla Valley is classified as a long shallow valley system that is actually contiguous with Pinto Valley to the north. Under more pluvial conditions, these valleys had the potential to overflow their blockades and become a continuous drainage (McCarty 1980, p. 7). Today, water supply is limited to a very few springs and seeps in the mountains and higher washes. Groundwater in the deep sandy soils of the valleys usually requires extensive deep drilling and is well beyond the reach of vegetation.

Palen Dry Lake is divided by alluvium into a northwest and southeast section (Geologic Map of California, Salton Sea Sheet, 1977). The two sections are isolated in part by mountains and miles of dunes formed during the modern dry regime. Palen Lake Northwest receives water mainly from the Coxcomb Mountains that abut its northwest side. Palen Lake Southeast section is fed by drainage from the Eagle, Palen, Coxcomb, Chuckwalla, and Orocopia mountains. The PSEGS lies within the Palen Lake southeast section.

The project amendment proposes to convert the two approved solar trough plants for either Reconfigured Alternative No. 2 or 3 into two solar power tower plants each of which uses a field of heliostats to concentrate solar energy on a solar receiver steam generator (SRSG) elevated to a maximum height of approximately 750 feet above the floor of the Chuckwalla Valley.

[2] The Bureau of Land Management Colorado Desert Planning Units include: Imperial, Santa Rosa, Orocopia, Twentynine Palms, Bristol/Cadiz, Palen, Turtle Mountain, Whipple Mountain, Big Maria, and Picacho).

The maximum area of ground disturbance for the amended project would be less than that for the approved project. The licensed PSPP project alternatives ranged from approximately 4,365 acres for Reconfigured Alternative No. 2 to 4,330 acres for Reconfigured Alternative No. 3. The disturbance area for the amended project has been reduced to approximately 3,794 acres or approximately 571 acres less than Reconfigured Alternative No. 2 and 536 less than Reconfigured Alternative No. 3.

The proposed amendment to the project would reduce the overall amount of ground disturbance and require an internal reconfiguration of project infrastructure. The amended project would contain internal roadway and utility corridors for each of the two plant's heliostat fields and power blocks. Both plant sites would be accessible from 20-foot wide paved or hardscape access roads from the entrance of the amended project site to and around both power blocks. The project owner indicates that the construction of the amended project would reduce the volume of requisite earthwork by approximately 4.3 million cubic yards, because the construction of heliostat fields does not require the grading of expansive level terraces required for solar trough fields. While the approved alternatives included the use of private land, 240 acres for Reconfigured Alternative No. 2 and 40 acres for No. 3, the proposed amended project would not develop these lands. Access to the site would use the same primary access road as originally approved. The project would continue to interconnect to the regional transmission grid currently under construction as Southern California Edison's Red Bluff Substation. The primary modifications to the approved project that have the potential to increase or add to the negative effects of the facility on cultural resources are

- two, 250-MW plants or units each consisting of a 750-foot tall solar power tower and receiver, a power block, and a dedicated and interconnected field of approximately 85,000 heliostats on pedestals,

ENVIRONMENTAL SETTING

Paleoclimate and Paleoenvironment

Information on paleoclimate and paleo environment for the southern Mojave and northern Sonoran (Colorado) deserts are derived from plant macrofossils found in packrat middens (Grayson 1993, pp. 119–128; 139–143; 194–195; 199–202, 215; Spaulding 1990; Tausch et al. 2004; Thompson 1990; Wigand and Rhode 2002, pp. 332–342; Cole 1986; Van Devender 1990; West et al. 2007, pp. 32–33), and stratigraphic studies of playa and dry lake deposits years (Ezzo et al. 1989, 1992).

The Holocene, the geologic epoch that followed the ice age, or Pleistocene, and during which humans are known to have occupied North America, began approximately 12,000 years ago. For purposes of this discussion, the Holocene is divided into four periods: Early, Middle, Early Late, and Late Late.

Early Holocene (10,000-6000 BC)

During the Late Pleistocene and Early Holocene, as the climate became warmer and drier, extensive lowland conifer woodlands retreated upslope and were replaced by desert scrub associations. In the northern Sonoran Desert, around 9500 BC, hot desert plants (e.g., pigmy cedar, cat claw acacia) began dispersing into the region. From about

8,400 BC on, creosote bush begins to appear. This warmer, drier period, however, is also noted for witnessing episodes of greater precipitation. In the Mojave Desert, three high lake-stands have been identified at Silver Lake playa, dating between 13,000 and 7300 BC (Ezzo et al. 1989). Gallegos et al. (1980, p. 93) postulate that two moister climatic intervals, dating between 10,500 and 9500 BC, occurred, based on a pair of caliche beds near Cadiz Dry Lake that were found to contain traces of human stonework.

Middle Holocene (6000-3500 BC)

The subsequent Middle Holocene was the warmest, driest part of the entire Holocene. Desert shrub vegetation dominated lowland and mid-level elevation localities. White burrobush and creosote bush increased in abundance. A dearth of vegetation data from the Middle Holocene suggests plant cover was probably very sparse as a consequence of severe drought conditions. Between approximately 4800 and 3000 BC, little evidence exists for summer rainfall. Gallegos et al. (1980, p. 93) postulate that a climatic interval, dating around 6500 to 6000 BC, probably resulted in lake filling based on the discovery of a site of that age, found in the fossil dunes near Bristol Dry Lake.

Early Late Holocene (3500 BC–AD 1)

The Early Late Holocene has been characterized as a period of relatively warm and dry conditions (sometimes drought) interspersed with evidence of cooler moister regimes. For example, evidence of peat deposits, dating to 3000 BC, have been found at various spring localities in the Mojave Desert. Similarly, around 1800 BC, a significant increase in the density of pinyon-juniper woodland took place in southern Nevada, suggesting cooler temperatures and winter-dominant precipitation. In the Mojave Desert, a high lake-stand at Silver Lake playa occurred approximately 1620 BC (Ezzo et al. 1989, 1992). Gallegos et al. (1980, p. 93) postulate that a climatic interval, about 1000 BC, probably resulted in lake filling again, based on evidence of shoreline camping at Cadiz Dry Lake.

Late Late Holocene (AD 1–present)

During the Late Late Holocene, temperature and precipitation patterns fluctuated significantly, swinging between periods of drought and relatively warm conditions (Meko et al. 2001; Stine 1994, 1996, 1998, 2000), with periods of summer-dominant precipitation and milder winters, contrasting with periods of cooler and somewhat drier conditions and increased winter-dominant precipitation, reminiscent of the previous epoch's ice age (Fagan 2000; Grove 1988; Meko et al. 2001; Scuderi 1987a, 1987b, 1990, 1993). Modern conditions have prevailed over the last 200 years, with increases in the distribution of pinyon pine, at the higher altitudes as well as expansion of saltbush and the creosote bush/white burrobush associations in the desert lowlands.

Gallegos et al. (1980, p. 93) postulate that a few hundred years ago, during the "Little Ice Age", rains would have maintained a marshy shallow lake in the Palen basin, supporting subsistence resources favorable for lakeshore hunting and gathering. This is based on hunting and processing tools, as well as red/buff pottery found in fossil dunes at the northwest end of the lake (Gallegos et al. 1980, p. 103). Large areas of residual sediments stand as "witness columns" and eroding plateaus, 1–2 meters higher than the present lakebed, indicating the former presence of an older lake. Rich archaeological deposits, mixed with lag gravel, are exposed near the base of Palen's eroding dunes (Gallegos et al. 1980, p. 106).

Geology

The following discussion is primarily excerpted from Steinkamp (2009). The project site is located within the geomorphic province known as the Basin and Range, situated in the Chuckwalla Valley between the Chuckwalla Mountains to the south and the Palen and Coxcomb mountains to the north (Jennings 1967). The underlying geology consists of Quaternary alluvial, eolian, and lakebed deposits ranging from Pleistocene (1.8 million years old) to Holocene (8,000 BC to Recent) in age.

Portions of the Red Bluff substation and transmission line route are underlain by Quaternary intermediate alluvium, estimated to be 200,000 and 2,000 years old, consisting variously of gravel, sand, and silt, being situated on top of inactive, older alluvial fan surfaces (Stone and Pelka 1989). The bulk of the project area is comprised of Quaternary younger alluvium, locally dated as AD 1 to present (Stone and Pelka 1989), composed of silt, sand, and gravel derived from the surrounding mountains.

In contrast, the northeastern portion of the project site and temporary disturbance area is blanketed with surficial Quaternary lake bed deposits underlain by both eolian deposits and younger alluvium. These lake bed deposits are weakly consolidated to slightly dissected and in part overlain by modern playa deposits consisting of partly gypsiferous silt and clay (Jennings 1967; Stone and Pelka 1989). Active sand dunes and sand sheets of recent age also occur in the northeastern portion of the project area (Jennings 1967; Stone and Pelka 1989). The transition zone between lake bed and dune field is a mix of strongly deflated areas, interspersed with hummocky, linear, dome, and blowout dunes.

From southwest to northeast, the geomorphic landscape consists of a broad bajada (a coalescing of neighboring alluvial fans into a single apron of deposits) with parallel drainages of parallel rills, gullies, and washes that flow northeast toward a dune field in the northeast corner of the project area, bordering Palen Dry Lake bed.

Prehistoric Setting

During the 1970s, the Bureau of Land Management undertook a large-scale cultural resources inventory of the Central Mojave and Colorado Desert Regions (Gallegos et al. 1980). Crabtree (1980), in an overview of the region, subsequently summarized the history of archaeological study, identified the cultural chronology and common site types observed, and outlined the research topics of interest at that time. Subsequent cultural resources management investigations have contributed additional information to help refine our understanding of the prehistory of this region (Arnold et al. 2002, pp. 46–48; Love and Dahdul 2002; Schaefer 1994; Schaefer and Laylander 2007; Warren 1984, pp. 403–409).

An initial cultural chronology-culture history scheme for the Colorado Desert was developed in the 1930s and 1940s (Campbell 1931, 1936; Campbell and Campbell 1935; Campbell et al. 1937; Rogers 1939, 1945). This scheme has formed the foundation for subsequent efforts, most recently expressed by Sutton et al. (2007, pp.

233–243; table 15.4), relating the temporal periods and complexes delineated to those found in the Mojave Desert.

Paleo-Indian Period (about 10,000–8000 BC)

The Paleoindian Period occurred during the late Pleistocene and the first half of the Early Holocene. Isolated fluted projectile points, assignable to the Western Clovis Tradition have been recovered from the Pinto Basin, Ocotillo Wells, Cuyamaca Pass, and the Yuha Desert (Dillon 2002, p. 113; Moratto 1984, p. 77, fig. 3.1; 87; Rondeau et al. 2007, pp. 64–65, fig. 5.1, table 5.1). All are surface finds, and have no associations with extinct fauna.

Lake Mojave Complex (8000–6000 BC)

The Lake Mojave complex, also known as the Western Pluvial Lakes/Western Stemmed Tradition (Beck and Jones 1997; Erlandson et al. 2007; papers in Graf and Schmitt 2007; Schaefer 1994, pp. 63–64; Sutton et al. 2007; papers in Willig et al. 1988), occurred during the second half of the Early Holocene. It is characterized by Great Basin Stemmed Series projectile points (Lake Mojave and Silver Lake types), abundant bifaces, steep-edged unifaces, crescents, and occasional cobble tools and ground stone tools. These artifacts often occur in undated surface contexts. Assemblage composition and site structure suggest highly mobile foragers, often traveling considerable distances. Little reliance upon vegetal resources is evidenced. The value of wetland habitats remains unclear. Lake Mojave life-ways may have resulted from relatively rapidly changing climate and habitats during the Early Holocene. This would have produced unpredictability in resource distribution and abundance, producing a high degree of residential mobility.

Deadman Lake Complex (7500–5200 BC)

Currently, the Deadman Lake complex appears confined to the Twentynine Palms area. Sites usually are surficial and located on old alluvial pediments. Artifacts include small-to-medium-size contracting stemmed or lozenge-shaped points, large concentrations of battered cobbles and core tools, and abundant bifaces, simple flake tools, and ground stone tools. The abundance of cobble tools suggests an emphasis upon plant processing. The Deadman Lake and Pinto complexes may represent two different human populations practicing different seasonal/annual rounds, or Deadman Lake may represent a component of the overall Pinto complex adaptation.

Pinto Complex (8000–3000 BC)

The Pinto complex spans portions of the Early and Middle Holocene. Toolstone use, based on sites attributed to this complex, focus upon materials other than obsidian and cryptocrystalline silicate (CCS). Pinto Series points are stemmed with indented bases, and display high levels of reworking. Bifacial and unifacial cores/tools are common. Ground stone tools are moderately to very abundant, indicating greatly increased use of plant resources. Pinto sites occur in a broad range of topographic and environmental settings, especially within remnant pluvial lake basins. Moderate to large numbers of people, practicing a collector subsistence strategy, occupied large residential base camps for prolonged periods. Logistical forays into surrounding resource patches probably were made from these sites.

Possible Abandonment (3000–1000 BC)

Beginning roughly at this time, conditions in the Mojave Desert were warmer and drier. Few archaeological sites date to this period. This suggests population densities were very low. It is possible some areas were largely abandoned. This period corresponds in part to the latter part of the proposed "Altithermal Abandonment," recognized by some prehistorians as characterizing portions of the Great Basin (see Kelly 1997, pp. 8–9).

Gypsum Complex (1000 BC–AD 200)

The Gypsum complex, spanning most of the Early Late Holocene, is characterized by the presence of corner-notched Elko Series points, concave-base Humboldt Series points, and well-shouldered contracting-stemmed Gypsum Series points. Numerous bifaces also occur. Manos and metates are relatively common. During the early portion of the Gypsum complex, settlement-subsistence appears focused near streams. At this time, increased trade and social complexity apparently occurred. Gypsum components are smaller, more abundant, and occur over a more diverse suite of settings than those dating previously. Evidence for ritual activities includes quartz crystals, paint, split-twig animal figurines, and rock art. Gypsum sites are uncommon in the southern and eastern Mojave Desert.

Rose Spring Complex (AD 200–AD 1000)

Cultural systems profoundly changed in the southern California deserts during Late Late Holocene with the introduction of the bow and arrow, represented by Rosegate Series points. During this time, a major increase in population is thought to have occurred, possibly resulting from a more productive environment and a more efficient hunting technology. Sites often are located near springs, along washes, and sometimes along lakeshores. Intensive occupation is indicated by the presence of wickiups, pit houses, and other types of structures. Well-developed middens have yielded artifact assemblages containing knives, drills, pipes, bone awls, various ground stone tools, marine shell ornaments, and large amounts of obsidian. Obsidian procurement and processing apparently significantly structured settlement-subsistence.

During the middle of this period, a drought referred to as the Medieval Climatic Anomaly occurred, resulting in hypothesized resource shortages.

Late Prehistoric Period (AD 1000–AD 1700)

During the Late Prehistoric period, horticultural practices and pottery were introduced (most likely from the Hohokam area in southern Arizona or from northern Mexico), having its greatest impact along the Lower Colorado River (McGuire and Schiffer 1982; Schaefer 1994, pp. 65–74; Schaefer and Laylander 2007, pp. 253–254). Ceramic artifacts began to appear in the Colorado Desert approximately AD 1000, assigned to the Lowland Patayan (Lower Colorado Buff Ware) and Tizon Brown Ware traditions (Lyneis 1988; Waters 1982a, 1982b).

A complex cultural landscape composed of rock art, trails, and geoglyphs[3] developed during the Late Prehistoric period. Trade and exchange were elaborated, with an

[3] Geoglyphs, also known as intaglios, were created on desert pavements by rearranging and/or clearing pebbles and rocks to form alignments, clearings, and/or figures. Rock alignments are present

emphasis on links between coastal southern California and the Southwest. In addition to pottery, artifact assemblages include Desert Series projectile points, shell and steatite beads, and a variety of milling tools. Obsidian use declines significantly, with CCS becoming the dominant toolstone.

Prehistory of the Chuckwalla Valley

Singer (1984) presents a lithic quarry-oriented prehistoric settlement model for the Chuckwalla Valley and environs. Over 200 prehistoric sites occur in the region. Past peoples inhabiting the area appear to have been very mobile, especially during late prehistoric and early historic times. During early historic times, native peoples inhabited towns/hamlets located along the Colorado River, within the Coachella Valley, and at major desert springs/oases.

The Chuckwalla Valley was a relatively closed resource exploitation zone. It served as an east-west oriented trade route/corridor between the Pacific Ocean and the Colorado River/greater Southwest. An extensive network of trails is present within the Chuckwalla Valley. Given its orientation and location, the valley may have been neutral territory (i.e., a buffer zone), unclaimed by neighboring native peoples. Quarry sites probably were “owned” by tribal groups. The distribution of particular types of toolstones may have corresponded to a group’s territorial boundaries, and a toolstone type may not have occurred beyond the limits of a group’s specific territory.

Within the Chuckwalla Valley, prehistoric sites are clustered around springs, wells, and other obvious important features/resources. Sites include villages with cemeteries, occupation sites with and without pottery, large and small concentrations of ceramic sherds and flaked stone tools, rock art sites, rock shelters with perishable items, rock rings/stone circles, geoglyphs, and cleared areas, a vast network of trails, markers and shrines, and quarry sites. Possible village locations are present at Palen Lake, Granite Well, and Hayfield Canyon.

A cluster of temporary habitation and special activity (task) sites occurs around a quarry workshop in the Chuckwalla Valley. The Chuckwalla Valley aplite quarry workshop complex probably was used throughout the Holocene. During this period, Chuckwalla Valley most likely was occupied, abandoned, and reoccupied by a succession of ethnic groups. In the Early Holocene (i.e., Lake Mohave complex times), the area may have been relatively densely inhabited. During the Middle Holocene (i.e., Pinto and Gypsum complexes period) it may only have been sporadically visited. The subsequent Late Holocene Rose Spring and Late Prehistoric periods probably witnessed reoccupation of the valley by Yuman and Numic-speaking peoples.

Research Topics

The research topics discussed below include toolstone procurement, ceramic traditions, horticulture, trade and exchange, and cultural landscapes.

throughout this region, while representational figures only occur close to the Lower Colorado River. It is assumed that they played some role in sacred or ritual activities for prehistoric Native Americans.

Toolstone Procurement

The geology of the Colorado Desert provided prehistoric peoples with a variety of lithic materials for artifact production (Schaefer and Laylander 2007, pp. 252–253). These included obsidian, cryptocrystalline silicates (chert), crystalline volcanics (basalt, rhyolite), quartz, and plutonic, metamorphic, and sedimentary rocks.

Coso obsidian was the dominant source of obsidian used by Colorado Desert peoples prior to AD 1000. Other obsidian sources, from the southern Mojave Desert, include Bristol Mountains and Devil Peak (Shackley 1994). Approximately a dozen sources located in Baja California, extreme northwest Sonora, and western Arizona may also have been used (Shackley 1988, 1995, 2005). During the last thousand years, however, Obsidian Butte was the principal obsidian used in the Colorado Desert and coastal southern California (Hughes 1986; Hughes and True 1983; Laylander and Christenson 1988; Schaefer and Laylander 2007, p. 251). Obsidian Butte, located near the southern edge of the Salton Sea, was inaccessible when Lake Cahuilla rose to inundate it (130 feet above sea level).

Several topics relating to prehistoric quarrying and tool manufacturing/use have been identified, including: distinction between formal versus the expedient procurement of toolstone (Wilke and Schroth 1989); lithic reduction strategies and transport of toolstone (Bamforth 1990, 1992); scales of production at ground stone tool quarries (Schneider et al. 1995); and differences in tools/toolstones by gender (Walsh 2000).

Bamforth (1990, 1992) considers Holocene settlement, raw material, and lithic procurement at several quarry sites in the central Mojave Desert. He suggests that quarry use was conditioned upon mobility strategies, regional quality and abundance of toolstone, as well as quarry location. Bamforth suggests that an emphasis on transporting prepared cores during the period 2000 BC–AD 500 may have resulted from the formation of relatively large and stable communities in areas with concentrated plant resources.

Singer (1984) studied two quarry workshop sites located in Chuckwalla Valley. Core production and reduction from locally available aplite was emphasized. This yielded flakes and bifaces, which appear to have been exported from the quarries for final reduction at other sites. Few formed tools were observed. Those that were present were choppers and scrapers, possibly used to manufacture wooden digging or prying sticks and shafts. The quarry sites appeared to have experienced long-term occupation and use.

Manufacturing efforts appear to have been directed towards production of expedient, rapidly discarded cutting/scraping/pounding/milling tools from locally available toolstone(s) (Ludwig 2005; Schaefer and Laylander 2007, pp. 252–252; Singer 1984). Specialized tool manufacturing included production of sandstone metates along the western side of the Colorado Desert, projectile point (arrow) workshops at seasonal task sites situated around playas, and large quarries at volcanic outcrops within the Lower Colorado and Gila River Valleys, where mortars and pestles were made (Schaefer and Laylander 2007, p. 252).

Ceramic Traditions

Schaefer and Laylander (2007, pp. 252–253) note that buffware pottery occurring within the Colorado Desert was initially assigned to the Hakataya ceramic series (Schroeder 1958, 1979). Subsequent studies (Waters 1982a, 1982b, 1982c) place it within the Lowland Patayan Ceramic Tradition. Both typologies are based on surface collections of sherds, with little data resulting from stratigraphic excavations, or associated radiocarbon dates. Schroeder focuses upon details of temper, inclusions, and surface treatment, while Waters emphasize rim form. Both attempt to define geographic limits of production for each type. Difficulties in applying either typology, and problems with stratigraphic integrity, archaeological contexts, and anomalous associated radiocarbon dates, have allowed only gross chronological estimates and have limited identification of manufacturing regions.

In the Salton Basin, some sites dating between about AD 350 and AD 1200 contain pottery (Love and Dahdul 2002). This evidence suggests pottery was not introduced or rarely used prior to about 1000 AD. Earlier dates from the preceding 200 years suggest Lake Cahuilla may have attracted Colorado River peoples (and their pottery). Early ceramic dates from the Colorado Desert correspond closely with the inception of widespread use of Tizon Brownware pottery in the Peninsular Ranges and along the Pacific Coast (Lyneis 1988; Griset 1996), although some dates suggest initial introduction of ceramics by AD 800, if not before.

Viewed regionally, pottery use within the Late Prehistoric of the Colorado Desert can be divided into three periods (Arnold et al. 2002, pp. 46–47; Love and Dahdul 2002, pp. 72–73; Waters 1982a, 1982b, 1982c). Patayan I times, about AD 800–AD 1050, witnessed the inception of several ceramic traditions. During Patayan II times, AD 1050–AD 1500, increased local manufacture and use of pottery occurred. Patayan III, AD 1500–AD 1760, saw the introduction of “Colorado Buff” pottery, and the westerly spread of ceramics to coastal southern California.

With respect to social and cultural factors governing pottery adoption and use within the Colorado Desert, recent analyses of pottery from the Mojave Desert and surrounding areas provide models focused on behavioral implications regarding its manufacture and function. One concern has been with determining if ceramic vessels were locally made (Eerkens 2001; Eerkens et al. 1999, 2002a; Griset 1996). Neutron activation analysis and petrographic studies have been used to identify chemical and material signatures (Eerkens et al. 2002b). Pottery manufacture does not appear to have been organized at a higher regional level. Instead, pots generally appear to have been locally produced and used, with limited exchange of pots between different groups. Production appears to have been organized at an individual or family level, emphasizing production of largely utilitarian wares.

Pottery from sites in the northern Mojave is characterized by a relatively high number of elemental signatures suggesting higher levels of mobility (Eerkens et al. 2002b). In addition to a higher degree of residential mobility, Eerkens (2003b) suggests people inhabiting the northern Mojave Desert produced a fairly large number of pots. The combination of high mobility and a fairly high level of pottery production are seen as leading to caching pots near lowland wetlands, which were fixed in the landscape, development of pottery attributes promoting fuel consumption, and a high degree of standardization of largely utilitarian ceramics.

Sedentism in the Owens Valley, northeast of the project area, appears to have developed concurrently with, or immediately prior to, an emphasis on resource storage approximately 500 AD. Small seed intensification appears to have occurred about AD 1300–AD 1400, at the time brownware pottery became widely used. He concludes that social models, such as those suggesting the activities of aggrandizers or the stabilization of long-distance exchange networks, do not explain these developments. The role played by decrease(s) in population-to-resource balance(s), resulting from increased population pressure, remains unclear.

Eerkens (2003c; 2004) suggests the significant increase in small seed use and the advent of brownware pottery around AD 1300–AD 1400 are linked. People focused upon seeds because they could easily be privatized. That is, they could be individually owned and thus would not be subject to unrestricted sharing. Pots were a critical component of small seed intensification, because they generally were individually made and owned and could be used within houses, allowing food preparation and consumption to occur in private. Privatization of small seeds may have resulted from increased population size yielding more potential “freeloaders,” new community kinship structures, and the creation of resource surplus.

Horticulture

At the time of initial Euroamerican contact, 240 years ago, native peoples living along the Lower Colorado River and the Colorado Delta were growing a wide variety of domesticates and wild grasses, which provided 30–50 percent of their subsistence economy (Bean and Lawton 1993; Castetter and Bell 1951; Schaefer and Laylander 2007, pp. 253–254). Annual flooding of the floodplains along the Colorado rejuvenated the soil and provided enough moisture to sustain crops. Lower Colorado River agriculture is presumed to have begun around 700 AD. It probably spread either from the Hokokam area (to the east), or from northern Mexico (to the southeast) (McGuire and Schiffer 1982).

Horticulture subsequently appears to have spread west from the Colorado River. Desert Tipai peoples practiced floodplain agriculture along the New and Alamo Rivers. They also constructed small dams and ditches along washes to direct irrigation water onto adjacent terraces. Agricultural elements probably reached the Imperial Valley around AD 1700. Seed caches and mythological references to cultigens possibly indicate very late prehistoric adoption of agriculture. However, the caches contained both native and Old World cultigens. Thus it is unclear if agriculture penetrated west of the Peninsular Ranges in southern California before Euroamerican contact and the sustained influence that came with the establishment of Spanish missions.

Native cultigens may have reached the western Colorado Desert through trade instead of by local production (Schaefer and Laylander 2007, p. 254). Within the Colorado Desert, several archaeological sites have ceramic jars or rock-lined cache pits containing food remains of native or Old World plants (cf., Bayman et al. 1996; Swenson 1984; Wilke 1978; Wilke and McDonald 1989; Wilke et al. 1977). Pumpkin seeds occur in human coprolites (fossilized feces) from the Myoma Dunes at the north end of Lake Cahuilla, and also in a ceramic jar from the west shore of Lake Cahuilla, north of the Fish Creek Mountains. The latter dated to AD 1420–1660 (Wilke 1978; Wilke et al. 1977).

Early-to mid-nineteenth-century Cahuilla archaeological sites contain glass beads, flaked glass, domestic animal bones, carbonized maize and tepary beans, and uncarbonized gourds. Abundant evidence exists indicating the Cahuilla practiced irrigated agriculture during the early- and mid-nineteenth century. The paucity of macro- and micro-fossil cultigen remains from prehistoric archaeological deposits in Cahuilla territory strongly suggests agriculture did not play a significant role in the Cahuilla economy until the early nineteenth century. Early historic intensification of agriculture may have resulted from final desiccation of Lake Cahuilla, regional population growth, decreased mobility, and acculturation, including introduction of Euroamerican irrigation techniques.

In the Mojave Desert and environs, in the approximate period from AD 1–1200, agriculture first was practiced in southern Nevada and environs as a consequence of the Anasazi Intrusion (Warren 1984, p. 421, fig. 8.25). Maize, squash, beans, grain amaranth, and sunflowers were grown. Agriculture was practiced along with foraging for wild plants and animals. Fields probably were irrigated in some manner. Agriculture appears to have intensified over time.

The Owens Valley Paiute were Great Basin Numic-speaking horticulturalists (Lawton et al. 1976; Liljeblad and Fowler 1986, pp. 417–418; Steward 1930, 1933, 1938, 1941, 1970). Ditch and surface irrigation of blue dicks (Brodiaea capitata), yellow nut grass (Cyperus esculentus), and spikerush (Eleocharis sp.), was practiced. This most likely developed during late prehistoric times, possibly triggered by increased population pressure resulting from climatic change and/or immigration (Bouey 1979).

Yohe (1997) notes aboriginal cultigens, such as melons, squash, and beans, were present at two rock shelters dating to the late nineteenth or early twentieth century in Death Valley. Fowler (1995, pp. 110–112; 1996, pp. 91–98) details garden horticulture among the Southern Paiute and Panamint and Timbisha Shoshone. Stream-irrigated gardens were cultivated, in which corn, beans, squash, sunflowers, and amaranth were grown. These groups also planted gardens near springs, had communal fields with irrigation ditches, and unirrigated stream-bank garden plots. Various land management practices were employed, including intentional burning, clearing, pruning, and coppicing, transplanting and cultivation, and cleaning of water sources.

Winter and Hogan (1986, pp. 125–127, table 1) note that during protohistoric times, agriculture was practiced by the southern California/Nevada Chemehuevi and Ash Meadows, Pahrump, Las Vegas, and Moapa Southern Paiute bands. Among the crops grown were corn, beans, squash, and sunflowers. Forms of plant husbandry directed towards non-domesticates included burning to encourage growth of new plants, broadcast seed sowing, and irrigation of wild stands of bulb and seed plants (Winter and Hogan 1986, pp. 128–129, table 2). These practices are thought to have begun prehistorically, continuing and possibly expanding during early historic times. Wallace (1980) suggests Native American agriculture in the Mojave region was exclusively a historic-period phenomenon.

Trade and Exchange

As Schaefer and Laylander (2007, pp. 254–256) note, prehistoric and ethnohistoric Colorado Desert peoples had a highly developed network of connections linking locations within and beyond the region. High mobility produced considerable cross-cultural interaction and integration in spite of frequent open aggression and warfare between different groups. This integration and interaction occurred between mobile hunter-gatherers and sedentary horticultural peoples. They are archaeologically manifested by the spatial distribution of site types, rock art, artifacts (especially ceramics and shell ornaments), and toolstones (especially obsidian).

Archaeologists monitor the dynamics of prehistoric trade in the Colorado Desert by analysis of the distributions of artifacts made from various toolstones, shell beads and ornaments, and ceramic types and composition (Schaefer and Laylander 2007, pp. 255–256). As previously stated, with respect to toolstones, obsidian from Obsidian Butte is fairly commonly represented in sites located within montane and coastal southern California (Hughes 1986; Hughes and True 1982; Laylander and Christensen 1988). Obsidian from sources in northern Baja California may have been routed via the Colorado Desert to coastal southern California sites (McFarland 2000). Wonderstone from the Rainbow Rock source is present in western San Diego County and the northern Coachella Valley (Bean et al. 1995; Pigniolo 1995). Material for steatite artifacts found in Colorado Desert sites probably comes from sources in the Peninsular Ranges. Material for argillite artifacts may be from a central Arizona source.

Artifacts made from shellfish species inhabiting the northern Sea of Cortez occur in coastal southern California and the Great Basin (Bennyhoff and Hughes 1987; Fitzgerald et al. 2005) and may have been traded through the Colorado Desert (Schaefer and Laylander 2007, p. 255). Shells from southern California coastal species have been found at a number of Colorado Desert sites and those in the Southwest (Ford 1983). These artifacts may have resulted from direct procurement of shells, or exchange. At the Elmore site, associated with the protohistoric recession of Lake Cahuilla, shell debitage indicates local manufacture of shell beads and ornaments (Rosen 1995). In the Coachella Valley, shell artifacts may reflect close ties to peoples living along the Santa Barbara Channel.

A cache of Lower Colorado Buffware (i.e., Patayan) anthropomorphic figures found in an Orange County site indicates interregional connections (Koerper and Hedges 1996). These also are suggested by the frequency of Lower Colorado Buffware (i.e., Patayan/Hakataya) pottery throughout the Colorado Desert (Bean et al. 1995; Cordell 1997; McGuire 1982; Schaefer and Laylander 2007, p. 255; Schroeder 1979; Shaul and Hill 1998; Waters 1982a, 1982b, 1982c). However, its use occurred among a number of prehistoric peoples practicing divergent settlement and subsistence patterns. Consequently little effort has been made to refine or apply the Patayan tradition as an integrative model.

On a local level, Plymale-Schneeberger (1993) examined pottery from three sites in Riverside County. Petrographic and geochemical analyses allowed quantitative distinction between Tizon Brown Ware and Lower Colorado Buff Ware. The study concluded that Brown Ware was locally produced while Buff Ware was imported. Seymour and [Von Till?] Warren (2004) examined proportions of Tizon Brown Ware and

Lower Colorado Buff Ware present at sites in Joshua Tree National Park and noted correspondence of pottery types with approximate boundaries of territories occupied by ethnohistorically known native peoples (that is, Cahuilla, Serrano, Chemehuevi).

Davis (1961) and Sample (1950) note that a considerable degree of historic-period trade between Native Americans occurred within and across the Colorado Desert. Trade networks across the Colorado Desert extended to the Yokuts and Chumash. Native peoples living along the Colorado River received and reciprocated goods from many groups living to the west.

Cultural Landscapes

In the Colorado Desert, trails, cairns, geoglyphs, cleared circles, rock rings, other desert pavement features, rock art sites, and artifact scatters appear to be elements of prehistoric-ethnohistoric cultural landscapes[4] (Schaefer and Laylander 2007, pp. 254–255; Cleland and Apple 2003). Specific localities include the Pilot Knob Complex, the rock art complex at Palo Verde Point, the Ripley Locality, and the Quien Sabe-Big Maria complex. Lower Colorado River geoglyph and rock art sites may represent prehistoric ceremonial centers, located along a route extending between sacred places, representing the cosmology and iconography of Yuman peoples (Altschul and Ezzo 1995; Cleland 2005; Ezzo and Altschul 1993; Gregory 2005; Hedges 2005; Johnson 1985, 2003; Woods et al. 1985).

Trails

During late prehistoric and ethnohistoric times, an extensive network of Native American trails was present in the Colorado Desert and environs (Heizer 1978; Cleland 2007; Sample 1950, p. 23; Apple 2005; Earle 2005; Melmed and Apple 2009; Von Werlhof 1986). Segments of many trails are still visible, connecting various important natural and cultural elements of landscape. For example, these trails are often marked by votive stone piles/cairns and/or ceramic sherd scatters.

A late prehistoric-early historic Native American trail has been reported traversing roughly east/west through the Chuckwalla Valley (Johnston and Johnston 1957, map 1). Johnston (1980, pp. 89–93, fig. 1) identifies this route as part of the Halchidhoma Trail (recorded as CA-Riv-53T) running from San Bernardino through San Gorgonio Pass to the Colorado River at present day Palo Verde Valley. In the vicinity of the Chuckwalla Valley, the trail proceeded roughly east-northeast from Hayfield Dry Lake past the future community of Desert Center, then eastward, south of Palen Dry Lake towards Ford Dry Lake, and then on to the Colorado River[5]. This trail may run directly through the PSEGS plant site. Another trail segment, CA-Riv-893T, oriented roughly north-south, is just south of the plant site.

[4] Cultural landscapes, when related to specific ethnic groups, are referred to as Ethnographic Landscapes (Hardesty 2000).

[5] A more direct trail route went southeast from Hayfield Dry Lake via Aztec Well/Corn Spring and south from Ford Lake, rejoining the northern route at the south end of the McCoy Mountains.

Geoglyphs

Geoglyphs were constructed on desert pavements by rearranging and/or clearing pebbles and rocks to form alignments, clearings, and/or figures (Arnold et al. 2002; Gilreath 2007, pp. 288–289; Solari and Johnson 1982). These constructions (Harner 1953) occur throughout the deserts of southeast California and adjacent portions of southern Nevada and western Arizona. Rock alignments are present throughout this region, while representational figures only occur close to the Lower Colorado River.

In the Mojave Desert, large rock alignments are found in Panamint Valley, Death Valley, Eureka Valley, and the Owens River Valley (Davis and Winslow 1965; Gilreath 2007, pp. 288–289; von Werlhof 1987). They have been interpreted as resulting from group ritual(s) (von Werlhof 1987). Many appear characterized by multiple-use episodes, with portions added through the years as part of ongoing rituals/ceremonies.

Colorado River geoglyphs include the Top Rock Maze (Rogers 1929) and a few dozen giant ground figures (Harner 1953; Setzler and Marshall 1952), often first observed from the air. During historic times, the Top Rock Maze was used by Yuman peoples for spiritual cleansing.

Johnson (1985, 2003), von Werlhof (2004), and Whitley (2000) relate the geoglyphs to Yuman cosmology, origin myths, and religion. Cation-ratio dating[6] of desert varnish has provided estimated ages of approximately AD 800–1000 for the Colorado geoglyphs (Dorn et al. 1992; Schaefer 1994, p. 63; von Werlhof 1995), although use of the technique remains controversial (Gilreath 2007, p. 289).

Von Werlhof (1995, 2004) relates these sites to the Yuman creation story. They also may have functioned as focal points for shamanistic activities, vision quests, curing, and group rituals/ceremonies. Symbolic activities also were represented by intentional pot-drop distributions along trails near water sources. The importance to Native Americans of water sources for survival during long-distance trips and seasonal rounds is obvious. Water sources also manifested significant spiritual values and often were associated with major rock art complexes (McCarthy 1993; Schaefer 1992).

Ethnographic Background

Ethnography fulfills a supporting role for other anthropological disciplines as well as contributing on its own merits. Ethnography provides a supporting role to the discipline of archaeology by providing a cultural and historic context for understanding the people that are associated with the material remains of the past. By understanding the cultural milieu in which archaeological sites and artifacts were manufactured, utilized, or cherished, this additional information can provide greater understanding for identification efforts, making significance determinations per the National Historic Preservation Act (NHPA) or CEQA; eligibility determinations for the National Register of Historic Places (NRHP) or the CRHR; and for assessing if and how artifacts are subject

[6] Cation ratios between weathered rock varnish and unweathered rock are used as a relative dating technique to roughly determine the age of prehistoric rock carvings (petroglyphs). The quantity of positively-charged ions within the varnish (a chemically-changed layer built up of calcium and potassium leachate over time) is compared to those within the unweathered rock beneath the varnish.

to other cultural resource laws, such as the Native American Graves Protection and Repatriation Act (NAGPRA) and the Archaeological Resources Protection Act (ARPA).

In addition, ethnography has merits of its own by providing information concerning ethnographic resources that tend to encompass physical places, areas, or elements or attributes of a site, place or area. Historic property types with overlap and affinity with ethnographic resources are referred to as cultural landscapes, traditional cultural properties, Sacred Sites, and heritage resources, or historical resources that are areas, places, or sites. There is notable overlap in terminology when referring to ethnographic resources. Studies that focus on specific ethnographic resource types may also take on names such as ethno-geography, ethno-botany, ethno-zoology, ethno-semantics, ethno-musicology, etc. In general, the ethnographic endeavor attempts to minimize human conflict by facilitating iterative cross cultural understandings and, by extension, self-awareness. An ethnographic analysis was conducted for the originally licensed PSPP project, and staff used this analysis to inform the current analysis for the amendment to the project. Staff is conducting an ethnographic study to identify Native American concerns and as a basis for determining the significance of related resources and potential mitigation for impacts to those resources that may have their integrity impacted due to the change in the visual nature of the PSEGS project.

Tribes were invited to participate in the ethnographic study, based upon a list of 16 affiliated tribes, organizations, and an individual provided by the Native American Heritage Commission and the Bureau of Land Management (BLM). The 16 invited entities represent nine different cultural affiliations. From north to south, these affiliations are: Chemehuevi (Southern Paiute), Mohave, Serrano, Cahuilla, Cupeño, Luiseño, Kumeyaay, Quechan, and Cocopah. Of the 16 entities, 7 are participating in consultation for the project and/or this study. Cultural Resources Figure 3 provides locational information for each of the tribes affiliated with the project area.

Southern Paiute

The Southern Paiute are an Indian population that resided within an expansive portion of the Great Basin. Their territory formed a crescent extending northwest from the vicinity of present-day Blythe, California along the Colorado River to the Amargosa Range. From the Amargosa Range, Southern Paiute territory extended northeast into southern Nevada, between the White River and Virgin River watersheds. The northern edge of Southern Paiute territory reached the southwestern part of present-day Utah. This group also held land in northern Arizona, north of and including the northern band of the Colorado River. The eastern boundary was marked by the southeastern flank of the Rocky Mountains, just east of the Colorado-San Juan River confluence. The Chemehuevi are the only subgroup of Southern Paiute that resided in the project vicinity, along the lower Colorado River between Needles and Blythe (Kelly and Fowler 1986: Figure 1). Today there are several groups of Chemehuevi, those who live at the Chemehuevi Indian Reservation near Parker, those who live at the Colorado River Indian Reservation, and those who reside at the reservations of the Twenty-nine Palms Band of Mission Indians, Augustine Band of Mission Indians, and Torres Martinez Mission Band of Indians.

Chemehuevi Indian Tribe

The Chemehuevi Tribe is a federally recognized tribe and the official name is the Chemehuevi Indian Tribe of the Chemehuevi Indian Reservation (BIA 2012: 133). Rather than remain on the Fort Mojave Reservation near Needles, California where they had been forced to live with some of the Mojave[7], the Chemehuevi requested that the federal government establish their home in their traditional area, the Chemehuevi Valley. They remained there and at Beaver Lake and Cottonwood Island until dam construction forced them out in 1929. The Chemehuevi Reservation was founded on the Colorado River in Chemehuevi Valley north of Parker, Arizona (Kelly and Fowler 1986: 388-389).

In 1935, Congress authorized the Metropolitan Water District to obtain as much reservation land as needed to create Parker Dam, which ultimately caused the inundation of 8,000 acres of tribal lands in 1940. In the 1960s, some Chemehuevi members from the Colorado River Indian Reservation joined with off-reservation tribal members in reorganizing the Chemehuevi Tribe and reactivating the Chemehuevi Reservation. The date of election of the Chemehuevi Indian Tribe's constitution was February 14, 1970 (Rusco and Rusco 1978: 565, Table 1).

The current reservation encompasses 32,000 acres of trust land with 30 miles of Colorado River frontage (Chemehuevi Indian Tribe 2013a). The tribe is based in Havasu Lake, California (BIA 2012: 123). An Executive Committee comprising a chairperson, vice-chairpersons, and secretary treasurer oversees daily tribal operations and enterprises. The tribe also has a nine-person tribal council and a tribal court (active since 1996). The tribe's Cultural Center seeks to educate its younger generations about contemporary and traditional Chemehuevi life. The tribe operates the Havasu Landing Resort & Casino (Chemehuevi Indian Tribe 2013b, 2013c, 2013d, 2013e)

Twenty-Nine Palms Band of Mission Indians

The Twenty-Nine Palms Band of Mission Indians reservation has two pieces: one south of the Oasis of Mara in the City of Twenty-nine Palms, and one adjacent to the Cabazon Reservation in Indio (TNPBMI 2013a). The Oasis of Mara was a Serrano residence as early as 1852, although groups were undoubtedly living at the oasis prior to the mid-nineteenth century. The Chemehuevi moved to the oasis after a war with the Mohave on the Colorado River in 1867. The water from the oasis provided sufficient water for horticulture, and hunting and gathering around the oasis was productive until the late 19th century when Euro-Americans settled in the area and began depleting the resources upon which the Chemehuevi were dependent. Eventually, the families who lived there, the Ramirez, Pine and Mike families spent part of their time following their traditional patterns, and the other working wage labor jobs in the Coachella Valley. The Chemehuevi received a patent in 1895 for a reservation near the oasis, but the 160 acre reservation was located southwest of the oasis in an area with no surface water and no Native Americans established any residences. Most of those Chemehuevi who lived in the Twenty-nine Palms area in 1908 moved to the Morongo Reservation in Banning

[7] 'Mojave' is routinely spelled with a 'j' when referencing the "Mojave" desert. In addition the Mojave Tribe also retains the "j" spelling. However the Mohave contingency of the Colorado River Indian Tribes (CRIT) prefers to spell 'Mohave' with an 'h.'

when Indian children were forced to attend the St. Boniface Indian School in Banning. The Twenty-nine Palms band retained an identity separate from those Chemehuevi at the reservation on the Colorado River and on other reservations in the Coachella Valley, but in 1910 they were encouraged to live at the Cabazon Reservation in Indio. Conflict between the Cahuilla and Chemehuevi at Cabazon led most of them to leave. They either moved to the Twenty-nine Palms reservation, with the Paiutes in Nevada, the Chemehuevi near Parker, the Luiseno and Cahuilla at Soboba reservation, the Agua Caliente Reservation or one of the other reservations in California. In the 1970s a 240 acre parcel of the Cabazon Reservation was allotted to the Twenty-nine Palms band.

Currently, the reservation maintains a total of 400 acres, 160 acres in Twenty-nine Palms and 240 acres in Indio (TNPBMI 2013). The tribe is based in Coachella, California (BIA 2012:110). The Tribal Council consists of all adults 18 years of age or older, and among the Tribal Council a chairman and secretary/treasurer is elected. The tribe employs a Tribal Historic Preservation Office who administers the tribe's cultural and heritage programs. The tribe also maintains the Spotlight 29 Casino in Coachella, and will be opening the Tortoise Rock Casino in Twenty-nine Palms in the fall of 2013 (TNPBMI 2013a, 2013b, 2013c).

Mohave

Currently, the Mohave Indians are members of one of two tribes, 1)former residents of the Fort Mojave Reservation in Arizona, now residing in Needles, and 2) Mohave of the Colorado River Reservation, part of the Colorado River Indian Tribes (Stewart 1983a: 55).

Colorado River Indian Tribe

The Colorado River Indian Tribes of the Colorado River Indian Reservation is a federally recognized tribe, headquartered in Parker, Arizona and members of the Mohave, Chemehuevi, Hopi, and Navajo tribes live here (BIA 2012:123; CRIR 2009a). The Colorado River Reservation was originally established in 1865 for the Mohave. Additional land was added in 1874 to settle Chemehuevi Indians on the reservation (Kelly and Fowler 1986: 388-389; Stewart 1983a: 55). Hopi and Navajo were later settled on the reservation as well (CRIR 2009a).

The Colorado River Reservation encompasses 300,000 acres on the Colorado River. The mainstay of the Colorado River Indian Tribes' economy has historically been agriculture and the tribe grew cotton, sorghum, and alfalfa. The Colorado River Indian Tribes run businesses in sand and gravel quarrying, real estate development and retail. Additionally, they operate the Blue Water Resort and Casino in Parker (CRIR 2009a). The tribal government is administered by a nine-person tribal council, which consists of a chairman, vice-chairman, treasurer, secretary, and five council members (CRIR 2009b).

Fort Mojave Indian Tribe

The Fort Mojave Indian Tribe of Arizona, California, and Nevada is a federally recognized tribe with its governmental seat in Needles, California (BIA 2012: 123). The Fort Mojave Reservation covers almost 42,000 acres in Arizona, California, and Nevada. The land is divided into three major segments: 23,669 acres in Mojave County, Arizona; 12,633 acres in San Bernardino County, California; and 5,582 acres in Clark County, Nevada (Fort Mojave Indian Tribe n.d.).

The Fort Mojave tribal government consists of a chairman, vice chairman, secretary, and four council members. The tribe operates the Avi Resort and Casino, which contains a casino, hotel, restaurants, and a movie theater. The tribe also hosts an annual Pow Wow every February (Fort Mojave Indian Tribe n.d.).

Quechan

Quechan Tribe of the Fort Yuma Indian Reservation (Quechan Tribe)

The Quechan Tribe is a federally recognized tribe with its governmental office in Yuma, Arizona (BIA 2012: 125). The U.S. government established the Fort Yuma-Quechan Reservation on the California side of the Colorado River in 1884, although much of the land was appropriated by Euro-Americans settlers. Reservation lands were further broken up by allotment to individual Quechan members in 1912. The tribe ratified a constitution and elected a seven-person tribal council in 1936. In 1978, the tribe had 25,000 acres of land restored to them (Bee 1983: 94-96). Today, the Quechan Tribe's reservation spans the Arizona-California border at the Colorado River near the confluence with the Gila River, and encompasses 45,000 acres of land.

The tribal government is headed by a president and vice president, as well as five council members. Business enterprises include a 700 acre agricultural lease to a non-tribal farmer and a sand-and-gravel lease to a private company. The tribe also manages trailer and RV parks, a museum, a casino, a utility company, and a fish and game department (Inter-Tribal Council of Arizona 2011). The tribe employs a Tribal Historic Preservation Officer and maintains the Quechan Cultural Committee.

Cocopah

Cocopah Indian Tribe

The Cocopah Indian Tribe is a federally recognized tribe with its seat in Somerton, Arizona (BIA 2012:125). The Cocopah originally resided north of their historically documented territory and are believed to have been displaced by the Mohave and Quechan ca. A.D. 1400-1500 (Williams 1983:99-100).

Today there are two branches of Cocopah, one in the United States ("American Cocopah") and one in Mexico ("Mexican Cocopah"). This division resulted from the actions of the United States and Mexican governments concerning Indians residing within the boundaries of these two dominant nations. For instance, in 1917, the United States gave the "American Cocopah" title to three small land areas under the jurisdiction of the Yuma agency (Williams 1983:102). Increased border enforcement in 1930 exacerbated the separation of the two groups (Kelly 1977: 13).

The Cocopah in Arizona began to organize in 1961, beginning with a revision of the tribal constitution and bringing electricity to tribal lands. The Cocopah have three reservations: Cocopah West Reservation, Cocopah East Reservation, and Cocopah Lots 5 and 6. These lands total 1,800 acres (Williams 1983:102). In 1964, the Cocopah Indian Tribe formed its first constitution and a five-person tribal council. In 1985, the

Cocopah obtained an additional 4,200 acres of reservation land, including the North Reservation, via the Cocopah Land Acquisition Bill. The tribe is currently led by a chairperson, vice-chairperson, and three council members (Cocopah Indian Tribe n.d.). A Tribal Historic Preservation Officer is employed by the tribe to facilitate cultural resource issues for the tribe.

Cahuilla

Cahuilla leaders Juan Antonio and Cabeson, among others, acted as negotiators for the treaties between the Cahuilla and the U.S. Government in 1851. Reservations were established for the Cahuilla in 1875 and they were able to maintain their traditional patterns in combination with wage labor until about 1891, when federal supervision of the 10 Cahuilla reservations increased. This supervision included enrollment in government schools and cultural suppression of traditional Cahuilla life-ways (Bean 1978:584, Table 3). Today, Cahuilla reside on eight different reservations in and around the Coachella Valley.

Agua Caliente Band of Cahuilla Indians

The federally recognized Agua Caliente Band of Cahuilla Indians was granted land at Tahquitz Canyon, Riverside County, in 1876 (ACBCI 2013; Bean et al. 1978: 5-14, 5-16). From 1891 until the 1930s, Indian Service (Bureau of Indian Affairs) personnel lived on-reservation and closely controlled tribal politics. The Indian Reorganization Act of 1934 gave more political autonomy to the Cahuilla, permitting, among other rights, the authority to reestablish tribal governments (Bean 1978: 584; Castillo 1978: 121).

Currently, the tribe is based out of Palm Springs, California, and its members constitute the largest single landowner in Palm Springs (BIA 2012: 106). The Agua Caliente Band is governed by a tribal council consisting of a chairman, vice chairman, secretary/treasurer, and two council members. The council members are elected by the tribe, and elected members appoint four proxy members (ACBCI 2012b). The tribe has numerous business ventures including the Agua Caliente Casino, Resort and Spa in Rancho Mirage; the Spa Resort Casino in Palm Springs; a golf resort, and real estate (ACBCI 2013)

Augustine Band of Cahuilla Indians

The Augustine Tribe and their Reservation are both named after Captain Vee-Vee Augustine, a Cahuilla leader born in 1820. There were at least 22 village sites noted by early explorers in the Coachella Valley, one of which ended up being the Augustine Reservation. The Reservation was established by Congress in 1891 at the Temal Wakhish village site near Thermal, California. In 1972 there was only one last surviving member of the tribe, Roberta Augustine the great-granddaughter of Captain Augustine. Roberta had three children who, along with their descendants, constitute the official tribal membership today.

This federally recognized tribe is based out of Coachella, California, and is governed by a tribally elected chairperson (BIA 2012: 106). Economic ventures for the tribe include the Augustine Casino, and the Augustine Solar Energy Park, a 1.1 MW solar photovoltaic plant at the Augustine Solar Energy Park built on reservation land (ABCI 2010a, 2010b, 2010c).

Cabazon Band of Mission Indians

The Cabazon Reservation was established in 1876 and is a federally recognized tribe based in Indio, California (BIA 2012:105). The primary economic resource on the 1,153 acre reservation is agriculture. As Mission Indians, the Cabazon Reservation associates and interacts closely with the network of other reservations of Mission Indians in the region (Bean 1978: 584-585, Table 3).

The tribal government of the Cabazon Band of Mission Indians consists of five tribally elected officials; a chairman, a vice-chairman, a secretary/treasurer, a liaison/general counsel, and a member at large. Elections are held every four years for these positions. The tribe employs a cultural resources director to handle cultural resource issues. The Fantasy Springs Casino and Resort in Palm Springs is operated by the tribe.

Cahuilla Band of Mission Indians

The Cahuilla Indian Reservation is located about 25 miles east of Temecula and 35 miles west of Coachella Valley, based out of Anza (BIA 2012:107). The federally recognized reservation was established in 1875 and today consists of about 60 homes on 18,884 acres of land. There are currently 325 enrolled Cahuilla members (Cahuilla Band of Indians 2013a).

The Cahuilla Tribal Government consists of a five-member Tribal Council elected by the general membership. The Council consists of a Tribal Chairperson, a Vice-Chairperson, a Secretary, and two Council Members. In addition, various tribal committees are appointed to address specific government functions within the tribe. Major sources of income for the tribe include the Cahuilla Casino, the Cahuilla Travel Website, and the Cahuilla Smoke Shop. In addition, the tribe has recently allocated 2,000 acres for future economic development, including renewable energy development, commercial warehousing, and a gas station/convenience store (Cahuilla Band of Indians 2013b, 2013c).

Morongo Band of Mission Indians

The Morongo Reservation was established in 1876, and is located in Banning, California (BIA 2012:108). Members of the reservation are of the Serrano, Cupeño, and Cahuilla groups. In terms of area, the Morongo Reservation is the largest of the Cahuilla reservations (Bean 1978: 584-585, Table 3).

The Morongo Band of Mission Indians is a federally recognized group governed by a tribal council consisting of a chairman and vice chairperson, as well as five council members. The tribe is the largest private-sector employer in the Banning region, and its economic resources include agriculture, cattle, recreation, the Four Diamonds Resort, the Morongo Casino Resort and Spa, restaurants, and a golf course, among other businesses. The tribe maintains a cultural heritage program to promote the tribe’s history, language, and connection to the land (Bean 1978: 585, Table3; MBMI 2013a, 2013b).

Ramona Band of Cahuilla Indians

The Ramona Indian Reservation was established in 1893 at the base of Thomas Mountain, in Anza, California. In 1970, there were only two members of the tribe, neither of whom lived on the 560 acre reservation (Bean 1978: 585, Table 3). The members of the Ramona Tribe are direct descendants of the Apapatchem clan, known as the "Medicine People". The reservation is located in the area where historically this clan gathered food, water, and medicine, and held spiritual ceremonies and celebrations.

The Tribal Government of the federally recognized Ramona Band of Cahuilla Indians consists of a tribally elected tribal chairperson and vice chairperson. One of the major economic vehicles for the tribe is the Ramona ecotourism project. This is a Department of Energy funded project to develop renewable energy projects in remote locations. The tribe will be one of the first "off-grid" reservations, using wind, solar photovoltaic/propane generator hybrid systems to generate between 65-80 kwH/day to power the reservation's housing, offices, and business ventures (RBCI 2005a, 2005b)

Soboba Band of Luiseño Indians

The federally recognized Soboba Indian Reservation was established in 1883 on a 3,172 acre parcel that included the village of Soboba. A non-Indian individual also claimed ownership of some of this land. After several legal battles, the private land was purchased by the Federal government and was then held in trust for the Soboba band by the Department of the Interior. Today the Reservation encompasses almost 7,000 acres and there are about 1,200 enrolled tribal members (SBLI 2013a).

The Soboba Indian Reservation is located in San Jacinto, California (BIA 2012:110). The Tribal Council consists of a tribally elected chairperson, and a vice-chairperson, a secretary, a treasurer, and a sergeant-at-arms who are elected by the Tribal Council. The main economic ventures of the tribe are the Soboba Casino and the Country Club at Soboba Springs (Soboba Band of Luiseño Indians 2013b, 2013c)

Torres-Martinez Desert Cahuilla Indians

The Torres and Martinez Reservations were established independently in 1876. Later, under the Relief of Mission Indians Act of 1891, these two reservations were combined. The federally recognized Reservation encompasses about 18,223 acres near Thermal, California (Bean 1978: 585, Table 3; TMDCI 2013a).

The Tribal Government of the Torres Martinez Tribe consists of eight Tribal Council members who are elected by the general membership. The Council members consist of a chairperson, a vice-chairperson, a secretary, a treasurer, and four non-office holding members (TMDCI 2013a, 2013b. The tribe employs over 150 people in positions within various tribal departments (e.g., accounting and finance, environmental protection, planning, security), and owns and operates the Red Earth Casino (TMDCI 2013c).

Serrano

The Serrano were historically located in the San Bernardino Mountains, east of Cajon Pass. When an *asistencia*, an outpost of the San Bernardino mission, was established at Redlands in 1819 the Spanish forced most of the Western Serrano into the missions away from their homeland. Those who were located in the area north of San Gorgonio

Pass, near Banning, California were able to preserve what remains of Serrano culture today (Bean 1978: 573).

San Manuel Band of Mission Indians

The San Manuel reservation was established in 1891 near Highland, California (BIA 2012:109). The federally recognized reservation is the home of the *Yuhaviatam* Clan of Serrano Indians, and is named after tribal leader Santos Manuel. The reservation consists of 800 acres of mostly mountainous land in the San Bernardino highlands.

The San Manuel Tribal council consists of a seven-member Tribal council who serve as the Business Committee. The Tribal council has a chairman, a vice chairman, a secretary, a treasurer and three business committee members who are elected by the General Council. The General Council consist of all adults 21 years or older. The San Manuel Band of Mission Indians is one of the largest employers in the Inland Empire. Their economic ventures include the San Manuel Indian Bingo and Casino; the Four Fires hotel in Washington, D.C.; the Three Fires hotel in Sacramento, California; and, commercial real estate (San Manuel 2013a, 2013b).

Other Groups with Native American Interests

La Cuna de Atzlan Sacred Sites Protection Circle

La Cuna de Atzlan Sacred Sites Protection Circle are a group of Native Americans and concerned citizens dedicated to the preservation of earth figures and other Sacred Sites in and around the vicinity of Blythe, California. The group has filed a petition, and currently are interveners for the PSEGS project. Two letters have been submitted on behalf of the group (Figueroa 2013a, 2013b).

Historic-Period Background

The following information has been taken directly from the September 2010 RSA that was completed as part of the original siting case. Research and analysis is ongoing in the expanded PAA and information on potential impacts in that area will be included in the FSA.

The project is located in an area that has historically been and remains remote from centers of development and settlement. The primary themes in this discussion focus on Spanish and Mexican routes through the desert, and early American traffic, mining, transportation, military training, power transmission, and agriculture/ranching.

Spanish and Mexican Routes through the Desert

Sixteenth-century maritime Spanish explorer, Hernando de Alarcon, made the first in-roads into the region in 1540, ascending 85 miles up the Colorado River to the head of navigation near present-day Yuma. Alarcon was sent to supply Coronado’s land expedition that had set out on foot from Compostela, Mexico, in search of the fabled seven cities of gold. He eventually cached the supplies and departed after waiting many days. Melchior Diaz, leading a small contingent of Coronado’s land unit, later arrived and recovered the supplies. Both Alarcon and Diaz reported the bleak nature of the country. The interior of the Colorado Desert was not explored further until 1702 when Father Eusebio Francisco Kino, a Jesuit missionary, situated in Sonora, began seeking an overland route to coastal California (Rice et al. 1996; Hague 1976; Warren 1980, pp 83–88).

Nearly seventy years later, Francisco Garcés (a Franciscan Padre) also seeking a route to the coast, forded the Colorado River at the mouth of the Gila River, traveling west through the desert before despairing and turning back. His efforts were eventually rewarded in March of 1774, arriving at Mission San Gabriel, accompanying the expedition of Captain Juan Bautista de Anza (Rice et al. 1996, Hague 1976). Two mission outposts were subsequently established near present-day Yuma in 1779 to minister to the native Quechan and strengthen Spain's hold on this strategic point of entry into California. All passage along this route, later known as the Anza or Yuma Trail, was discontinued in 1781 when the Quechan revolted killed over thirty missionaries, settlers, and soldiers, including Garcés.

Jose Maria Romero, a Mexican Army captain, explored a second route between 1823 and 1826, along the indigenous Halchidhoma Trail. He had learned of this route a couple of years earlier when a group of Cocomaricopa Indians from Arizona arrived at Mission San Gabriel, having reportedly crossed the Colorado River near present-day Blythe, journeying westward through the Chuckwalla Valley and over the San Gorgonio Pass. On January 6, 1824, Romero was likely in the vicinity of Palen Lake (Bean and Mason 1962, pp. 40–41), having made his way up the Salton Wash, between the Orocopias and Chuckwallas. Estudillo, one of the members of the expedition, noted horse paths and footpaths of the Indians, and bones along the trail (Johnson 1980).

Early American Trans-Desert Crossings

In 1846, during the opening stages of the Mexican-American war, General Stephen Watts Kearny led an advance column of the United States Army into the region. From Santa Fe, Kearny's troops entered California by way of Yuma, reaching San Diego in December, having abandoned their wagons shortly after crossing the Rio Grande. The war ended in 1848 with the signing of the Treaty of Guadalupe Hidalgo.

Only days after the Mexican-American War ended, gold was discovered, kicking off the California Rush of 1849. It is estimated that more than 100,000 travelers passed by way of the Yuma Crossing.[8] The presence of so many travelers along the route had a definite impact on the desert. Whereas previous expeditions made the journey in isolation, during the Gold Rush, trails became relative highways. Companies of miners frequently encountered one another or ran across the remains of recently vacated campsites. The desert floor also became littered with articles abandoned when they either fell apart or proved too heavy or cumbersome for their weary owners. Broken wagons, furniture, articles of clothing, tools and even weapons left by the side of the road proved to be a bonanza for scavengers (Lamb n.d.).

After 1851, travel to California along the southern route through the Colorado Desert declined (Lamb n.d.). Horse traders and livestock drovers still used the trail to drive herds from Texas and Mexico to California and the U.S. Army continued to send caravans of provisions from San Diego to its outpost, Fort Yuma, at least until 1852.

[8] http://www.yumaheritage.com/history.html

Emigrants, moving west, however, were more apt to be settling in southern California as farmers or ranchers instead of prospecting for mineral resources.

Desert Land Act, Entrymen, and Homesteading

Anglo-American homesteading and settlement in the Chuckwalla Valley was dependent upon the access to groundwater. The first known documented well was that of Hank Brown, mapped as early as 1856, apparently excavated for use by the Department of Interior's General Land Office survey to establish the San Bernardino Base Line and Meridian through the then uncharted area. Washington, the surveyor noted the well was 45 feet deep and provided good water (about one mile west of the PSEGS) within Township 5 South and Range 16 E, northwest quarter of Section 10 (General Land Office, Plat Map 1856), near the present day airfield northeast of Desert Center (about five miles northwest of the PSEGS). Brown reportedly blazed a wagon road for the boundary surveys up Salt Creek Pass between the Orocopia and Chocolate Mountains and on toward present-day Desert Center (Warren and Roske 1981, p. 17).

Some twenty years later, Congress, to encourage and promote economic development of the arid public lands of the West, passed the Desert Land Act in 1877. Through this act, individuals could apply for entry onto public lands that could not produce a paying crop without artificial irrigation. After four years demonstrating proof of reclamation and improvements, desert entrymen would gain title to the land.

Brown's offspring, Floyd Brown, was probably one of the earliest participants in the desert land entry program. It does not appear that many others joined him until a quarter century later. In 1908, a subsidiary organization to the Edison Light and Power Company of Los Angeles, the Chuckwalla Land and Power Co., obtained a number of claims on the California side of the Colorado River north of Parker with the intent of building a dam to generate power and irrigate the Chuckwalla Valley, 40 miles to the west.[9] By the following year, practically all the land in the valley was taken, either by purchase, desert claim, or homestead under the encouragement offered by the development company. The Santa Fe Railroad even had plans to build from Palo Verde through the heart of the valley (Los Angeles Herald 1910). Unfortunately, the Department of the Interior, of the opinion that it was a promoter's pipe dream, refused to sanction the scheme.[10]

Four years later, the California Conservation Commission reported to the Governor and Legislature that while the power and irrigation project had been abandoned by the Chuckwalla Development Company, a group of 410 desert entrymen had formed the Chuckwalla Valley and Palo Verde Mesa Irrigation Association to proceed with the project independently (California Conservation Commission 1913). Most of these men were facing forfeiture of their lands and a loss on their investments, not being able to show final proof of securing water. The Senate and House Committees on Public Lands, recognizing their hardship, passed legislation granting them an extension (an exemption from cancellation for a period of one year) to give them time to carry out their plans (U.S. House of Representatives 1913). The Chuckwalla relief act benefited 780 entrymen, nearly 100 of whom were situated within the PSGES vicinity.

[9] *Imperial Valley Press,* February 27, 1909, September 17, 1910.

[10] *Imperial Valley Press,* June 3, 1911.

In 1909, at the start of the land rush, Brown's well was reportedly 300 feet deep, and plainly visible from the road, with two adobe buildings and a corral near it (Mendenhall 1909). A couple of years later, a man named Peter S. Gruendike settled in the valley not far west of the PSEGS (Wharton 1912). Gruendike's well is in the same general vicinity of Brown's and may be one-and-the-same. Gruendike was an active entryman, publishing an account of his Mountain View Experimental Ranch in *Out West* in 1911. By then, he had a good 10-foot-tall windmill in working order and a large tank, along with many kinds of trees planted and 300 or more palms of different kinds. At the time, he was very enthusiastic regarding the future outlook, having visions of growing hay, grain, melons, grapes, dates, cotton, and all citrus fruits. His land was patented in 1916.

Stephen Ragsdale, a cotton farmer from Palo Verde Mesa, acquired Gruendike's property in 1915 and began operating a towing business at the establishment. Six years later, when Route 60 opened a mile or so to the north, he uprooted and founded the tiny settlement of Desert Center, midway between Indio and Blythe.[11] Desert Center, at that time, consisted of a café with an attached gasoline station, a towing service/repair garage, a market, post office, several cabins for travelers, and a swimming pool. In addition to supporting tourism by providing sparse amenities for travelers, the local farming community, and a couple of mobile home parks.

Desert Driving and Automobile Roads

Automobiles began seriously replacing buckboards (four-wheeled wagons drawn by a horses or mules) about 1910.[12] Because of bad roads, the high-centered Model-T became the vehicle of choice. At that time, no maps, road signs, or service stations existed. Venturesome motorists in Southern California faced with these circumstances, banded together in 1900 to form a touring club and began publishing a monthly magazine with tips on travel and directions to popular destinations (Warren 1980, p. 92). As desert driving could be perilous, motorists began advocating for better information and road assistance. In 1917, the U.S. Geological Survey erected signs directing travelers to water at 167 localities in California's desert (Thompson 1921). The California Department of Engineering, after paving its first auto road in 1912, began issuing maps in 1918 (Warren 1980, p. 92).

In 1915, the Chuckwalla Valley Road was essentially ninety miles of blow sand and cross washes with a couple of ruts. It was not until 1936 that U.S. Highway 60-70 between Indio and Blythe was paved (Norris and Carrico 1978). In 1968, this highway became Interstate 10 (I-10), a major transportation corridor through the Chuckwalla Valley today, connecting Los Angeles and Phoenix. Most other roads in the area remained unpaved.

Canals and Capital, Irrigation in the Colorado Desert

The paucity of water in the desert prior to irrigation made agriculture a challenge. Plans to improve matters began as early as 1880s. Thomas Blythe, an investor from San Francisco, bank rolled the construction of a canal in the Palo Verde Valley,[13] forty miles

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[11] http://en.wikipedia.org/wiki/Desert_Center_California

[12] http://www.dustyway.com/2008/12/desert-driving-in-early-days.html

[13] http://www.pvid.org/History.html

east of the PSEGS. The water, taken from a swamp area called Olive Lake, was used to irrigate pasturelands and small agricultural plots. With Blythe's death in 1883, no further agricultural development in the valley occurred until the turn of the century. In 1904, the Palo Verde Land and Water Company purchased the Blythe Estate and began the task of constructing additional canals and intake structures. As previously mentioned, the desert entrymen formed the Chuckwalla Valley and Palo Verde Mesa Irrigation Association in 1913. Flood damages inflicted by the Colorado River, however, necessitated the formation of the Palo Verde Joint Levee District in 1917. The Palo Verde Drainage District was later established in 1921.[14] Two years later, the state legislature was petitioned to pass the Palo Verde Irrigation District Act in order to better administer both irrigation and drainage functions.

Although schemes to appropriate Colorado River waters began as early as 1859, the first major canal, the Alamo, was not constructed until 1901 (Harrington 1962). It conveyed water to the Imperial Valley for two years before becoming choked with silt (Warren 1980, p. 99). A temporary measure to bypass the blocked areas resulted in disaster when a spring flood in 1905 diverted the whole river into the Salton Sink, creating the body of water known today as the Salton Sea. The task of turning the river back into its main channel was extremely difficult and complicated by the fact that the canal had been built on both sides of the U.S.-Mexican border making the repair an international effort. In response to this disaster, the California Irrigation District Act was passed in 1911. The Imperial Irrigation District was subsequently formed to straighten out the mess, acquiring the properties from the bankrupt irrigation company.

In the first decade of the twentieth century, farmers in the Coachella Valley, west of the PSEGS relied solely upon groundwater from artesian wells, planting extensive dates, figs, and grapes (Warren 1980, p. 98). By 1918, however, the water table had become seriously depleted. The Coachella Valley County Water District was subsequently formed to promote water conservation and control distribution. With completion of a new and improved "All-American Canal" to irrigate the Imperial Valley in 1940, communities in the Coachella Valley began forming plans to tap into it. The Coachella Canal, 122 miles long, was built nine years later.

The Colorado River Aqueduct is a water conveyance structure operated by the Metropolitan Water District of Southern California. It impounds water from the Colorado River at Lake Havasu on the California-Arizona border west across the Mojave and Colorado deserts to the east side of the Santa Ana Mountains. Its construction, between 1933 and 1941, required an army of 5,000 men. It is recognized as one of the engineering marvels of the modern world and was nominated as a National Historic Engineering Landmark by the American Society of Civil Engineers.[15,] A portion of this aqueduct tunnels through the Coxcomb Mountains north of the Chuckwalla Valley and the PSEGS.

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[14] It is not clear whether the desert entrymen were involved in the formation of the drainage district.

[15] http://www.mwdh2o.com/mwdh2o/pages/about/history4.swf

Hydroelectric Power Transmission

During the late nineteenth century, history was made generating and transmitting electricity in Southern California's Inland Empire.[16] Pioneer engineers and entrepreneurs took the industry's first steps toward large capacity power plants and long distance power transmission nearly 125 years ago. Charles R. Lloyd and Gustavus Olivio Newman built California's first hydroelectric power plant in western Riverside County in 1887. It relied upon water from a canal in Highgrove at the base of a 50-foot elevation drop. It began by powering 30 outdoor arc lights (15 in Colton and 15 in Riverside) from a direct current dynamo (Powers 2009).

In the early 1890s, direct current (DC) relied upon a distributed system involving many power plants and numerous short transmission lines because it was not practical to vary the voltage to meet differing consumer requirements for lighting and motorized appliances. Further, DC systems were inefficient because low-voltage transmission necessitated conveyance of high-currents through resistive conducting wires resulting in large energy losses. In contrast, alternating current (AC) relied upon a centralized system involving fewer power plants, long-distance transmission lines, and transformers to step down the voltage, essentially enabling the conveyance of high-voltages at low-currents, thereby reducing resistance and energy loss.

In September of 1893, while the dominant electric companies were fighting over the emerging electric power standards (DC versus AC), the small community of Redlands, in San Bernardino County, managed to engineer and complete the first commercially viable power plant in the United States (Myers 1983; Hay 1991). With the foresight of Almarian Decker, long-distance electric power transmission was achieved via transformers and the development of a revolutionary three-phase AC generator. Decker's power generation and delivery system was so successful that it became the Southern California standard.

Hydroelectricity, referred to as "white coal," was a clean and inexpensive source of power that enabled industrial capitalism to take hold in the West (Teisch 2001). Engineers began to dam western rivers for electricity in the 1890s, just as the hydraulic mining industry declined. Citizens, politicians, and reformers viewed electricity as a necessity that would dramatically uplift the country's standard of living. Water and power companies like Edison Light and Power Company of Los Angeles (later known as Southern California Edison), seeing big money, made every effort to control the stakes.

Before 1913, the highest voltage lines in the Los Angeles area were operated in the 10–75-kV range. Some of the earliest distribution lines were built to serve rural communities (Taylor 2005). During the 1930s, any circuits built were those that extended lines constructed a decade earlier. Many of these lines focused on following railroad spur lines and existing distribution lines to growing communities.

The first electricity came to Blythe in 1917. Two 50-watt diesel engines generated power 18 hours a day. It was not until 1930 that this system was abandoned when a 70-mile-long transmission line was constructed connecting Blythe with Calipatria in the Imperial Valley, where the line's main system was located. In the 1950s, the Blythe-Eagle

[16] http://www.edison.com/files/backgrounder_mtview_historic.pdf

transmission line was constructed. It was a 161-kV transmission line that connected the Blythe-Eagle Mountain Substation in Blythe to a substation near Eagle Mountain (Williams 2009; Myers 1983). The other transmission line in the vicinity of the PSEGS is the Devers-Palo Verde- line, a 500-kV lattice-tower transmission line constructed in 1982. It connects a plant in Arizona with a substation near Palm Springs.

Mining

Riverside County is known mostly for its sporadic, small-scale mining of gold, silver, lead, copper, uranium, fluorite, and manganese.[17] The following summary is derived from Shumway et al (1980), who provide an overview of mining in the region, focusing on areas relevant to the project area.

Large numbers of prospectors were attracted to the region during the gold boom in La Paz (in western Arizona, approximately six miles north of present-day Ehrenberg) in 1862. Not long after, miners began combing the mountains on either side of the Chuckwalla Valley. Gold was being mined as early as 1865 in the Eagle Mountain District northwest of the PSEGS. Much later, in the late 1940s, Kaiser Steel began a large-scale iron ore mining operation in the Eagle Mountains. In the Granite Mountains to the north-northwest, there was a short stint of gold mining beginning in 1894, followed by a resurgence in the late 1920s by the Chuckwalla Mining and Milling Corporation. Copper mining occurred in the Palen Mountains to the northwest during the second decade of the twentieth century, by the Fluor Spar Group, Homestake Group, Crescent Copper Group, Orphan Boy, and Ophir mines. Most of these mines were abandoned by 1917 (California State Mineralogist 1919).

The short-lived Pacific Mining District was established in 1887, in the Chuckwalla Mountains, south of the PSEGS, following gold and silver discoveries that caused the most substantial rush to Riverside County in its history. Sixty claims were filed by the end of the year, but the boom fizzled by 1890 because the owners never had enough capital to work them properly (California State Mineralogist 1890). About 1898, some 40 claims in the area were taken up by the Red Cloud Mining Company. In 1901, a force of 50 men worked there. The company installed a new hoist and a 30-ton mill, and was raising money through stock offerings to construct a tram from the mine to the mill. The company changed hands some time before 1915, however, and soon folded. Just prior to this, half-a-dozen prospectors began working the Chuckwalla Placer Diggings near Chuckwalla Springs, three miles south of the PSEGS. This lasted about fifteen years. The Red Cloud Mine was later resurrected, in 1931, when a small amalgamation plant was built, and continued operations until 1945.

A review of the BLM's National Integrated Land System (NILS) GeoCommunicator website,[18] showed a cluster of closed placer mining claims within the PSEGS. Additional information on these claims is currently being sought regarding claimants and date ranges of claims.

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[17] Exceptions include sizeable sustained mining operations at Midland for gypsum and in the Eagle Mountains for iron.

[18] http://www.geocommunicator.gov/GeoComm/index.shtm

Military Activities

Desert Training Center

In 1942, during World War II, Gen. George S. Patton established the Desert Training Center/California-Arizona Maneuver Area (DTC/C-AMA) in a sparsely populated region of southeastern California, Arizona, and Nevada. Its purpose was to prepare tank, infantry, and air units for the harsh conditions of North Africa, practicing maneuvers, developing tactics, and field testing equipment (Meller 1946). The installation, in operation for two years (until the end of the war), was 16,000 square miles in extent. It was the first simulated theater of operations in the United States. Its location was chosen for its unforgiving desert heat, rugged terrain, available telephone communications system, and accessibility by established railroads and highways (Henley 1992, pp. 5–7; Howard 1985, pp. 273–274).

Seven camps were established for divisional use. Camp Young, near Indio, served as the main headquarters (Crossley 1997). Camp Desert Center was located between Chiriaco Summit and the community of Desert Center in T5S/R14E, Sections 26, 28, 30, 32, and 34; and T4S/R15E, Sections 1–15, 17, 18, 22, and 30-34 (Ickes 1942, pp. 1–2, as cited in Bischoff 2000, p. 58). It encompassed 34,000 acres, consisting of an encampment with temporary housing structures, an evacuation hospital, observers' camp, an ordnance campsite, quartermaster truck site, and maneuver area (USACOE 1993, p. 3). The Desert Center Army Airfield was situated just northwest of the community of Desert Center. It contained two paved runways, more than 40 buildings (officer's quarters, a mess hall, a dispensary, a headquarters building, a recreation hall, a link trainer building, a hangar, various supply buildings, an operations building, a power house, a pump house, a control tower), a well, and a 10,000-gallon water tower (Bischoff 2000, p. 93).

In 1986, BLM planned to nominate each of the seven division camps to the NRHP, to develop an interpretive program for the DTC/C-AMA, and to provide historical resources protection through designation as an Area of Critical Concern (ACEC) (Bischoff 2000, p. 134). Subsequently, Bischoff (2000, p. 133), in considering the historical and archaeological contexts for the DTS/C-AMA, found that it was a historically significant resource under all four criteria of the NRHP. As such, he recommended that the facility be nominated to the NRHP as a discontiguous district of clearly functionally and temporally related resources. He further proposed that the facility be recorded as multiple properties consisting of contributing and noncontributing elements of the district. DTC/C-AMA can be thought of as an interconnected landscape of WWII training sites that are highly significant for their association with Gen. George S. Patton and for their contributions to our understanding of how American soldiers were trained during WWII.

Desert Strike

During the Cold War years, relations between the United States and the Soviet Union were fragile. While a campaign promoting the nonproliferation of nuclear weapons began in 1958, a treaty was not signed until 1970. Thus, amid worries of nuclear war, a two-week training exercise was launched in 1964, called Desert Strike. It involved over 100,000 men, 780 aircraft, 1,000 tanks, and 7,000 other vehicles along the banks the

Colorado River and adjoining desert valleys ranging over 150,000 square miles of California, Nevada, and Arizona (Garthoff 2001, p. 199; Nystrom 2003). Four Army divisions, three Army Reserve and National Guard brigades, and fifteen tactical Air Force squadrons took part.

The exercise was a two-sided enactment, with fictitious world powers “Calonia” and “Nezona” sharing a common border at the Colorado River. The premise of the conflict between these two entities, each led by a Joint Task Force, was a dispute over water rights. Major tactical operations during the exercise included deep armored offensive thrusts, defensive operations along natural barriers, counterattacks including airmobile and airborne assaults, and the simulated use of nuclear weapons. The Air Force provided fighter, air defense, interdiction, counter-air reconnaissance, and troop carrier operations in support of both joint task forces (Desert Strike n.d., p. 316).

In the first phase of Desert Strike, Calonia initiated mock battle with a full-scale invasion of Nezona. A new concept for military river crossings was put into operation during this invasion, accomplished with a combination of assault boats, amphibious armored personnel carriers, ferries, bridges, and fords at eight major sites along a 140-mile stretch of the Colorado River. The practice of attack and counterattack continued into a second phase, in which simulated nuclear strikes and airborne assaults were traded between the forces. Heavy equipment, such as the M60 tank, was used during practice maneuvers, and the track marks can still be seen across the desert (Prose and Wilshire 2000).

CULTURAL RESOURCES INVENTORY

A project-specific cultural resources inventory is a necessary step in staff’s effort to determine whether a proposed project may cause significant effects to historically significant cultural resources (i.e., historical resources) and would therefore, under CEQA, have a significant adverse effect on the environment.

The development of a cultural resources inventory entails working through a sequence of investigatory phases. Generally, the research method proceeds from the known to the unknown. These phases typically involve doing background research to identify known cultural resources, conducting fieldwork to collect requisite primary data on not-yet-identified cultural resources in the vicinity of a proposed project or project amendment, assessing the results of any geotechnical studies or environmental assessments completed for a proposed facility site including ancillary infrastructure, and developing recommendations of historical significance (see “Determining the Historical Significance of Cultural Resources,” below) for any cultural resources that are identified.

This subsection describes the research methods used by the project owner and Energy Commission staff for each phase and provides the results of the research, including literature and records searches (California Historical Resources Information System (CHRIS) and local records), archival research, Native American consultation, and field investigations. Staff provides a description of each identified cultural resource, recommendations on their historical significance, and the basis for those recommendations. Assessments of the amended project’s greater effect on historically significant cultural resources; potential effects on previously unidentified, buried archaeological resources; and proposed mitigation measures for all significant effects are presented in separate subsections below.

PROJECT AREA OF ANALYSIS (PAA)

The PAA is a concept that staff uses to bound the geographic area in which the proposed project has the potential to affect cultural resources. The effects that a project may have on cultural resources may be immediate, further removed in time, or cumulative. They may be physical, visual, auditory, or olfactory in character. The geographic area that would encompass consideration of all such effects may or may not be one uninterrupted expanse. It may include the project area, which would be the site of the proposed plant (project site), the routes of requisite transmission lines and water and natural gas pipelines, and other offsite ancillary facilities, in addition to one or several discontiguous areas where it could be argued the project could potentially affect cultural resources.

The project description included in the Petition for Amendment states that the project will no longer use the parabolic trough technology, as originally licensed, but will instead use solar power towers, associated power blocks, and heliostat fields. After review of the petition and a site visit to the project site and surrounding area, staff determined that the previous PAA used in the 2010 licensing was not adequate to analyze the potential effects that could occur, given this change in technology. Specifically, switching from relatively low profile parabolic troughs to two, 750-foot tall power towers has the potential to effect cultural resources much farther away; therefore, the PAA has been expanded. Staff has observed in the field that the project will be plainly visible from at least 15 miles away. Therefore, staff has determined that, in order to adequately evaluate the new potential effects of the amended project, the revised PAA includes all visible areas within approximately 15 miles of the project area boundary (see **Cultural Resources Figure 1**). As shown in Figure 1 the viewshed extends much farther than 15 miles in some areas while in other areas the viewshed is less than 15 miles, due to the area topography. Staff has determined that this would constitute the geographic area across which the project may have the potential to cast significant visual effects on cultural resources. The archaeological, ethnographic, and built-environment components of the PAA for the amended project vary with respect to the differences in the character of the inventory for each of these resource types, and are described separately below.

Archaeological Resources PAA

During the original analysis of the project's potential to affect archaeological resources, the PAA was largely limited to the minimum geographic standards set out in the Energy Commission's siting regulations. As has already been noted above, the proposed addition of two, 750-foot tall solar power towers to the licensed project significantly increases the intrusion of the vertical profile of the project across Chuckwalla Valley, relative to the visibility the project would have had if either of the reconfigured parabolic trough alternatives had been built as originally licensed. Due to this significant increase in visibility, the Archaeological Resources PAA has been expanded to include all visible areas within 15 miles of the project area boundary (see **Cultural Resources Figure 1**).

Ethnographic Resources PAA

The Ethnographic PAA encompasses the view shed within which it would be possible to see one of the two proposed solar power towers. In general the view-shed perimeter is delineated by the crests of the mountain ranges that define the combined Palen and Chuckwalla valleys. The ranges listed are provided in a clockwise direction and starting due north of the project are the Granite Mountains, Palen Mountains, McCoy Mountains, Mule Mountains, Little Chuckwalla Mountains, Chuckwalla Mountains, Eagle Mountains and the Coxcomb Mountains. While some higher elevation areas beyond the first ring of mountains can be seen, and while some closer areas cannot be seen because of intervening canyon walls or other intruding visual obstacles, staff is interested in analyzing only those resources that can be reasonably seen from the height of the solar power towers (see **Cultural Resources Figure 1**).

Built-Environment PAA

For built-environment resources in the rural context of the project site, and for each project alternative under the analysis for the original license, the PAA was defined as the project site and any above-ground linear facilities, plus a half-mile buffer. As previously stated, the addition of two, 750-foot solar power towers to the licensed project stands to significantly increase the visibility of the project across the Chuckwalla Valley, relative to the visibility of the project if it had been built as originally licensed. Due to this significant increase in visibility, the Built Environment PAA has been expanded to include all visible areas within 15 miles of the project area boundary (see **Cultural Resources Figure 1**).

DATA COMPILATION FOR PROJECT AREA OF ANALYSIS

Record, File, and Database Searches

Identification of cultural resources in the PAA, analysis of the significance of those resources, and the potential project-related effects requires resource information specific to the project area and vicinity. Various repositories in California hold compilations of information on the locations and descriptions of cultural resources that have been identified and recorded in past cultural resources surveys. Consistent with the Energy Commission’s Data Regulations, the applicant conducted background inventory research on the original PAA and provided the results as part of the PSPP Application for Certification (AFC). The following describes those efforts in 2009-10. Research is ongoing on the expanded PAA for the amended project and will be included in the FSA.

CHRIS Records Search

The California Historical Resources Information System, or CHRIS, is a federation of eleven independent cultural resources data repositories overseen by the California State Office of Historic Preservation. These centers are located around the state, and each holds information about the cultural resources of several surrounding counties. Qualified cultural resources specialists obtain data on known resources from these centers and in turn submit new data from their ongoing research to the centers. The project falls within the jurisdiction of the Eastern Information Center, which is housed in the Anthropology Department at the University of California, Riverside.

As a part of the original licensing process Palen Solar I, LLC's[19] cultural resources consultant, AECOM, submitted a records search request to the Eastern Information Center, at the University of California, Riverside, on January 29, 2009. This study area was of the project footprint and a one-mile buffer around the archaeological PAA (exclusive of the transmission route) established for the AFC as part of the original licensing. A supplemental records search was performed on October 15, 2009, to cover the transmission corridor and a half-mile buffer area. The following information is a result of those records searches. The additional records search for the expanded PAA for the amended project is in process and will be provided in the FSA.

Previous Surveys

Twelve previous studies have been conducted within the original 2009 study area (including the buffer area outside the original archaeological PAA). These are summarized in **Cultural Resources Table 2**. It appears that less than 1 percent of the archaeological PAA has been previously surveyed.

Four studies, related to Southern California Edison's Devers-Palo Verde- transmission lines, were conducted north of the original archaeological PAA (Cowan and Wallof 1977; Wallof and Cowan 1977; Westec Services, Inc. 1982; Wilson 2009). These same four studies reported on a linear corridor south of the original archaeological PAA. Three additional linear studies, south of the original archaeological PAA, include two along I-10 related to a pipeline project and a safety project (Greenwood 1975; Hammond 1981) and a fiber optic project along Chuckwalla Road (Underwood et al. 1986). Several localized surveys, scattered both in and out of the original archaeological PAA, relate to geotechnical boring and pole replacement projects (Crew 1980; BLM 1980; Schmidt 2005). The remaining investigations include a survey along Corn Springs Road (Martinez et al. 2008) and a reconnaissance along the dunes on the southeast edge of Palen Dry Lake (Ritter 1981).

Cultural Resources Table 2
Previous Surveys within the Original Study Area (2009 Records Search Limits)

Report No.	Date	Within Arch. PAA	Author(s)	Title
00161	1975	Y	Greenwood	Paleontological, Archaeological, Historical, and Cultural Resources: West Coast-Midwest Pipeline Project, Long Beach to Colorado River.
00190	1981	Y	Hammond	Archaeological Survey Report for the Proposed Safety Project on Interstate 10 Between Chiriaco Summit and Wiley's Well Overcrossing, Riverside County, California
00220	1977	Y	Cowan & Wallof	Interim Report: Fieldwork and Data Analysis: Cultural Resource Survey of the Proposed Southern California Edison Palo Verde-Devers 500 kV Power Transmission Line
00221	1982	Y	Westec Services, Inc.	Cultural Resource Inventory and National Register Assessment of the Southern California Edison Palo Verde to Devers Transmission Line Corridor (California Portion)

[19] Palen Solar I, LLC was the project owner when the original license was issued.

Report No.	Date	Within Arch. PAA	Author(s)	Title
00222	1977	Y	Wallof & Cowan	Final Report: Cultural Resource Survey of the Proposed Southern California Edison Palo Verde-Devers 500 kV Power Transmission Line
00813	1980	N	Bureau of Land Management	Eastern Riverside County Geothermal Temperature Gradient Holes
00982	1980	Y	Crew	An Archaeological Survey of Geothermal Drilling Sites in Riverside County
01341	1981	N	Ritter	Archaeological Appraisal of the Palen Dry Lake Area of Critical Environmental Concern, Riverside County, California
02210	1986	Y	Underwood et al.	Preliminary Cultural Resources Survey Report for the US Telecom Fiber Optic Cable Project, From San Timoteo Canyon to Socorro, Texas: The California Segment
05245	2005	Y	Schmidt	Negative Archaeological Survey Report: Southern California Edison Company, Blythe-Eagle Mountain 161-kV Deteriorated Pole Replacement Project
08181	2008	N	Martinez et al.	Cultural Resources Study Regarding Motorized Vehicle Routes of Travel on Lands Managed by the Bureau of Land Management California Desert District in Imperial, Riverside, and San Bernardino Counties, California
unknown	2009	Y	Wilson	Letter Report: Archaeological Monitoring for the Geotechnical Investigation of the proposed Devers-Palo Verde No. 2 Transmission Line Project, Riverside County, California

Previously Recorded Resources

Twelve previously recorded resources were identified within the original 2009 study area, seven historic-period and five prehistoric archaeological sites (see **Cultural Resources Table 3**, below). These include: a segment of historical Chuckwalla Road, four early-twentieth-century tin can scatters and two isolates (a tin can and a 1940s general infantry periscope-style flashlight).

Cultural Resources Table 3
Previously Recorded Sites within the original Study Area (2009 Records Search Limits)

Period	Primary # (P-33-)	Site Trinomial (CA-Riv-)	Site Type	Constituents
Historic	13592		Tin can scatter	Church-key opened beverage cans, juice cans, meat tins
	13681		Isolate	Hole-in-cap can
	13964	7648	Tin can scatter & section marker	Tin cans & wood fragments
	14161		Isolate	General Infantry periscope style flashlight
	17137	8920	Tin can & glass scatter	Hole-in-top cans, evaporated milk cans, glass fragments
	17138	8921	Tin can & glass scatter	Tins cans, glass fragments, and milled lumber

Period	Primary # (P-33-)	Site Trinomial (CA-Riv-)	Site Type	Constituents
	17766		Road Segment	Rte 60/70 w/ associated diversion dikes (Chuckwalla Rd)
Prehistoric	n/a	893T	Trail Segment	None
	n/a	1515	numerous widely dispersed loci of sparse lithics & FAR (fire-affected rock) scatters over an extensive area	FAR, core fragments, flakes, cores, hammer-stones, cobble chopper tools, milling tools, bone fragments, projectile point, pottery sherds, turquoise pendant, and ring of boulders. Rumored fishhooks, fish bone, and possible human remains (burials and cremations).
	13591		Isolate	Quartzite biface
	14160		Isolate	Incised pottery rim sherd and body sherd
	14177		Cleared Circle Ring	None

Five prehistoric resources were identified outside the original archaeological PAA. Four, south of the project area, included: a remnant of a foot trail (CA-Riv-893T); a pottery sherd scatter (P-33-14160); a rock ring (P-33-14177); and an isolated quartz biface fragment (P-13591). One very large seasonal campsite, CA-Riv-1515, was identified and recorded by Ritter (1981), less than 0.5 mile to the northeast of the original PAA.

CA-Riv-1515 is situated within low dunes bordering the east edge of Palen Dry Lake bed. It is characterized as an extensive elongated scatter of cultural materials over approximately three miles of the playa. The site boundaries, as delineated, incorporate many small localities of activity. Noted associated artifacts included: scatters of fire-affected rocks, milling tools (mano and metate fragments), flakes of chalcedony, quartzite, and basalt, toolstone core detritus, a Rose Spring projectile point, isolated pottery sherds (probably Tizon Brown ware), quartzite hammerstones, quartzite cobble chopper-tools, scattered bone fragments (rabbit, tortoise, and large mammal), and a ring of boulders. Anecdotal information, derived from informants (reported to Ritter by Ed Carlson, District Ranger for Joshua Tree National Monument), suggests that fish bone and fishhooks also occur, along with burials and/or cremations, and beads. A probable turquoise pendant was found in 1975 at the north end of the site.

Reed (1981) prepared an Area of Critical Environmental Concern (ACEC) management plan and environmental assessment for Palen Dry Lake and CA-Riv-1515. The ACEC is situated adjacent to the PSEGS in an area encompassing 5.3 square miles (within all or parts of T5S R17E, Sections 23, 24, 25, & 26; T5S R18E, Sections 30, 31, & 32; T6S R17E, Section 1; and T6S R18E, Sections 5,6,7, & 8).

Further afield, outside the original CHRIS study area, Gallegos et al. (1980) discuss two other prehistoric sites associated with the northwest section of Palen Dry Lake, found during a cultural resources inventory of the Central Mojave and Colorado Desert regions (no numerical designations were assigned). Typical archaeological remains underlying the dunes in that vicinity include coarse abraders of basalt and chert, along with flakes of fine quality chalcedony and obsidian, as well as a few pottery sherds (Gallegos et al.

1980, p. 106). Notes associated with a collection of about 300 artifacts (mostly chipped stone, some ground stone, a few pottery sherds, and an unworked piece of turquoise) archived at the University of California Los Angeles (Accession No. 320), describe two areas: Area A (0.5 mile square at the northern edge of the lake) and Area B (located half a mile to the south of Area A).

Eight miles west-northwest of the project site, a major aplite toolstone quarry (CA-Riv-1814) was found during investigations for the Devers-Palo Verde transmission line study (Singer 1980). It was determined eligible for the National Register of Historic Places (NRHP). Also recorded during that study was a very large site (CA-Riv-1383) spread over 45 acres, with 33 loci, including 10 rock rings, 3 cleared circles, 170 petroglyphs, 3 trails, 79 potsherds, and sparse lithic scatters containing 193 flakes of aplite and quartzite. This site was also determined eligible for the NRHP.

Archival and Library Research

Detailed resource-specific information needed by staff may entail primary and secondary research in various archives and libraries. An applicant may include archival information as part of the information provided to staff in the AFC or may undertake such research to respond to staff's data requests. Staff may also undertake such research to supplement information provided by the applicant. The following describes the efforts that were undertaken during the original licensing case. Additional research is currently being conducted for the expanded PAA. Archival research concerning ethnographic resources has been completed and is detailed in the ethnographic section of this assessment.

Along with conducting the records search, AECOM also visited both the General Patton Memorial Museum (on April 30, 2009) and the Palo Verde Historical Museum and Society (May 4–5, 2009) in order to learn more about regional history. The General Patton Museum is located at Chiriaco Summit near Desert Center and contains information about the Desert Training Facility and other military history related to the project area. The Palo Verde Museum, in Blythe, houses information on the history of the region, focusing heavily on the development of the Blythe community, as well as a comprehensive collection of local periodicals.

AECOM also performed other archival research, including the examination of historic topographic maps including: *Chuckwalla Mountains* (1:50,000 scale, 1947); *Sidewinder Well* (1:62,500 scale, 1952); *Palen Mountains* (1:48,000 scale, 1943); and *Hopkins Well* 1:48,000, 1943). In addition, other historic maps were accessed online from California State University, Chico and the University of Alabama. Also reviewed were maps from the Malcolm Rogers collection on file at the Museum of Man in San Diego.

Staff executed additional archival research, visiting the University of California, Davis Shields Library.

Staff conducted additional on-line searches for historic maps depicting the project area. The following maps were examined:

- Beale (1861), Map of Public Surveys in California, Scale 1:1,140,000.
- American Photo-Lithographic Company (1865), California, Scale 1:5,069,000.

- Asher and Adams (1872), California and Nevada- South Portion, Scale 1:1,267,000.
- Williams (1873), Map of California and Nevada, Scale 1:3,485,000.
- Colton (1873), Colton's California and Nevada, Scale 1:2,091,000.
- Mitchell (1875), Map of the State of California, Scale 1:2,408,000.
- Hardesty (1882), Map of California and Nevada, Scale 1:2,000,000;
- Hardesty (1883), Map of Southeastern California, Scale 1:1,140,000.
- Rand McNalley (1884), California, Scale 1:2,028,000.
- Punnett Brothers (1897), Map of the State of California, Scale 1:2,218,000.
- Rand McNalley (1897), California, Scale 1:1,190,000.
- U.S. Geological Survey (1914), Lithologic Map of California, Scale 1:2,000,000.
- Smith (1916), Geological Map of the State of California, Scale 1:760,320.

Archival and Library Research Results

AECOM acquired historical data on the project vicinity, but identified no additional cultural resources in or near the project PAAs (Tennyson and Allen 2009). Staff accessed additional historical information from the University of California Davis library and documents available online.

Local Agency and Organization Consultation

California counties and cities may recognize particular cultural resources as locally historically important by ordinance, in general plans, or by maintaining specific lists. Consistent with the Energy Commission's Data Regulations, the applicant and Energy Commission Cultural Resources staff contacted local planning agencies and historical and archaeological societies to acquire information on locally recognized cultural resources specific to the vicinity of the project.

Local Agency and Organization Consultation Results

AECOM received no responses from the various historical societies, museums, and research institutions contacted. As the project is located on BLM land, a Fieldwork Authorization Request form was filed and approved on March 10, 2009.

Local Historical Societies

California counties and cities may recognize particular cultural resources as locally historically important by ordinance, in general plans, or by maintaining specific lists. To facilitate the environmental review of their projects, applicants acquire information on locally recognized cultural resources specific to the vicinity of their project by consulting local planning agencies and local historical and archaeological societies.

AECOM contacted various local historical societies, museums, and research institutions requesting information for the project footprint and surrounding area. The following institutions were contacted by both formal letter (dated June 1, 2009) and follow-up phone call (on July 17, 2009): General Patton Memorial Museum; Historic Resources

Management Programs, University of California, Riverside; Palm Springs Historical Society; Palo Verde Historical Museum and Society; and Riverside County Historical Commission. AECOM also visited the Bureau of Land Management (BLM) office in Palm Springs was visited on May 4, 2009, in order to examine the General Land Office (GLO) plat maps for the PSEGS, desert land entries, and various survey reports.

AECOM received no responses from the various historical societies, museums, and research institutions contacted. As the project is located on BLM land, a Fieldwork Authorization Request form was filed and approved on March 10, 2009.

Native American Heritage Commission

The Governor's Executive Order B-10-11, executed on September 19, 2011, directs state agencies to engage in meaningful consultation with California Indian Tribes on matters that may affect tribal communities. Consistent with Executive Order B-10-11, the California Natural Resources Agency adopted a tribal consultation policy on November 20, 2012. The Energy Commission is a "department" within the Natural Resources Agency and is required to consult with tribes consistent with the Natural Resources Agency tribal consultation policy as well as Energy Commission regulation and policy. The Energy Commission Siting Regulations require applicants to contact the Native American Heritage Commission (NAHC) for information on Native American sacred sites and a list of Native Americans interested in the project vicinity. The applicant is then required to notify the Native Americans on the NAHC's list about the project and include a copy of all correspondence with the NAHC and Native Americans and any written responses received, as well as a written summary of any oral responses in the AFC (CEC Regs 2007:App. B(g)(2)(D):87).

The NAHC is the primary California government agency responsible for identifying and cataloging Native American cultural resources, providing protection to Native American human burials and skeletal remains from vandalism and inadvertent destruction, and preventing irreparable damage to designated sacred sites and interference with the expression of Native American religion in California and specifically regarding actions on private or state lands. It also provides a legal means by which Native American descendents can make known their concerns regarding the need for sensitive treatment and disposition of Native American burials, skeletal remains, and items associated with Native American burials.

The NAHC maintains two databases to assist cultural resources specialists in identifying cultural resources of concern to California Native Americans, referred to by staff as Native American ethnographic resources. The NAHC's Sacred Lands database has records for places and objects that Native Americans consider sacred or otherwise important, such as cemeteries and gathering places for traditional foods and materials. Their Contacts database has the names and contact information for individuals, representing a group or themselves, who have expressed an interest in being contacted about development projects in specified areas.

Both the project owner and staff requested information on the presence of sacred lands in the vicinity of the PSEGS project area, as well as a list of Native Americans to whom inquiries should be sent to identify both additional cultural resources and any concerns the Native Americans may have about the proposed project.

Staff contacted the NAHC on February 12, 2013, and requested a search of the Sacred Lands File and a Native American contacts list. The NAHC responded in February 2013 with a list of Native Americans interested in consulting on development projects in the project area. On February 25, 2013 staff sent letters to all of the NAHC listed tribal entities, consisting of nine tribes, one tribal foundation and one tribal individual, inviting them to participate in a field trip to the proposed project area and encouraging tribes to provide additional cultural resources information to staff. BLM staff requested that the Energy Commission broaden consultation to tribes that the BLM understood to have a cultural interest in the project vicinity but that were not included on the NAHC list. Staff complied with the BLM request by sending out additional letters on April 3, 2013 to an additional six tribes. (see **Cultural Resources Figure 2** for general map of tribal government office locations and territories).

On behalf of the applicant for the PSPP, EDAW contacted the NAHC on April 13, 2009, and requested a search of the Sacred Lands File and a Native American contacts list. The NAHC responded on April 20, 2009, with a list of Native Americans interested in consulting on development projects in the project area. Letters to tribes and individuals listed on the NAHC contact list were mailed or faxed by EDAW on July 8, 2009. Copies of the contact letters were provided in Confidential Attachments 3, 4 and 5 of the cultural resources technical report (Tennyson and Apple 2010) that informed the PSPP AFC. A detailed summary table of the results of consultations with the individual Native American organizations on the NAHC contact list was also included. EDAW received responses from the Cabazon Band of Mission Indians that indicated they had no comment on the project. Another response was received from Joseph Benitez stating that the Chemehuevi tribe should be contacted.

The record search of the NAHC Sacred Lands file conducted by EDAW (since acquired by AECOM), did indicate the presence of Native American cultural resources on or within one half mile of the PSEGS site. However, the Sacred Lands file search conducted by staff of the PSEGS footprint did not indicate the presence of Native American cultural resources in the immediate project area. The reader should note that the Sacred Lands file only contains those resources that tribes are willing to publically identify and cannot be considered a comprehensive list of places and objects that Native Americans consider sacred or otherwise important. In addition, the NAHC inventory search provides requesters with presence/absence, but not specific locations and resources types or themes. It is expected that staff will glean specific information from participating tribes.

Field Investigations

In support of the broader research effort to identify historical resources in a PAA, the Energy Commission's Data Regulations require applicants to conduct field surveys to both relocate and identify cultural resources in or near proposed project areas, where prior surveys are more than five years old. These prescribed surveys include pedestrian archaeological surveys and built-environment windshield surveys. Additionally, staff may ask applicants to undertake geoarchaeological investigations or conduct additional fieldwork to support CRHR eligibility evaluations of the archaeological resources present in a PAA.

As part of the original licensing AECOM conducted surveys to identify previously unrecorded cultural resources in the original PAA. These surveys include a pedestrian archaeological surface survey, a geoarchaeological subsurface investigation, and a built-environment windshield survey.

Pedestrian surveys of the project site were conducted in several stages:

- The main project footprint and originally proposed transmission line/substation siting was surveyed by AECOM April 13–May 6, 2009, and October 14–26, 2009 (Tennyson and Apple 2009);
- Portions of a new transmission line and transmission line alternative were surveyed by AECOM in May, 2010 (final report not yet available to staff[20]);
- Other portions of the new and alternative transmission line routes, the new and alternative substation locations, and the alternative substation access road route were surveyed by ECORP for the Desert Sunlight Project (survey dates not known, and final report not yet available to staff); and
- A survey of the redundant telecommunications line route has not been conducted as of this writing.

AECOM surveys were conducted using four-to-eight-person teams each led by a crew chief. These teams maintained transect-spacing of 20 meters or less. Identified sites and/or isolates were flagged and recorded, their positions determined with handheld global positioning system (GPS) units. An arbitrary distance of 50 meters between artifacts and features was used to create boundaries between individual sites. Sites were defined as four or more artifacts within a boundary; isolates were defined as three or fewer artifacts. Temporary recording forms were completed in the field as the sites and isolates were identified, and additional intensive survey was conducted with three-meter intervals to fully delineate site boundaries. Flags were removed immediately after recordation. Staff has no description of ECORP's field methods.

Cultural Resources Table 3 lists the field investigations staff used for the present analysis. The table includes pertinent investigations from the original siting case as well as a few of the investigations that staff has either requested of the project owner or done themselves in order to analyze the subject amendment. The field methods and results of the investigations that staff does have are detailed below. Staff hopes to have the results of the bulk of the investigations requested in Data Requests Sets 2 and 3 (CEC 2013e, CEC 2013h) in time for the preparation of the FSA.

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[20] In early May, 2010, the BLM restricted all holders of BLM cultural resources survey permits, including the PSPP applicant and the Desert Sunlight cultural resources consultant, from providing data directly to the Energy Commission, due to concerns about what appeared to be differing regulations between the two agencies on restricting access to sensitive cultural resources data. The issue has since been resolved, but, as of the time of this writing, no formal mechanism for the transmission of confidential cultural resources data to the Energy Commission has yet been developed.

CULTURAL RESOURCES Table 4
Completed Cultural Resources Inventory Investigations Relevant to the Analysis of the Amended Project[21]

Investigation Type	Results	Report Reference
Geoarchaeological Monitoring of Geotechnical Excavations	Gross, reconnaissance-level geomorphic framework proposed for the original project area	(Steincamp 2009)
Phase I Geoarchaeological Reconnaissance	Aerial and ground-based geomorphic analysis and development of a moderately high-resolution geoarchaeological context for the amended project area	(Nials 2013)
Intensive Pedestrian Cultural Resources Surveys of the Facility Site and Ancillary Infrastructure	Documentation of 1 historic structure, 9 prehistoric and 54 historical archaeological deposits	(Tennyson and Apple 2009), (AECOM EDAW 2009a)

[21] Various studies are currently being undertaken in order to gather adequate data on the expanded PAA. These studies will be reviewed and information from them included in the FSA.

Investigation Type	Results	Report Reference
Ethnographic Resource Study	11 Potential Traditional Cultural Properties: 1. Palen Dunes/Palen Lake 2. Ford Dry Lake 3. McCoy Spring (CA-Riv-0132) National Register District 4. Mule Tank (CA-Riv-0504 and CA-Riv-0773) ACEC 5. Corn Spring (CA-Riv-032) 6. North Chuckwalla Mountains Petroglyph District (CA-Riv-01383) 7. North Chuckwalla Mountains Prehistoric Quarry District (CA-Riv-01814) 8. Long Tank 9. Alligator Rock 10. Dragon Wash (CA-Riv-049) 11. San Pascual Well	PSEGS Draft Ethnographic Report prepared by Energy Commission staff.

[1] The technical report for this survey documents a total of 13 new archaeological sites. Energy Commission staff, on the basis of a field examination, determined that one of the newly recorded prehistoric archaeological sites (Temporary No. S-2) was actually the result of recent historic activity.

Archaeological Field Investigations

Geoarchaeological Monitoring of Geotechnical Excavations

Geoarchaeological monitoring of a geotechnical investigation within the PSEGS archaeological PAA took place July 20–28, 2009 (Steinkamp 2009). Excavations of twelve boreholes and eight test pits were observed for presence/absence of paleosols, archaeological artifacts, or other evidence of archaeological deposition. Stratigraphic samples were collected for sedimentological and mineralogical data. Test pits, 1.5–3 meters deep, were placed in locations where deep footings or weight-bearing loads are planned. No cultural resources were found, and no evidence of subsurface paleosols or cultural deposits were noted during the course of monitoring.

Observations of the surface topography and subsurface deposits from the test pits suggest that the site is dominated by a roughly 10–33-centimeter-thick veneer of soil (A horizon)[22] formed in fluvial (re-worked alluvial fan deposits) and eolian (wind-deposited) sands and fluvial gravels originating from the Pleistocene alluvial fans of the surrounding mountain slopes. A-horizon soils consist of olive gray gravelly sand with sparse roots, sub-angular pebbles, angular blocky structure, and a clear wavy boundary. The C-horizon consists of a C1 horizon of storm couplets overlaying a C2 and C3 horizon of alluvial and dune sands, as well as alluvial gravels. Data from the borings indicate that the deeper subsurface deposits, below three meters, consist of alluvial fan sand and gravels that appear to represent alluvial fan transgression and aggradation, and clay that likely correlates to transgression of early lake deposits during glacial periods and stable phases of the coalescing alluvial fans.

Steinkamp concludes, on the basis of these observations, that the potential for buried shallow archaeological deposits is highest within the northeast quadrant of the original archaeological PAA, where wave-cut platforms of paleo-lacustrine and beach deposits were observed beneath dune deposits, less than a meter below the surface. Within the remainder of this PAA, if buried deposits are present, they are more likely to be deeper (up to 20 feet), due to the greater depth of alluvial fan deposition. Archaeological deposits at depth, within the alluvial fan deposits, have the potential to be heavily disturbed by millennia of alluvial fan transgression and erosion processes. Over the last 80 years, however, dikes, constructed on the upslope side of U.S. Route 60/70 in the 1930s, have protected this area by diverting storm water runoff (Steinkamp 2009, pp. 16–18).

Phase I Geoarchaeological Reconnaissance

Fred Nials conducted an aerial and ground-based geomorphic analysis and developed a moderately high-resolution geoarchaeological context for the amended project area. This geoarchaeological assessment of the PSEGS had a number of objectives including:

- Determine whether Pleistocene/Holocene transition pluvial lakes existed in Chuckwalla Valley that may have influenced archaeological site distribution in or near the PSEGS area;
- Describe the geomorphic setting and dominant geomorphic processes responsible for the context of prehistoric sites;
- Evaluate the distribution, function, duration of occupation, and potential for dating of archaeological sites in and near the project area insofar as can be determined by site locations and geomorphic context;
- Evaluate the potential for intact buried sites; and
- Recommend additional site treatment(s), if suitable, to protect cultural resrouces and maximize information return.

[22] Sedimentologists denote successively deeper soil layers with alphabetical letters, starting at the top with "A."

Intensive Pedestrian Cultural Resources Survey

AECOM, Applied Earthworks, and ECORP teams found 64[23] resources during their field investigations of various components of the PSEGS (the facility footprint, surrounding temporary disturbance area, access roads, transmission line, and substation footprint). These included one historic structure, nine prehistoric and 54 historic-period archaeological sites (Tennyson and Apple 2009, pp. 57–124; AECOM EDAW 2009a, pp. 15–17).

Prehistoric Archaeological Resources

Nine prehistoric sites were identified during field investigations within the different components of the project (facility footprint, facility access roads, temporary disturbance area, transmission line corridor, substation footprint, and substation access road); including five sparse lithic scatters and four sparse lithic and fire-affected rock (FAR) scatters (**Cultural Resources Table 5**).

CULTURAL RESOURCES Table 5
Newly Discovered Prehistoric Resources within the Archaeological PAA

Site Ref. (SMP-P-)	Resource Type	Size (m)	Landform	Constituents	Other
1015	Lithic scatter	90x30	Gravel terrace	31 flakes & 2 cores (cryptocryst, metavolcanic, basalt, rhyolite)	Surficial
1016	Lithic scatter	45x25	Gravel terrace	7 flakes (cryptocryst, metavolc, basalt, quartz)	Surficial
1017	Lithic & FAR scatter	50x18	Deflated dune terrace	3 flakes (metavolcanic), quartzite hammerstone, piece ground stone, 60+ FAR frags	Possible subsurface deposit
1018	Lithic & FAR scatter	25x9	Deflated dune terrace	13 pieces metavolcanic debitage, 35 pieces FAR, metate frag	Possible subsurface deposit
2014	Lithic scatter	30x20	Dune	3 flakes & core (metavolcanic)	Possible subsurface deposit
2015	Lithic & FAR scatter	47x22	Dune at base of alluvial fan	40+ flakes (metavolc, cryptocryst), biface frag (basalt), domed scraper, core, 4 metate frags, 2 poss. metate frags, boulder with ground surface, and marine shell frag	Possible subsurface deposit
2018	Lithic & FAR scatter	54x28	Deflated dune on periphery of Dry Lake	Five clusters of FAR (126 pieces of basaltic, metavolcanic, and granitic rocks), a metavolcanic primary flake, cryptocrystalline biface-thinning flake, a quartz secondary flake, a metavolcanic hammerstone/ battered cobble	Possible subsurface deposit

[23] This number is not final as the redundant telecommunications line route has yet to be surveyed for cultural resources.

Site Ref. (SMP-P-)	Resource Type	Size (m)	Landform	Constituents	Other
2023	Lithic & FAR scatter	75x16	Alluvial fan	2 flakes, core, 8 metate fragments, 1 mano, & 6 pieces of FAR	Possible subsurface deposit
MT-001	Lithic scatter	60x20		1 rhyolite core/chopper, 1 rhyolite tested cobble, and 1 rhyolite core	Historic component, mid-20th century can scatter and one screw-top glass bottle

Historic-Period Archaeological

Ethnographic Field Activities

Native American Consultation

Energy Commission staff held meetings with affiliated tribes to exchange general information and to gauge tribal interest in participating in further project-related ethnographic studies. Staff based their invitations to tribal government representatives and individual traditional Native American practitioners upon a February 13, 2013 listing provided by the NAHC and a separate March 12, 2013 list provided by the BLM.

On March 22, 2013 a general meeting was held at the BLM Corn Springs campground and the PSEGS project site. Energy Commission staff, BLM staff, and cultural resources staff from the Colorado River Indian Tribes, Agua Caliente Band of Mission Indians, Morongo Band of Mission Indians, San Manuel Band of Mission Indians and the Soboba Band of Luiseño Indians attended. Topics discussed at this meeting included project details, interest in further project participation, and sharing contact information.

On May 20, 2013 a meeting was held at the Agua Caliente Band of Cahuilla Indians office in Palms Springs. Energy Commission staff, BLM staff, and cultural resources staff from the Agua Caliente tribe attended. Topics discussed at this meeting included project schedule, the draft ethnographic report, and tribal concerns.

On May 21, 2013 a meeting was held at the Soboba Band of Luiseño Indians office in San Jacinto. Energy Commission staff, BLM staff, and cultural resources staff from the Soboba band were present. Topics discussed at this meeting included project schedule, the draft ethnographic report, and tribal concerns.

On May 23, 2013 a meeting was held at the PSEGS project site near Desert Center. Energy Commission staff and cultural resources staff from the Fort Mojave tribe attended. Topics discussed at this meeting included project details, project schedule, the draft ethnographic report, and tribal concerns.

On May 24, 2013 a meeting was held at the Quechan Indian Tribe office in Winterhaven, California. Energy Commission staff, the Quechan Tribal Historic Preservation Officer (THPO), and the Quechan Cultural Committee were present.

Topics discussed at this meeting included project details, interest in further project participation, the draft ethnographic report and tribal concerns. The Quechan Committee offered to provide expert witness testimony during the hearings for the PSEGS project should the need arise.

On June 20, 2013 a general meeting was held at the Morongo Band of Mission Indians tribal offices. Energy Commission staff and the Inter-Tribal Cultural Working Group, consisting of the Morongo Band of Mission Indians, the Torres-Martinez Desert Cahuilla Indians, the San Manuel Band of Mission Indians, the Agua Caliente Band of Mission Indians, the Soboba Band of Luiseño Indians, and the Twenty-Nine Palms Band of Mission Indians, were present. Topics discussed at this meeting included project background and details, the Energy Commission amendment process, discussion of the draft technical ethnographic report and PSA, and discussion of Data Requests 29, 30, and 31 and the reconnaissance survey of the Coxcomb and Palen mountains.

Staff plans to conduct several more meetings after publication of the PSA and before publication of the FSA. The results of those meetings will then be detailed in the Final Ethnographic Study and the FSA.

Ethnographic Study

Ethnographic Methods

Ethnography at its best takes years to complete. Ethnographers can spend a lifetime studying another culture and still find that their cross-cultural knowledge of their "second" culture is incomplete. Ethnography is generally a long-term endeavor lasting from several months to years. Ideally, one would spend one year studying another culture so that one can learn about their various seasonal variations and adaptations. Academic and self-funded anthropologists may have such luxury. However, the merits of ethnography, when employed to understand project impacts to ethnographic resources, often requires less than optimal study durations. One method, called "Rapid Cultural Assessment" was developed in the 1930s to assist sociologists' understanding of American rural agricultural community responses to socioeconomic impacts ensuing from evolving environmental conditions (NPS 2007, Chapter 10:8, http://www.iisd.org/casl/caslguide/rapidruralappraisal.htm).

The National Park Service (NPS) has developed similar methods for understanding ethnographic resources within shortened time frames related to project review. The NPS method, called Rapid Ethnographic Assessment Procedures (REAP), was generally followed for this project-related ethnographic study. REAP consists of a selection of ethnographic methods that relies on interview, observation, and research techniques to describe a way of life common to a group of people. This way of life can include their knowledge, customs, beliefs, social habitats, technology, arts, values, and institutions; characteristics that contribute to the identification of Traditional Cultural Properties (TCPs) (King 2003:134). REAP involves active participation of the people in a cultural group to render representations of a way of life from their point of view. Unlike traditional ethnography, REAP focuses investigations and resultant descriptions on solving specific problems or issues that may arise as a result of proceeding with a development project.

REAP's truncated methods include but are not limited to (http://www.nps.gov/ethnography/training/elcamino/phase1.htm#reap):

1. Group meetings/interviews where the ethnographer explains the project to the group, answers general questions and solicits immediate responses, fears and apprehensions, benefits, or other general perceptions from the participants concerning the project, the area where the project is being proposed, and the general connections of traditional people to the project area. Often issues of confidentiality are discussed. Surmounting the issues of confidentiality, the ethnographer may be successful in scheduling follow-up activities with specific individuals to increase ethnographic understanding.

2. Areas worth further ethnographic inquiry are identified; a research design, including research/interview questions, is developed; and specific people are scheduled by the ethnographer and the group for follow-up interviews. Follow-up interviews should be conducted according to the protocols of documentation and confidentiality identified during the group meeting/interview. Interview notes, however recorded, should be vetted with source individuals to verify accuracy and to gather additional nuanced information.

3. Follow-up interviews with the same or additional people often occur while both the ethnographer and the community begin to further think about the project, the project effects, and additional information that is necessary for fully identifying, evaluating, assessing effects, or otherwise considering impacts to ethnographic resources.

4. As Steps 1 through 3 are being conducted, a parallel archival "search, retrieve, and assess" process is undertaken to provide supporting or conflicting information to what is being discovered through the interview process. In addition to archive, book store, and other informational repositories (e.g., the Internet), the people themselves or other ethnographers with previous experiences with the same people may provide source materials.

5. Field visits will help the ethnographer triangulate between what people currently say, what people have written in the past, and what is actually or perceived by the ethnographer as a potential ethnographic resource in the project area.

Guidelines issued by state and federal agencies serve to direct the identification and evaluation of historic resources. The Office of Historic Preservation (California) issued Technical Assistance Series #6 comparing the criteria and process for listing historic resources in the CRHR and NRHP. OHP acknowledged that "the two programs are very similar" because the NRHP was used as the model for the CRHR. There are however no state level guidelines for the identification and evaluation of TCPs; therefore, practitioners in California defer to the federal guidelines found in National Register Bulletin 38 (Parker and King 1998).

Research Strategies

Energy Commission staff developed research strategies based upon the results of the meetings with tribes and previous ethnographic studies conducted by Energy Commission Staff in the region. Staff identified the ethnographic project area of analysis to be the same as the view-shed delineation area identified by the Owner (Fleming 2013). This figure (See **Cultural Resources Figure 1**) describes an area within an approximately 15 mile radius of the PSEGS facility.

The Prehistoric Trail Network Cultural Landscape (PTNCL) passes through the project area. This trail corridor was identified in the Staff Assessment written for the PSPP, and Condition of Certification **CUL-1** was applied to reduce the cumulative effects of four utility-scale solar energy facilities located in Rice Valley, Chuckwalla Valley and the Palo Verde Mesa. Staff's knowledge of the PTNCL helped to inform the data requests and research strategies by providing a context upon which these requests and questions could be asked. For example, knowing that the PTNCL passes through the project area suggests that several tributary trails likely passed within close proximity to the PSEGS project area connecting to the larger trail network and also potential places of ethnographic significance. By understanding these trail networks, staff has the ability to predict where potential resources or trails could be based on this knowledge.

These research strategies provided general guidance for preliminary archival research and allowed for the preparation of interviews. Because this analysis is focused on the changes from the originally licensed project to the currently proposed PSEGS facility, the primary focus of this research design is on the indirect effects to the setting of potential ethnographic resources.

Research questions and directives developed included, but are not limited to:

- Research specific Chuckwalla Valley and neighboring regions (Lower Colorado River Valley, Coachella Valley) Native American history and culture to establish potential places of ethnographic significance that are located within the ethnographic PAA. Such places can be, but are not limited to; springs and other sources of water, rock art panels, habitation sites, and ceremonial sites.
- Research contributing elements to the potential TCPs. This list of elements is based on previous research Energy Commission staff conducted in the region, and includes but is not limited to:
    - Amity/enmity (Bean et al. 1978) relationships between tribes
    - Trails
    - Water
    - Totemic clan names
    - Subsistence
    - Plants and animals
    - Ceremonies
- Research the role of medicine men and rock art to better understand the relationships among rock art sites in the Chuckwalla Valley.

- Inquire as to the relationships between the Mohave[24], Chemehuevi, Quechan, Cahuilla, and Serrano cultures and the potential places of ethnographic significance.
- Inquire as to the extent that the PSEGS solar power towers negatively impact the integrity of these potential ethnographic resources.

Interviews

Staff plans on conducting ethnographic interviews after completion of most of the archival research. This will allow for more focused interview questions, saving both time and money. Moreover, the abbreviated nature and fast-paced schedule of the amendment process did not afford the opportunity to establish interview sessions prior to publication of the draft ethnographic report or the PSA. Therefore, this section will be completed for the final report and FSA. Staff anticipates that the interviews will provide information that may add or change ethnographic resources characterizations for both this document and the FSA.

Ethnographic Method Constraints

It is important to acknowledge several constraints staff has identified thus far to the ethnographic methods. The purpose of acknowledging these constraints is to allow the reader and decision-makers to understand why some parts of this draft may seem incomplete. These consist of issues of confidentiality, time, language, access to private land, and missing data. Constraints were categorized as *surmountable*, *partially surmountable*, or *insurmountable* as described below.

Tribal answers to research questions can be sensitive, and tribes attach a high degree of confidentiality to such information. As such, these confidentiality concerns require more coordination and a lengthier schedule for completing the ethnographic study and subsequent report than other technical studies. In particular some tribes, particularly the Colorado River Indian Tribes (CRIT), require an application for all ethnographers who desire to interview CRIT tribal members. Staff is currently drafting a CRIT Permit Application that, upon signature of CRIT and the Energy Commission staff, would allow staff to conduct ethnographic interviews with tribal members. This draft report only provides what can be learned from the written ethnographic and ethnohistoric record. Staff anticipates some oral history interview information to be obtained and incorporated into the report after PSA publication. *Constraint partially surmounted*.

Time limits imposed by the Energy Commission amendment process are another constraint. The Mohave, Chemehuevi, Quechan, Cahuilla, and Serrano cultures, and traditional cultural practices related to epistemology, world view, and religion, are too complex to understand within the limits of a three month study. The Rapid Ethnographic Assessment Procedures were adapted to this ethnographic study. While REAP cannot replace the quality of long-term ethnography, it does provide some ability to include ethnographic resources in the Energy Commission amendment process; a process that only affords Energy Commission staff with a few months to conduct independent research. *Constraint partially surmounted*.

[24] The Mohave who reside at the Colorado River Indian Reservation spell their name with an "h", whereas the Fort Mojave spell theirs with a "j". Staff will use the appropriate spelling when referring to each group, but when referring to the group as a whole staff will use the Mohave spelling.

Language barriers and differences in world view can make ethnography challenging. Some cultural practices and understandings are foreign to the English language and scientific way of knowing, and can only be articulated in the traditional languages of Native Americans. Staff does not speak or understand any of the languages traditionally spoken by the Mohave, Chemehuevi, Quechan, Cahuilla, or Serrano. Additionally, in past ethnographic studies conducted by Energy Commission staff with some of these tribes, concerns were expressed about the ability of new forms of language (i.e., English and Western-based science) to express the tribes' deep seeded understanding of their cultural places. However, information conveyed in this report is provided in the English language only. *Constraint is insurmountable.*

The San Pascual well is located on private land. The dominant feature of this area is a large wash emanating from the Pinto Basin and fed by washes emanating from the Coxcomb and Eagle Mountains. The well was likely constructed within or in very close proximity to the wash because water is more likely to be closer to the surface in a wash. However, the wash itself and the area around the wash are privately owned. Therefore, staff was unable to examine what is extant of the well, compromising staff's ability to assess the site. *Constraint not surmounted.*

Due to time constraints, the trail study requested of the project owner (Data Requests 29, 30, 31) has not yet been initiated. The project owner has agreed to conduct the study, but the results will only be included in the final ethnographic report that will inform the FSA. However, a discussion of trails is included in this report based on the archival research conducted thus far. *Constraint partially surmounted*.

Also, due to time constraints, a reconnaissance archeological/ethnographic survey along the flanks of the Palen and Coxcomb Mountains in those portions of the mountains in the viewshed of the proposed project facilities has yet to occur. Staff anticipates results of this survey will be available for inclusion in the FSA.

Preliminary Results of Ethnography

Staff Ethnographic Archival Efforts

Staff made efforts to seek, obtain, and assess culturally relevant information from various archival and other sources. These sources include:

- Documents were obtained via various internet searches and subsequent downloads
- Books were obtained from online used book stores
- Books and manuscripts from the California State Library
- Books and manuscripts from the Sacramento State University Library
- Books and manuscripts from the University of California Davis Peter Shields Library
- Books and manuscripts from the University of California Berkeley George and Mary Foster Anthropology Library
- Books and manuscripts from the University of California Bancroft Library
- Archaeological site records and reports from the Eastern Information Center at the University of California Riverside

- Archaeological site records and field notes collected by Malcolm Rogers, housed at the Museum of Man in San Diego
- Archaeological field notes collected by Alan Koloseike, housed at the Fowler Museum at the University of California Los Angeles

Places Analysis

Preliminary tribal meetings suggested that understanding the general cultural background of the Native American groups in the area would help to better inform staff's analysis of potential TCPs by providing context to these resources. Therefore the ethnographic report analysis describes the general cultural background of the primary groups with traditional ties to the PSEGS project area, i.e., the Mohave, Chemehuevi, Quechan, Cahuilla, and Serrano. This general cultural background includes a discussion of language groups, ancestral territory, amity/enmity relationships, trails and trail features, water, plants and animals, and rock art. More specific cultural aspects of each group are discussed in each cultural section focusing on tribal organization and/or totemic clan names, subsistence/agriculture, and ceremonies.

Ethnographic Resources

While several definitions of ethnographic resources can be found in historic preservation literature, the National Park Service provides the most succinct and commonly used definition (NPS 2007: Chapter 10):

> *Ethnographic resources are variations of natural resources and standard cultural resource types. They are subsistence and ceremonial locales and sites, structures, objects, and rural and urban landscapes assigned cultural significance by traditional users. The decision to call resources "ethnographic" depends on whether associated peoples perceive them as traditionally meaningful to their identity as a group and the survival of their life-ways.*

The term ethnographic resources can include resources that are also referred to as traditional cultural properties, sacred sites, cultural landscapes, heritage resources, historic properties, or historical resources that are sites, areas or places.

Traditional Cultural Properties/Places

Traditional Cultural Properties (TCPs) were defined in order to provide a layer of meaning, relevancy, or significance from a communal or localized perspective to the cultural resources profession that is otherwise dominated by archaeology and the knowledge and perspectives that archaeologists promote (King 2003: 21-33). Thomas King and Patricia Parker authored an innovative and influential National Park Service Bulletin (NPS Bulletin 38)[25] that defined what TCPs are, how to understand, locate and document TCPs, and how to ethnographically interact with communities that wish to participate in the protection of their special places. An explanation of "traditional cultural significance" is provided in the following quote from NPS Bulletin 38 (Parker and King 1998: 1):

[25] A discussion of the applicable state and federal guidelines is included in the methods section below

> *One kind of cultural significance a property may possess, and that may make it eligible for inclusion in the Register, is traditional cultural significance. "Traditional" in this context refers to those beliefs, customs, and practices of a living community of people that have been passed down through the generations, usually orally or through practice. The traditional cultural significance of a historic property, then, is significance derived from the role the property plays in a community's historically rooted beliefs, customs, and practices.*

Such places of traditional cultural significance can include a location that a Native American group associates with their traditional beliefs concerning their origins, cultural history, or nature of the world; the buildings, structures, or patterns of land use that reflect the cultural tradition valued by the long-term residents of a rural community; a cultural group's traditional home in an urban environment that reflects its beliefs and practices; a location where ceremonial activities conducted by Native American practitioners have historically, or are known or thought to have occurred; or, a location where the economic, artistic, or other cultural practices that are important in maintaining a community's historic identity have traditionally been carried out (Parker and King 1998: 1).

Thus, a property that is eligible for inclusion in the National or California registers because of its association with cultural practices or beliefs of a living community that "(a) are rooted in that community's history, and (b) are important in maintaining the continuing cultural identity of the community is a traditional cultural property" (Parker and King 1998: 1).

While the TCP definition provided in NPS Bulletin 38 addresses many types of special places, some confusion exists with language added during the 1992 amendments to the NHPA at Section 101(d)6. This section says that "properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization may be determined eligible for inclusion on the National Register." The section further extols agencies to consult with Indian tribes and Native Hawaiians concerning the values that their communities may attach to special places. This has led some to erroneously interpret the Act's Section 101 language to limit TCPs to only Native Americans and Native Hawaiians. However, the specific language of the Act does not prohibit diversity beyond the two specific ethnicities called out; but rather affirms that Native Americans asserting TCPs during the Section 106 process must be considered as "Sacred Sites.

Staff considers the term "Sacred Site" to be different than the term "Traditional Cultural Property", although they are often used interchangeably, even when it is erroneous to do so. The term Sacred Site comes from the American Indian Religious Freedom Act (AIRFA), the Religious Freedom Restoration Act, and Executive Order 13007. Without elaborating further on information concerning the history and resulting inter-relation of the acts and the order, suffice to say that Executive Order 13007 provides the best guidance and definition of the term "Sacred Site". Executive Order 13007 calls for the Federal government to accommodate access to, and ceremonial use of, Sacred Sites by Indian religious practitioners and to avoid adversely affecting the integrity of Sacred Sites through federal land manager actions (ACHP 2002). The definition is as follows:

> *"…any specific, discrete, narrowly delineated location on Federal land that is identified by an Indian tribe, an Indian individual determined to be an appropriately authoritative representative of an Indian religion, as sacred by virtue of its established religious significance to, or ceremonial use by, an Indian religion; provided that the tribe or appropriately authoritative representative of an Indian religion has informed the agency of the existence of such a site."*

Therefore, these two terms are not interchangeable because Sacred Sites can only be located on Federal lands and the definition calls out the limited geographic extent of Sacred Sites as "specific, discrete [and] narrowly delineated." However, TCPs are often identified as a result of Federal undertakings and tend to be geographically more expansive than "specific, discrete and narrowly delineated Sacred Sites." TCPs tend to be larger because aspects such as viewshed and changes through time need to be considered when defining the boundaries of a TCP (Parker and King 1998: 20)

For the purposes of this study, the research focus is with Native American sites, places, and areas otherwise referred to as ethnographic resources, located in and around the proposed project area. Having said this, and based upon the discussion provided above, the reader should be aware that there are multiple overlaps of terminology. Staff will primarily use the term "places" in reference to the type of historical resources discussed in this draft report; however, where applicable staff will use the term that a source document uses.

Places and landforms can be part of a cultural system. For example, Native Americans often consider mountain peaks, rivers, springs, and seeps to be important or sacred places. The following list of places includes those areas which are understood to have potential cultural significance for tribes in the vicinity of the PSEGS project area and therefore should be evaluated as possible ethnographic resources. These places have been derived from topographical maps of the region, as well as from published sources (i.e., Bean et al. 1978, Kroeber 1976, and Laird 1976). They are discussed geographically beginning with the Palen Dunes/ Palen Lake ACEC and moving in a clockwise direction around the PSEGS ethnographic PAA. Some places are included here by name but with minimal description; these places require additional research, including interviews with Native Americans.

Based upon initial tribal consultations and archival research, the following is a list and description of the 11 potential Traditional Cultural Properties preliminarily identified thus far by staff:

1. Palen Dunes/Palen Lake

   The Palen Dunes/Palen Lake area is a BLM designated Area of Critical Environmental Concern (ACEC) for the sensitive cultural resources located in the boundaries of the ACEC. The Palen Dunes/Palen Lake area is a resource identified by staff. It is located in the PSEGS ethnographic PAA about 3.5 miles north of the proposed project area. It covers an area of approximately 3,632 acres (5.7 square miles). This potential ethnographic resource includes the 3,632 acre Palen ACEC, which also includes some of the dunes on the alluvial terrace of the Palen Mountains and the dry lake bed of Palen Lake, as well an additional approximately 500 acres of dunes north, west , and southwest of the ACEC. The key components of this area are the ancient Indian archaeological sites located in the dunes and on the margins of the dry lake bed, and the resources that were available to groups when water was present in the lake bed.

As mentioned previously, Palen Lake was an area that held ephemeral sources of water after significant rainfall events. This habitat provided a place for ancient Indian people to periodically obtain water and food resources, and evidence of their occupation of this lake habitat is indicated by several archaeological sites which have been documented along the shoreline of the lake, especially in the dunes (Ritter 1981). Nials (2013) suggests that Palen Lake does not exhibit the geologic characteristics that would indicate groups could have established anything more than temporary encampments because the lake only maintained ephemeral water sources.

The archaeological sites identified in the dune areas and along the margins of the lake identified in the Palen Dunes ACEC documentation (Ritter 1981) corroborate the suggestion that use of the lake and dune area was likely on a temporary basis. Artifacts identified include hearth features indicated by clusters of burnt (fire-affected) river cobbles, materials for making and maintaining stone tools, pottery sherds, a tortoise shell pendant, animal bones, and implements for grinding food (i.e., manos and metates)(Ritter 1981). The indications for short-term occupation of the area are suggested by the paucity of cultural remains and the sparse density of the artifacts (Ritter 1981:7). The activities which occurred likely included: gathering and processing mesquite and Palo Verde beans; gathering and processing grasses and other hard seed plants; hunting of rabbit, tortoise, and mountain sheep; cooking and consuming plant food resources and water; stone tool maintenance; and short-term camping (Ritter 1981:7-8).

In addition to those sites identified by Ritter (1981), at least 16 other archaeological sites have been identified in the area. Most of these sites occur to the west and southwest of the dry lake bed, and several are clustered around mesquite hummocks. These sites primarily represent campsites and consist of lithic debitage, ground stone tools, ceramics, burned and unburned bone, fire-affected rocks, and hearths.

There are reports of cremations at these sites as well. Site CA-Riv-201 (Rogers' designation C-82A, Koloseike Area A) was initially recorded by Malcolm Rogers at some point in the early 20th century as a large village site with a cremation area, ceramics, milling equipment, and many small projectile points (Singer 1984:45). Rogers' notes and site records were obtained from the Museum of Man, but there is no mention of cremations. However, Alan Koloseike re-examined the site in the early 1960s and did indicate the presence of a cremation (UCLA 2013). Another cremation was reported at CA-Riv-660 by Chester King in 1964, but Wilke (1973) suggests that the cremation may have been mistaken for what he identified as tortoise bone and shell fragments.

Little chronological information about these sites is available. Pottery was identified at multiple sites. Some of the pottery sherds were identified as Tizon Brown Ware and a sherd of the Parker series. This suggests a date of A.D. 1000 to post 1500 (Waters 1980:1). Additionally, a projectile point collected during the Ritter (1981) survey was identified as a Rose Spring point. These projectile points date to about A.D. 200 to 1100 (Sutton et al. 2007: 236, table 15.4). There is an indication that some of the lithic flaking technology present at CA-Riv-697 may represent that of Paleo-Indians (12,000 to 8,000 years ago) (Davis and Taylor 1978), but this has not yet been confirmed. However, a projectile point identified as a Clovis point was found about 15 miles east of CA-Riv-697 (Rondeau 2012), suggesting that Paleo-Indians were present in the Chuckwalla Valley. While the archaeological evidence suggests that this area was occupied during Late Prehistoric times, dune areas are not always reliable indicators of all of the artifacts at a site. Sand dunes frequently shift from aeolian processes, and can easily obscure and/or uncover artifacts.

Dune areas in the southern California deserts provide habitat for several plant and animal species which are especially important for Native American groups. The Palen Dunes area provides low to moderate potential for desert tortoise habitat (PSPP RSA 2010:C.2-1 – C.2-2), an animal species that has significance for all of the tribes of concern. Dunes are also habitat for other plant and animal species which are significant to Native American groups. More specific information concerning plants and animals of concern to Native Americans in the dunes area and the PSEGS project area in general, will ideally be obtained through interviews with tribal members following publication of the PSA.

Places that have been occupied by the descendants of contemporary Native American peoples are considered culturally important. Regardless of the duration of occupation at the Palen Dunes and Lake, descendants of contemporary Native Americans were present here, and their presence indicates a culturally sensitive location for contemporary Native Americans. In the Bean et al. (1978:7-7) study, researchers found that Palen Lake was an area of concern for tribal groups. Moreover, Russell et al.'s (2002:49) study of the Imperial Sand Dunes indicated that members of the CRIT regard dune areas as important because in the past dunes were used to bury the dead, and "in Numic culture, starting around the Salton Sea, Twenty-Nine Palms area, there is a belief that powerful little medicine people make the sand dunes their habitat. It also houses water babies, who are also powerful." While these concerns have yet to be expressed by any tribes with regard to the Palen Dunes, it is reasonable to assume that similar concerns about the Palen Dunes area will be introduced by tribes during further consultation and interview efforts. Interviews with Mohave members in the Russell et al. (2002) study concerning the Imperial Sand Dunes indicated that dunes are important because they "sing". The "singing sands" are a well-known phenomenon that occurs when wind-blown grains of sand rub together making an audible noise. The Mohave indicated that references to singing dunes are mentioned in Mohave history and songs (Russell et al. 2002:56). Interviews with Cahuilla tribal members suggest that they regard dune areas as mysterious. The mysterious quality of dunes comes from the fact that the wind is constantly changing the dunes, and the role of wind in the larger landscape connecting mountains and valleys (Russell et al. 2002:64).

2. Ford Dry Lake

Ford Dry Lake is located about nine miles east of the PSEGS project area, in the Chuckwalla Valley south-southeast of the Palen Mountains and south-southwest of the McCoy Mountains. Ford Dry Lake is similar to Palen Lake because these are both locations that contained water in the past; however, there are no extensive dunes which surround Ford Dry Lake. Geoarchaeology fieldwork conducted for the PSEGS project concluded that from the Late Pleistocene/Early Holocene, Ford Dry Lake (and Palen Lake) were only ephemerally present (Nials 2012:21). Like the sites represented around Palen Lake, the archaeological sites that surround Ford Dry Lake suggest occasional, short-term plant and animal gathering and processing camps, or overnight camps by groups moving through the Chuckwalla Valley via the PTNCL; although there are a larger number of sites recorded around Ford Dry Lake than there are around Palen Lake. However, this does not necessarily mean Ford Dry Lake was more densely occupied. A larger frequency of recorded sites could also be explained as a product of survey sampling bias.

Artifact assemblages at the sites around Ford Dry Lake typically include lithics and lithic debitage (which includes the materials for making stone tools, waste products from making stone tools, and stone tools themselves), groundstone tools (for processing plant foods), fire-affected and fire-cracked rock (indicating hearths used for processing resources), and ceramics. Several of these sites contain diagnostic artifacts, i.e., artifacts that can be assigned to a specific time period based on a chronology developed for the region. Table X indicates those sites which have diagnostic artifacts, what those artifacts are, and the time period (or periods) that the site may represent.

CULTURAL RESOURCES Table 6
Archaeological Sites with Diagnostic Artifacts In the vicinity of Ford Dry Lake

Site Number	Diagnostic Artifacts	Time Period
CA-Riv-0663 (P-33-0663)	Parker Buff & Tizon brownware; Corner-notched projectile point	A.D. 1000 to post 1500
P-33-01818	Tumco Buff	A.D. 1000 to 1500
P-33-02157	Tizon brownware	A.D. 1000 to post 1500
P-33-03801	Parker Buff	A.D. 1000 to post 1500
P-33-03808	Tumco red-on-buff	A.D. 1000 to 1500
P-33-03809	Tumco Buff	A.D. 1000 to 1500
CA-Riv-06170 (P-33-08655)	Rose Spring projectile point	A.D. 200 to 1100
CA-Riv-09067 (P-33-017451)	Desert side-notched projectile point	A.D. 1100 to Contact
CA-Riv-09072 (P-33-017456)	Rose Spring projectile point	A.D. 200 to 1100
CA-Riv-09084 (P-33-017468)	Olivella shell bead	A.D. 1100 to Contact (GSEP FEIS appdx. ?)
CA-Riv-09220 (P-33-017789)	Cottonwood leaf-shaped	A.D. 1100 to Contact

Site Number	Diagnostic Artifacts	Time Period
	projectile point	
P-33-01131	Tizon brownware	A.D. 1000 to post 1500
CA-Riv-09224 (P-33-017793)	Desert side-notched projectile point	A.D. 1100 to Contact

Like the occupation sites at Palen Lake, these are culturally important resources for Native Americans. Bean et al. (1978:7-7) also found that Ford Dry Lake was an area of concern for tribal groups.

3. McCoy Spring (CA-Riv-0132

McCoy Spring is located about 15 miles east of the project area at the western base of the McCoy Mountains. The proposed PSEGS would be in the line of sight of this NRHP listed district, which encompasses over 30 acres.

One of the most notable features at McCoy Spring is the extensive petroglyphs, one of the largest concentrations in the Colorado Desert. There are over 700 boulders with at least 1,000 individual petroglyph elements, including abstract designs, geometric designs, and anthropomorphic digitate figures (McCarthy 1986, Reed 1981:2). Design elements representative of the Great Basin Engraved variant are present at the spring, which includes curvilinear forms (the most prevalent), plain circles, circles with central dots, circles with connecting bars, assemblages of circular elements, sets of concentric U or V-shaped forms, curvilinear meanders, wavy lines, dot patterns, grids, cross-hatching, and maze-like patterns (Reed 1981:8). At least 12 digitate anthropomorphic human figures are located at McCoy Spring (Reed 1981:3). The petroglyphs at McCoy Spring exhibit varying degrees of re-patination, indicating that these petroglyphs range in age over several thousands of years. That is, rocks exhibiting more patina are older, relatively, than rocks with no or less patina because it takes many years for patina to accumulate. Absolute dating of petroglyphs is still in the experimental phases (e.g., Dorn et al. 1992; Lyttle et al. 2008) and no dating of the petroglyphs at McCoy Spring has taken place thus far. Therefore, the variation of patina on the petroglyphs suggests that the site was occupied over a long period of time, and it continues to be a site of importance for Native Americans into the Late Prehistoric Period and up to the present.

In addition to petroglyphs, archaeological features located at the spring include midden deposits with associated ceramics, groundstone tools used for grinding food, and flaked stone tools and debitage.

It should be noted that numerous trails from the north, west, and south lead to McCoy Spring, and from here then radiate out to other culturally important locations such as Corn Spring. The trail network connected these culturally important places in both a real and metaphysical sense. Along those trails in close proximity to McCoy Spring are cleared circles. Cleared circles have been interpreted to have several different functions (see Apple 2005; Bullard et al. 2008), both secular and sacred. This archaeological evidence indicates that McCoy Spring was occupied on a relatively frequent basis, likely by groups travelling through the Chuckwalla Valley.

Springs are especially important features for Native American groups. They provided places for groups to rest and replenish, and their importance to ancient Indians is indicated by the vast number of petroglyphs often found at important springs. Rock art and trails, both of which are prevalent at McCoy Spring, are areas of concern for Native Americans when they have to potential to be impacted, directly or indirectly (i.e., impacted visually) (Bean et al. 1978:6-14 - 6-15, 6-24 – 6-27, 6-39 – 6-40, 6-52, 6-53 – 6-55). Additionally, as noted in the rock art section above, it is generally accepted that rock art are loci of religious activity and are understood to represent the activity of medicine people. Because of the religious connection Native Americans have with rock art, rock art sites are important resources for contemporary Native American groups.

4. Mule Tank (CA-Riv-0504 and CA-Riv-0773) ACEC

Mule Tank is located along northwestern side of the Mule Mountains in the Mule Mountains ACEC, approximately, 26 miles east/southeast of the project area. This NRHP listed place consists of a tank that rests below a rock outcrop, extensive petroglyphs, earth figures, cave niches, and trail remnants. Mule Tank encompasses about 4 acres, and the proposed PSEGS would be in the line of sight of the entrance to the canyon. The name for the spring and the mountains are said to come from the word “mul al”, which refers to a metate or flat grinding stone (Patencio 1943:62).

There are about 65 petroglyph panels located at Mule Tank, and these are the only known rock art locations in the Mule Mountains. Like the petroglyphs found at McCoy Springs, the petroglyphs at Mule Tank exhibit varying degrees of re-patination, indicating long-term, and relatively continual use of the site. The petroglyphs have been identified as part of the Great Basin Rock Art Tradition. Whitley (2001) suggests that the rock art at Mule Tank is interpreted to depict the visions of Yuman medicine people or from boys and girls who created the rock art during their initiation ceremony. It is argued that the dot and circle patterns and other geometric/entoptic designs confirm the ethnographic interpretation that these panels represent the “visionary imagery of puberty initiates”. The meaning of these patterns is unknown, but they are understood to be symbolic of supernatural power, and confirmation of a successful dream (Whitely 2001:10). Further evidence of dreaming is suggested by the female human/animal figure at the site. Whitely (2001:11) suggests that the female figure and diamond chain combination panel indicated that women conducted vision quests here, potentially as initiates, and possibly involving a female medicine person (Whitely 1996).

The earth figures identified at the Mule Mountains ACEC are located about 1.8 miles northeast of Mule Tank on the northeastern talus slope of the mountains. The earth figures consist of dance circles, four sets of cleared circles, each measuring about 1 meter in diameter, in a 3/4 circle shape, with the open end of the partial circle facing north. There are also earth figures that consist of about 10, 1-meter in diameter parallel cleared circles, and several trails. It is difficult to ascertain whether these earth figures are within the visual impact area for the PSEGS. Once a more complete visual analysis is undertaken a more definitive statement regarding the position of the earth figures can be made. These earth figures are representative of the Geoglyph Variant of the larger Earth Figure Tradition of Native California rock art (Whitely 2000:66-67).

In addition to being a ceremonial location based on the petroglyphs and earth figures, the Mule Mountains are regarded by some as one of the places that souls dwell on their journey to the land of the dead (Kelly 2012).

5. Corn Spring (CA-Riv-032)

   This National Register listed site is a spring is located in the Chuckwalla Mountains, about 6.75 miles southwest of the PSEGS project area. The PSEGS solar power tower would not be in the direct line of sight of Corn Spring, but this is one of the most important resources for Native Americans in the Chuckwalla Valley. Moreover, there are several ancillary components to the Corn Springs site, including trails, cleared circles, and other trail features just outside of the canyon that are in the direct line of sight of the project. As such, staff considers this place to be a possible ethnographic resource that should be evaluated for project impacts.

   The most prominent feature of Corn Spring are the over 600 petroglyphs on 32 separate panels in 11 different concentrations located on rock outcrops surrounding the spring. Like most of the other petroglyphs in the area, these have been classified as the Great Basin Engraved variant, with the curvilinear style predominating. Design elements that have been identified include circles, assemblages of circular elements, curvy lines, U-shaped or semi-circular forms, dot patterns, cross-hatching, possible rain fringe, crosses, and circles with connecting bars. The petroglyphs exhibit varying degrees of re-patination, indicating a relatively long history of use and knowledge of the area by Native Americans. Like those petroglyphs at Mule Tank, Whitely (1996:109) suggests that the petroglyphs at Corn Spring represent the vision quests of medicine people or initiates.

   Corn Spring was one of the most reliable sources of water within 20 miles of the spring (Fenenga 1981:13), and the archaeological evidence supports that this area was regularly occupied over several thousand years. In addition to water, food in the form of mesquite beans and edible seeds was easily obtained at the spring, and as mentioned previously, miners in the early 20th century indicated that corn grew up around the spring, no doubt having been planted by Native Americans years before (Gunther 1984:136). The spring not only attracted people, but animals as well, and groups set up hunting blinds along known animal trails into the spring. Other archaeological elements at the spring include trail segments, ceramic scatters, cleared circles, lithic debitage, bedrock mortars, and milling slicks.

   As mentioned, rock art sites are especially important resources for Native Americans because of the religious connotations associated with medicine people and dreaming.

6. North Chuckwalla Petroglyph District (CA-Riv-01383)

   The North Chuckwalla Petroglyph District is located in the northeastern portion of the Chuckwalla Mountains, about 4.5 miles west of the PSEGS project area, and about 5 miles east of the Alligator Rock geologic feature. Although the site was not officially recorded until 1979, the proximity of the site to a widely travelled corridor (i.e., the PTNCL and the U.S. 60/I-10) suggests that it was probably well known before it was formally recorded. The PSEGS solar power tower would be located in the direct viewshed of this NRHP listed petroglyph district.

This site consists of 158 panels of petroglyphs in five loci, and the stylistic elements are similar to those at Corn Spring (Hedges 1980:15). On the 158 panels, there are 92 identifiable design elements, which include curvilinear designs, rectilinear designs, representational elements and various combinations of these designs (Hedges 1980: 13). There are also several glyphs which are not discernible elements, but rather seemingly random peckings, a feature unique to this site. Interestingly, on one of the boulders on which petroglyphs are pecked (Locus B) it was noted that a metallic ringing sound occurred when struck with a rock (Hedges 1980:26). The general orientation of the petroglyphs is to the southwest; almost all north and east facing surfaces are bare of petroglyphs. Hedges (1980:21) suggested that this may be related to the orientation of the wash which comes out of the mountains in a northeast direction, but there is no evidence to suggest any obvious connection to a celestial body.

The petroglyphs at the North Chuckwalla Petroglyph district, like those from Corn Spring, Mule Tank, and McCoy Spring, likely represent the work of medicine people or initiates. The petroglyphs at this site exhibit varying degrees of re-patination; some glyphs appear relatively new or recently re-pecked, while others appear older with significant patina over the glyph.

Other elements present at the North Chuckwalla Petroglyph District include rock rings, trails, flaked stone debitage, bedrock milling features and groundstone artifacts, temporary camps, ceramics, and cleared circles. One of the Native American observers (Chemehuevi) during the Devers-Palo Verde transmission line survey suggested that one of the particularly large cleared circles was a crying or mourning circle, and likely was associated with Chemehuevi travel songs (Westec 1980:192). Ideally, ethnographic interviews will help to clarify these circles and a more substantial discussion of them will occur in the final draft of this report and the FSA.

As mentioned, rock art sites are especially important resources for Native Americans because of the religious connotations associated with medicine people and vision questing. The significance of this site to Native Americans is further emphasized by the presence of the crying or mourning circle that was identified.

7. North Chuckwalla Mountain Quarry District (CA-Riv-01814)

   The North Chuckwalla Mountain Quarry District is located in the Alligator Rock ACEC, about 2 miles east of the Alligator Rock feature. The district encompasses about 480 acres centered on an igneous rock feature which was the source of most of the quarrying material. The site was first recorded by the cultural resources survey for the Devers-Palo Verde Transmission line in 1979/1980, and nominated to the NRHP the following year. The site is especially important for understanding ancient Indian lithic tool procurement and manufacture. One material in particular, aplite a fine-grained felsic rock, is found throughout the quarry site, and was especially desirable for its fracturing qualities (Eckhardt et al. 2006:5). Evidence for an emphasis on the block-on-block manufacturing technique for the creation of large flakes and blades and the production of large flake and core tools has been documented, and a dearth of smaller waste flakes suggests that the final stages of tool manufacture were likely conducted elsewhere (Gallegos 1981:4).

The site is composed of at least 79 discrete loci of lithic tool reduction, many of which also have additional archaeological elements (e.g., rock rings, hearth features). Lithic materials do not lend themselves to absolute dating techniques, and therefore only relative chronology can be developed using lithic artifacts. Such dating techniques focus on the degree of desert varnish, the degree of patination, weathering, and the depth of rock migration into the surface. Other archaeological artifacts and features present include fire-affected rock, charred animal bones, rock rings, cleared circles, a rock shelter, trails, and ceramics. Ceramics are a useful indicator of chronology, and it is known that ceramics were introduced to the area ca. A.D. 1000, and therefore, it can be suggested that the site dates to at least as early as this time period. However, a San Dieguito II tool was located at the site which suggests a date ca. 6000 B.C. Additionally, a high degree of patina and desert varnish has been noted on several artifacts suggesting an early component to this district (Gallegos 1981:6).

Rock outcroppings, rock features and trails, all of which are present at the North Chuckwalla Petroglyph District, are significant to contemporary Native American groups because they are understood to represent a physical link to the past (Bean et al. 1978:5-54, 6-14, 6-24). The prominent position of the quarry district to the PTNCL has led some to suggest that the quarry likely was used as a landmark and during the ancient Indian period likely would have had a place name for those who travelled along the trail (Gallegos 1981:8).

8. Long Tank

Long Tank is located in the Alligator Rock ACEC, on the northern slope of the Chuckwalla Mountains, about 10 miles west of the PSEGS project area. The tanks are in close proximity to the Alligator Rock geologic feature, situated less than 2 miles southeast. This location contains granite tanks which are known to hold water and likely was a spot to stop for water along the PTNCL. Little archival information was available about this location in those sources examined thus far, and no archaeological site record exists. Additional archival work, interviews, and an examination of the location ideally will provide additional information regarding Long Tank to be included in the final draft of this report and the FSA.

9. Alligator Rock

Alligator Rock is a very large rock outcrop immediately north of the Chuckwalla Mountains, about 9.75 miles west of the PSEGS project area. The rock is named for its shape, as its rugged nature resembles the ridges on the back of an alligator. Alligator Rock is within a much larger designated ACEC area, and from the rock itself the PSEGS project would be visible.

Members of the La Cuna de Atzlan organization suggest that Alligator Rock has spiritual significance (Figueroa 2013b:3). The adjacent Chuckwalla Mountains were likely named for the desert reptile, the large Chuckwalla lizard (Gunther 1984:115), and it is understood by these members that Alligator Rock is a part of these “Lizard Mountains”, and represents the lizard. The understood continuity between these geologic formations is likely why a reptile was used to describe this feature. Ideally, additional consultation and interviews with tribal members and La Cuna de Atzlan will help to better inform this understanding for inclusion in the final draft of this report and the FSA.

Several archaeological sites are located in the immediate vicinity of Alligator Rock. Two National Register of Historic Places listed districts, the North Chuckwalla Petroglyph District and the North Chuckwalla Prehistoric Quarries District, are located in the Alligator Rock ACEC and are discussed in more detail in respective sections above. However, there are additional sites not located in these districts that are located primarily adjacent and to the west of the Alligator Rock formation. Archaeological artifacts and features at these sites include rock rings, lithic debitage and hammerstones, rock shelters, milling tools and bedrock mortars, petroglyph panels, and trails.

These archaeological sites likely represent temporary campsites for groups processing plant and lithic materials, or as overnight stops for groups travelling along the PTNCL (Swenson 1986:10). These archaeological resources are important to contemporary Native Americans, primarily because it is evidence of their ancestors. As mentioned, some archaeological artifacts and features, especially petroglyphs and rock rings, often have more ceremonial or religious significance for tribes than sites that are more utilitarian in nature.

10. Dragon Wash (CA-Riv-049)

Dragon Wash is a petroglyph site located in the southeastern Eagle Mountains, about 15 miles west of the PSEGS project and in the direct viewshed of the project. Located within the boundaries of Joshua Tree National Park, this petroglyph site has two loci of petroglyphs encompassing about 0.6 acre in total on 6 or 7 boulders. At least 29 distinctive design elements were noted on these panels, with only moderate vandalism noted from surveyors. A trail feature was noted in 1948, but an update to the site in 1975 did not relocate the trail; however, a close look at Google Earth of the desert pavement just east of the wash does appear to show likely ancient Indian trails leading into the wash. Bedrock mortars were identified nearby in 1948, but also were not relocated in the 1975 update to the site. However, while conducting research at the Eastern Information Center at the University of California Riverside, staff noticed that CA-Riv-7317 recorded in 2003 located just south and slightly east of the wash, is a bedrock mortar location and is likely the same identified by earlier surveyors.

It is suggested by members of La Cuna de Atzlan (Figueroa 2013a) that the petroglyphs at Dragon Wash are in line with the Ripley Intaglios, about 60 miles east of the wash. Evidence of this connection is cited by La Cuna de Atzlan, who understand that the “hummingbird” petroglyph at Dragon Wash is also represented by a “hummingbird” earth figure at the Ripley Intaglio site. Another earth figure with a circle and four lines extending out is said to also be in line with Dragon Wash

Without diagnostic artifacts it is difficult to ascribe a time period to the Dragon Wash petroglyphs. A lack of other archaeological evidence does not necessarily suggest that this area was not frequently used by Native American groups, particularly because the alluvial nature of the wash likely has covered or transported any surface artifacts. The site is located in close proximity to the PTNCL, and likely played a role in the rituals of medicine people. The site is positioned is such a way that if one were to look east they would have a direct line of sight of the Lower Colorado River valley. Members of La Cuna de Atzlan suggest that these petroglyphs are in line with the earth figures located in Ripley, across the Colorado River in Arizona. La Cuna de Atzlan contends that the PSEGS project would disrupt this alignment (Figueroa 2013a:2), likely affecting their ability to understand the connectivity of sacred places in the region.

11. San Pascual Well

The San Pascual Well was located during the Romero-Estudio expedition in 1823-1824 while attempting to establish a route for Euro-Americans to cross the Colorado Desert and more efficiently connect the Los Angeles area to the Tucson region. The well is approximately 5 miles northwest from the PSEGS project area. The expedition named the well San Pascual, and Estudio's entry in his diary states "we found signs of basket-making by the Indian women on several occasions, bones of horses and pieces of ollas" (Bean and Mason 1962:41). Bean and Mason (1962:41, footnote 22) suggest that this well was in the Desert Center area based on the landmarks provided in the diary, and the fact that the expedition was likely headed for Palen Pass. A General Land Office (GLO) map from 1856 identifies "a well 45 feet deep of fair water in this quarter section", (Brown 1856).

Staff intends to conduct additional research concerning this well and Indian habitation site to be included in the Final Ethnographic Report and FSA.

Native Americans view their environment in a holistic manner; therefore these places and landforms are not the only important ones, and should be considered a less than comprehensive list. In addition, all land, space, air between, above and below these places and landforms are also considered important. Cachora (2000, cited in Bean and Toenjes 2012:19) noted that there is a web of power which connects important landscape features such as mountains and springs. Destruction of this web of power affects the "entire cosmos." Peaks are most important, but valleys between peaks and desert pavements are also important in that they are pathways for "the web that must run through from peak to peak" (Cachora 2000, cited in Bean and Toenjes 2012:19).

Native American connectivity may be expressed via a variety of different manners. For example, Native American groups in the vicinity of the PSEGS project area express their relationship to the land through dreaming, conceptions of multi-layered worlds, song and/or story-scapes, communication through rock art, and relationships between humans and sources of power, both natural and supernatural forms of power.

Staff has focused on these ethnographic resources as potential Traditional Cultural Properties, and staff is continuing to obtain information and analyze potential relationships between these resources. Thus far, staff has not drawn any conclusions concerning the relationships between these resources, but the reader should be aware that there is a possibility that these resources could be a part of a larger historic district or cultural landscape.

Built-Environment Field Activities

As a part of the original licensing process windshield surveys were conducted for the built-environment PAA on May 1, 2009 (AECOM EDAW 2009e) and in May 2010. Five resources were identified. These include: two wooden bridges built in 1931, a transmission line from the late 1950s, a school house dating to around 1935, and a complex of residential buildings and structures built between the 1920s and 1950s. These are referenced, respectively, as the Aztec Ditch Bridge (Caltrans Bridge 56C0102), the Tarantula Ditch Bridge (Caltrans Bridge 56C0103), the Blythe-Eagle Mountain 161-kV transmission line (SMP-H-1024), the Desert Center School House (P-33-6833), and SMP-B-MKM-001. With the exception of the transmission line, none are considered to be in the Area of Direct Disturbance.

On February 13-14, 2013 and March 7-8, 2013, subsequent to the amendment being filed, Energy Commission staff visited the project site and the surrounding area. A Built-Environment specialist was in attendance.

SUMMARY OF CULTURAL RESOURCES LOCATED IN THE PSEGS PROJECT AREAS OF ANALYSIS, COMPILED FROM ALL SOURCES

Cultural Resources Table 7 lists the cultural resources identified by investigations conducted by the original project applicant and staff. In the "Analysis of Impacts to Cultural Resources" subsection, below, staff presents descriptions of these resources and its determinations of their eligibility for recordation on the CRHR. This is only a partial list. At this time the resources discussed below represent those that were recorded and evaluated as part of the original licensing case or as a result of preliminary ethnographic research conducted by staff during the second quarter of 2013. Research and evaluation is ongoing to determine if additional resources in the expanded PAA are present and could be impacted by the modified project.

A total of 64 cultural resources are present within the previous 2009 archaeological and built-environment PAAs (not including isolated artifacts) either previously recorded or newly discovered during field investigations (**Cultural Resources Table 7**). One historic structure and 63 archaeological sites are known, with nine being prehistoric, 54 being historic-period. Of the prehistoric sites, five are sparse lithic scatters and four are sparse lithic and FAR scatters. Of the historical sites, 35 are refuse scatters (mostly cans dating to the 1920s–1940s), three are placer mining claims, and two are survey marker features. Additionally, one road, one corral, three sets of military tank tracks, five small prospecting quartz reduction loci, and four rock cairns were identified. Lastly, one electrical power transmission line is noted as a built-environment resource.

Cultural Resources Table 7
Summary of Known Cultural Resources to date (Previously Identified & Newly Discovered)

Archaeological	Prehistoric Sites	Lithic Scatters	5
		Lithic & FAR Scatters	4
	Historical Sites	Refuse Scatters	35
		Placer Mining Claims	3
		Survey Marker Features	2
		Roads	1
		Corral	1
		Military Tank Tracks	3
		Quartz Reduction Loci	5
		Rock Cairns	4
Ethnographic		Traditional Cultural Properties/Places	11
Built-Environment	Structures	Power Transmission Line	1
Total			75

ANALYSIS OF IMPACTS TO CULTURAL RESOURCES

DETERMINING THE HISTORICAL SIGNIFICANCE OF CULTURAL RESOURCES

Under CEQA, "a project that may cause a substantial adverse change in the significance of an historical resource is a project that may have a significant effect on the environment" (Pub. Resources Code, § 21084.1). Consequently, the Energy Commission, as a lead agency, must evaluate the historical significance of cultural resources by determining whether they meet several sets of specified criteria. Under CEQA, the definition of a historically significant cultural resource is that it is a "resource listed in, or determined to be eligible by the State Historical Resources Commission, for listing in the CRHR", or "a resource listed in a local register of historical resources or identified as significant in a historical resource survey meeting the requirements of section 5024.1 (g) of the Public Resources Code," or "any object, building, structure, site, area, place, record, or manuscript which a lead agency determines to be historically significant or significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California, provided the agency's determination is supported by substantial evidence in light of the whole record" (Cal. Code Regs., tit. 14, § 15064.5(a)).

In general, to be considered historically significant under the CEQA Guidelines, a cultural resource must meet the criteria for listing in the CRHR. These criteria are essentially the same as the eligibility criteria for the NRHP. In addition to being at least 50 years old,[26] a resource must meet at least one of the following four criteria (Pub. Resources Code, § 5024.1):

- Criterion 1, is associated with events that have made a significant contribution to the broad patterns of our history;

[26] The Office of Historic Preservation's Instructions for Recording Historical Resources (1995) endorses recording and evaluating resources over 45 years of age to accommodate a potential five-year lag in the planning process.

- Criterion 2, is associated with the lives of persons significant in our past;
- Criterion 3, embodies the distinctive characteristics of a type, period, or method of construction, or represents the work of a master, or possesses high artistic values; or
- Criterion 4, has yielded, or may be likely to yield, information important to history or prehistory.

Historical resources must also possess sufficient integrity of location, design, setting, materials, workmanship, feeling, and association to convey their historical significance (Cal. Code Regs., tit. 14, § 4852(c)).

Additionally, cultural resources listed in or formally determined eligible for the National Register of Historic Places (NRHP) and California Registered Historical Landmarks numbered No. 770 and up are automatically listed in the CRHR and are therefore also historical resources (Pub. Resources Code, § 5024.1(d)). However, even if a cultural resource is not listed or determined to be eligible for listing in the CRHR, CEQA allows a lead agency to make a determination as to whether it is a historical resource and, therefore, historically significant (Pub. Resources Code, § 21084.1).

The assessment of potentially significant adverse impacts to historical resources and the mitigation that may be required of a proposed project to reduce any such impacts depend on CRHR-eligibility evaluations.

California Register of Historical Resources Evaluations

Under CEQA, mitigation need only be developed for substantial project-related adverse impacts to historically significant cultural resources (historical resources). Consequently, staff seeks CRHR eligibility recommendations for those cultural resources subject to possible project impacts. The existing documentation for previously known cultural resources may include CRHR eligibility recommendations, and the applicant's cultural resources specialists often make CRHR eligibility recommendations for newly identified cultural resources they discover and record in their project-related surveys. Staff considers these prior CRHR eligibility evaluations and may accept them or conclude that additional information is needed before making its own recommendations.

When the available information on known or newly identified resources that could be impacted by the proposed project is not sufficient for staff to make a recommendation on CRHR eligibility, staff may ask an applicant to conduct additional research to gather the information needed to make such a recommendation, or staff may gather the additional information. For an archaeological resource, the additional research usually entails some degree of field excavation, called a "Phase II" investigation. For an ethnographic resource, the additional research may be an ethnographic study. For built-environment resources, the additional research would probably be archival. The object of this additional research is to obtain sufficient information to enable staff to validate or make a recommendation of CRHR eligibility for each cultural resource that the proposed project could impact.

METHODS AND THRESHOLDS FOR DETERMINING SIGNIFICANCE OF IMPACTS TO HISTORICAL RESOURCES

The regulatory threshold for whether a proposed project would have a significant effect with respect to cultural resources is a finding that the project would materially impair the significance of one or more historical resources (Cal. Code Regs., tit. 14 § 15064.5(b)(1)). The CEQA Guidelines define material impairment, in part, as any project action that "demolishes or materially alters in an adverse manner those physical characteristics of a historical resource that convey its historical significance and that justify its eligibility for inclusion in the California Register of Historical Resources as determined by a lead agency for purposes of CEQA" (Cal. Code Regs., tit. 14 § 15064.5(b)(2)(C)). In order to assess whether a proposed project would materially impair the significance of a historical resource, one would therefore need to know and understand why that resource was eligible for inclusion in the CRHR. A resource's CRHR eligibility status has two parts, a value for which the resource is significant and integrity sufficient to convey that significant value (Cal. Code Regs., tit. 14 § 4852(c)). (Note that "significance" as used in relation to the determination of a resource's CRHR eligibility status is a much more narrowly focused technical use of the term than the broader sense of its use at, among other places, section 21084.1 of the Public Resources Code or section 15064.5(a) of the California Code of Regulations.) The significance component of a resource's eligibility status is determined, as noted in the "Determining the Historical Significance of Cultural Resources" subsection above, with reference to its potential associative, design or construction, or information values as set out in the CRHR's four significance criteria (Cal. Code Regs., tit. 14 § 4852(b)(1–4). A resource may be eligible under one or more of these values. The integrity component of a resource's eligibility status is determined with reference to "location, design, setting, materials, workmanship, feeling, and association" (Cal. Code Regs., tit. 14 § 4852(c). Which of these aspects of integrity are relevant in a determination of a resource's CRHR eligibility are dependent on the particular values for which that resource has been determined to be significant. The analysis of whether any of the potential impacts of a proposed project cross the threshold of a significant effect under CEQA, therefore, requires the consideration, primarily, of that project's impacts on each applicable aspect of integrity for each historical resource subject to any such impacts. Dependent upon the particular values for which a resource has been determined to be significant, the aspects of integrity under consideration may be mostly related to the characteristics of the resource itself, or they may also be related to the characteristics of the physical and visual contexts that envelope the resource and whether those contexts would retain the ability to convey the values for which the resource has been found to be significant.

The general procedure of staff's determination of the significance of project impacts to cultural resources, then, is to:

1. Establish the inventory of historical resources, a subset of the Cultural Resources Inventory;

2. Identify and consider the nature of each resource's significance relative to the CRHR's criteria;

3. Consider how subject resources' historical significance are manifested physically and perceptually, and assess the baseline integrity of those characteristics and contexts;

4. Assess, more specifically, those aspects of each resource's integrity that are critical to that resource's ability to convey its historical significance; and

5. Analyze whether potential project impacts would alter any historical resources to the extent that any such resource would no longer be able to convey its historical significance.

Assessment of Impacts and Recommended Mitigation

To identify construction-related impacts to cultural resources that would need to be mitigated, staff first identifies all historical resources and evaluates the potential project impacts to the significant cultural resources to determine if these impacts are substantial and adverse (see above). Staff must then recommend avoidance or other mitigation for substantial and adverse impacts to these historical resources. Staff also must assess whether the proposed project has the potential to impact as-yet-unknown buried archaeological resources and recommend mitigation for impacts to previously unknown but historically significant resources discovered during construction, if impacts to such resources cannot be avoided.

CEQA advises a lead agency to make provisions for archaeological resources unexpectedly encountered during construction, and a project owner may be required to train workers to recognize cultural resources, fund mitigation, and delay construction in the area of the find (Pub. Resources Code, § 21083.2; Cal. Code Regs., tit. 14, §§ 15064.5(f) and 15126.4(b)). Consequently, staff recommends that procedures for identifying, evaluating, and possibly mitigating impacts to archaeological resources discovered during construction be put in place through conditions of certification to reduce those impacts to a less than significant level or to the extent feasible.

Direct and Indirect Impacts

In the abstract, direct impacts to cultural resources are those associated with project development, construction, and operation (co-existence). Construction usually entails surface and subsurface disturbance of the ground, and direct impacts to archaeological resources may result from the immediate disturbance of the deposits, whether from vegetation removal, vehicle travel over the surface, earth-moving activities, excavation, or demolition of overlying structures. Construction can have direct impacts on historic built-environment resources when, for example, those buildings or structures must be removed to make way for the proposed project or when the vibrations of construction impair the stability of historic buildings or structures nearby. New construction can have direct impacts on historic built-environment resources when it is stylistically incompatible with their neighbors and the setting, and when the proposed project produces something harmful to the materials or structural integrity of the historic buildings and structures, such as emissions or vibrations.

Generally speaking, indirect impacts to archaeological resources are those which may result from increased erosion due to site clearance and preparation, or from inadvertent damage or outright vandalism to exposed resource components due to improved accessibility. Similarly, historic buildings and structures can suffer indirect impacts when project construction causes obsolescence and demolition or creates improved accessibility, making vandalism or greater weather exposure possible.

Ground disturbance accompanying construction at a proposed plant site, along proposed linear facilities, and at a proposed construction laydown area has the potential to directly impact unknown archaeological resources. The potential direct, physical impacts of the proposed construction on unknown archaeological resources are commensurate with the extent of ground disturbance entailed in the particular mode of construction. This varies with each component of the proposed project. Placing the proposed project into this particular setting could have a direct impact on the integrity of association, setting, and feeling of nearby standing historic built-environment resources.

ANALYSIS OF IMPACTS TO ARCHAEOLOGICAL RESOURCES

Evaluations of Archaeological Resources

Evaluations of archaeological resources often require the execution of field research to gather the information necessary to adequately evidence whether and why particular resources possess historical significance. The most common purpose of evaluative archaeological field research, referred to as Phase II archaeological research in cultural resources management, is to record observations that establish the association of a resource with significant events, or that establish the resource as a potential source of significant historical information. This type of research focuses on the identification, documentation, and analysis of the information, the data sets that can be extracted from the material remains in archaeological deposits, and from the physical contexts of and the spatial associations among those remains.

Phase II archaeological research does not always require archaeological excavation. Archaeological deposits usually occur as either relatively thin, broad scatters of artifacts and ecofacts, or as layered, matrix-supported deposits of such materials. The evaluation of broad scatter-type deposits, solely on the basis of surface observation, is appropriate when it can be argued that they are almost entirely exposed at the surface, and that the landforms on the surface of which such deposits are found are older than the commonly accepted date of the initial human occupation of North America, or that the exposed material remains indicate a light and transitory use of the ground surface. For archaeological deposits where such arguments cannot be compellingly made, excavation is necessary to identify and assess the spatial integrity of the data sets that any buried components of those deposits may contain.

Staff evaluations, below, of the archaeological resources in the PAA divide the adjusted total inventory of 12 archaeological resources found as a result of the intensive pedestrian cultural resources survey (see “Intensive Pedestrian Archaeological Resources Survey” subsection, above) and an additional archaeological resource identified by staff into two groups: those resources for which surface observations provide sufficient information to make recommendations of historical significance and those resources for which Phase II archaeological research has been necessary to inform such recommendations.

Evaluations of Archaeological Resources on the Basis of Surface Observation

Prehistoric Archaeological Resources

Individual Prehistoric Archaeological Sites

There are three prehistoric archaeological sites from the original siting case (SMP-P-2018, SMP-P-2023, and SMP-P-MT-001) that remain in the draft revised PAA for the amended project. These three prehistoric sites, along with the six other such sites that are not on the proposed facility site (SMP-P-1015, SMP-P-1016, SMP-P-1017, SMP-P-1018, SMP-P-2014, and SMP-P-2015), were assumed in 2010, for the purposes of CEQA, to be eligible for listing in the CRHR, because there was not enough information at that time to make formal recommendations to the Siting Committee on the historical significance of these resources. That information still does not exist, and staff does not propose to alter the regulatory remedy that was developed for the resources during the original siting case.

The three prehistoric sites that would remain subject to the amended project's effects and are assumed to be historically significant include one small sparse lithic scatter (SMP-P-MT-001) and two sparse scatters of lithic material and fire-affected rock (FAR) (SMP-P-2018 and SMP-P-2023).

SMP-P-2018 consists of a low density lithic scatter with five clusters of FAR, of granitic, basaltic, and metavolcanic origins (Cluster 1- 9 pieces; Cluster 2- 40; Cluster 3- 10; Cluster 4- 42; Cluster 5- 25). Artifacts lying outside these FAR features included a tested cryptocrystalline battered stone, a gray metavolcanic tested cobble, a cryptocrystalline biface-thinning flake, and a quartz secondary flake. The site, encompassing an area 1,512 m^2, is situated on a stabilized dune on the southwest side of Palen Dry Lake, at an elevation of 484 feet above sea level.

SMP-P-2023 consists of a discrete scatter of FAR (6 pieces), three flakes of quartz and cryptocrystalline toolstone, a battered metavolcanic core, eight granitic metate fragments, and a unifacial granitic mano. The site, encompassing an area 3,768 m^2, is situated on an alluvial fan not far from Palen Dry Lake, at an elevation of 466 feet above sea level.

SMP-P-MT-001 consists of a rhyolite core/chopper, a rhyolite tested cobble, and a rhyolite core. It also has an historic component including a mid-20th century can scatter with one screw-top glass bottle.

These three archaeological deposits may include subsurface components that have the potential to contribute information important to the prehistory of the region, consistent with Criterion 4 of the CRHR. None are likely to be found significant under Criteria 1–3 of the CRHR.

Cultural Landscapes

A cultural landscape consists of "geographic area, including both natural and cultural resources, associated with a historic event, activity or person" (NPS 1996). The National

Park Service has defined four overlapping categories of cultural landscapes: historic designed, historic vernacular, historic site, and ethnographic. Historic designed landscapes are deliberate artistic creations, reflecting recognized styles, and are often associated with important builders, building trends, or events in the history of the construction of these kinds of landscapes. Historic vernacular landscapes illustrate people's values and attitudes towards the land and reflect patterns of settlement, use, and development over time. Historic sites are significant for their associations with important events, activities, and persons. Existing features and conditions are defined and interpreted in terms of what happened there at particular times in the past. Finally, ethnographic landscapes can be spaces rather than things that can be owned. These spaces or places are given meaning through their association with local and regional histories, cultural identities, beliefs, and behaviors. Ethnographic landscapes can include horizons, unmarked spiritual corridors, and places of connection between the earth's surface and the upper and lower realms. While these kinds of landscapes are often associated with Native Americans, they can be associated with any cultural group or belief system. Cultural landscapes can be determined eligible and nominated for inclusion on the NRHP as either sites or districts. As such, these landscapes can be contiguous or noncontiguous (Evans et al. 2001; NPS 1996).

During the original siting case staff identified two cultural landscapes that overlay the PSEGS: the Prehistoric Trails Network Cultural Landscape and the Desert Training Center Cultural Landscape. Both resources have broadly scattered contributing elements throughout the general vicinity and are assumed eligible under NRHP Criteria A and D. These are discussed below.

The Prehistoric Trails Network Cultural Landscape

The Energy Commission has designated a noncontiguous cultural landscape (a.k.a. "historic district") that incorporates prehistoric archaeological sites associated with the Halchidhoma Trail (CA-Riv-0053T), referred to here as the Prehistoric Trails Network Cultural Landscape (PTNCL). This landscape consists of important destinations in the Colorado Desert near Blythe, California, the network of trails that tie them together, and the features and sites associated with the trails. The foundation of this cultural landscape is a core group of 224 sites originally recorded by McCarthy (1993).

In the 1990s McCarthy (1993) and a group of volunteers recorded 20 km of the Halchidhoma Trail (CA-Riv-0053T) as it curves around the southern and western side of the McCoy Mountains leading from the Blythe Intaligos (geoglyphs) through the Chuckwalla Valley. They identified 224 trail-associated sites and subsidiary trails associated with the Halchidhoma Trail. McCarthy's report provides the basis for preliminary definitions of the boundaries, period of significance, thematic associations, and property types of the PTNCL.

The NRHP guidance for districts and cultural landscapes requires identifying certain characteristics, including boundaries, one or more periods of significance, thematic associations, and property (resource) types. The boundaries of the PTNCL need to be refined as additional pieces are identified, but in broad terms the boundary extends along the length of the historically known route of the Halchidhoma Trail, from where it begins near Blythe at the Colorado River, continuing to the west through the Chuckwalla Valley towards modern Los Angeles, with a suggested width of 10 miles. The period of significance also needs to be refined, but it appears that the prehistoric trail systems of southern California were used for thousands of years. Therefore, as a preliminary measure, Energy Commission staff defines the period of significance as the entire prehistoric and early historic periods. The thematic associations currently include travel, trade, and ritual. Resource exploitation, particularly the collection of stone tool and ground stone raw materials, is also an important theme. The PTNCL site types are divided into three categories: destinations, trails, and trail-associated sites or features.[27]

Destinations primarily include water sources, but also include residential, religious, and resource-collection sites. Water-oriented destinations include natural features such as rivers, springs, lakes, rainwater tanks, as well as man-made wells. Residential sites include villages and camps with evidence of a full range of activities. Religious sites include geoglyphs and petroglyphs. The importance of particular destinations is indicated by the web of multiple trails that converge on certain places, often mountain passes or water sources.

Trails can either be created by the movement of traveling feet or formally constructed. They average 30 cm in width and can be traced for many km, interrupted only by gullies and washes. Trails are usually the shortest and most convenient routes from one point on the landscape to another.

Trail-associated sites or features could include: concentrations of ceramics/pot drops, cleared circles, rock rings, rock clusters, rock cairns, rock alignments, petroglyphs, and geoglyphs. When the trail itself is not preserved, its route can often be approximately traced by distinctive patterns of trail-associated sites and features.

Energy Commission determined that the PTNCL is eligible for listing on the NRHP under Criteria A and D and for the CRHR under Criteria 1 and 4. Under Criterion A/1, a resource is eligible if it is associated with “events that have made a significant contribution to the broad patterns of our history”. In the context of a Native American site where its importance is not recorded in written form, National Register Bulletin 38 (NPS 1998, pp. 12–13) makes it clear that the word “our” refers to the group that finds the property significant and "history" includes both traditional oral and written history. Important events can include specific events, or repetitive trends. Places referred to in Native American oral histories and creation stories, therefore, are potentially eligible.

Native American groups in the Mojave Desert consistently accord mythological importance to springs, petroglyph sites, and particularly trails systems. Trails across the desert mark the locations of travels of ancestral groups as they migrated to the confluence of the Gila and Colorado Rivers. Trails also facilitate dream travel to these places and the times when events mentioned in story and song occurred (Cleland 2005, p. 132). The particular trail that forms the backbone for this cultural landscape, the Halchidhoma Trail (CA-Riv-0053T), is well known from multiple historical and ethnographic sources. It was an essential trade, transportation, and ritual route for Native American peoples and early European visitors in the Colorado Desert during

[27] The list of property types included in the PTNCL is not comprehensive; it should be added to as needed as new patterns are discovered.

prehistoric and historic times. This route was an essential connection between the Pacific Coast and the Southwestern deserts of Arizona and New Mexico.

Energy Commission staff considers the resources that make up the PTNCL to be significant under NRHP Criterion A (CRHR Criterion 1), for their ties to important events in American history. However, most property types associated with the PTNCL exist today as archaeological resources, such as petroglyphs, pot drops, cleared circles, and webs of intersecting trails. These sites are also considered register-eligible under Criterion D/4 for their ability to yield information important in history and prehistory.

Desert Training Center California-Arizona Maneuver Area Cultural Landscape

The Energy Commission has designated a noncontiguous cultural landscape (historic district) that incorporates historical archaeological sites associated with Gen. Patton's World War II Desert Training Center California-Arizona Maneuver Area (DTC/C-AMA) in the Chuckwalla Valley and on the Palo Verde Mesa, to be known as the Desert Training Center Cultural Landscape (DTCCL). The BLM has nominated this district to the NRHP several times. Each time the nomination was rejected mainly because the resource was not yet 50 years old at the time of the nomination. As part of the nomination process, BLM sponsored a detailed archaeological study of the resource which resulted in the publication of a cultural context (Bischoff 2000).

Staff notes that the resource is currently more than 50 years old. The NRHP guidance for districts and cultural landscapes requires identifying certain characteristics, including boundaries, one or more periods of significance, thematic associations, and property (resource) types. The boundaries of the DTCCL need to be refined, based on the historical record. The period of significance is 1942–1944. The thematic associations include the nation's preparation for World War II, U.S. Military Training, Gen. George S. Patton, Jr., and Gen. Walton Walker. The DTCCL site types include depots, airfields, ranges, bivouacs, maneuver areas, camps, and hospitals; and others may be defined later.

Energy Commission determined that the DTCCL is eligible for listing on the NRHP under Criteria A and D (CRHR Criteria 1 and 4). The DTC/C-AMA was the largest and the only such military training facility in American military history. The training that took place here undoubtedly helped to win World War II. Most property types associated with the DTC/C-AMA, across the full extent of the resource, exist today as archaeological resources, such as refuse deposits, tank tracks, foxholes, and bivouacs. These sites would be considered primarily eligible under NRHP Criterion D (CRHR Criterion 4) for their ability to yield information important in history. Other property types such as the airfields, camps, and hospitals are eligible for listing under Criterion A (CRHR Criterion 1).

Military records report that the Chuckwalla Valley and portions of the proposed project site were primarily used as maneuver areas, campsites, and small group training areas. Here soldiers practiced desert survival and infiltration techniques. The remains of these smaller exercises are undoubtedly more ephemeral than those involving whole army divisions (e.g., 15,000 men), however, evidence may still be present. Artifacts and features associated with them would most likely be shell casings, grenade containers, foxholes, C-ration cans, and other refuse (Bischoff 2000, p. 116). Evidence of these specific activities may still be present within the PSEGS site footprint.

The DTCCL is a vast region extending well beyond the original archaeological PAA. At present count, there are approximately 36 potential contributors within the project site that need to be confirmed as clearly associated with the DTCCL: the corral (SMP-H-2016) and 35 can scatters (some with associated tank tracks). These sites are expected to be subject to direct impacts from the PSEGS. The information provided in the original AFC was not sufficient to allow staff to determine the eligibility of these resources, thus eligibility is assumed. As such, the Energy Commission previously determined that impacts to them, if unavoidable, would be mitigated by data recovery. The PSEGS would contribute to a cumulative impact to numerous other resources in the vicinity that will be subject to direct impacts as future projects are approved, including but not limited to Desert Center Airfield, Camp Desert Center, Observers Camp, 36 Evacuation Hospital, and Ordnance Depot.

Historical Archaeological Resources

There are 51 historical archaeological sites from the original siting case that remain in the draft revised PAA for the amended project. Thirty-seven of these 51 archaeological deposits, along with two other such deposits that are not on the newly proposed facility site (SMP-JR-101 and SMP-JR-102), were assumed in 2010, for the purposes of CEQA, to be eligible for listing in the CRHR, because there was not enough information at that time to make formal recommendations to the Siting Committee on the historical significance of these resources. That information still does not exist, and staff does not propose to alter the regulatory remedy that was developed for the resources during the original siting case. The balance of 14 historical archaeological sites from the original siting case were recommended as ineligible for listing in the CRHR. Staff does not propose to alter those recommendations either.

The thirty-seven historical archaeological sites that would remain subject to the amended project’s effects and are assumed to be historically significant primarily appear to relate to the historical themes of refuse disposal and mining.

Refuse Disposal

Uncertainties in the reliability of field identifications of dateable tin can traits make it impossible to confidently attribute specific resources to periods of significance. As such, the Commission assumed eligibility for all of the refuse deposit sites having artifacts predating 1950 and that most are associated with WWII military training activities. These sites are listed in **Cultural Resources Table 6**, above.

Thirty-nine historical refuse scatters, predominantly of tin cans, are present within the original PAA, found within three distinct contexts[28]: alluvial washes, roadsides, and off-road between alluvial washes. It is likely that some of the discards in washes are

[28] Only 25 of the 41 refuse scatters have been classified or described. The remaining 17 were only recently found during the May 2010 survey along the new transmission line. These include: SMP-H-JR-101, SMP-H102, SMP-H103, SMP-H-104, SMP-H-105, SMP-H-106, SMP-H-107, SMP-H-109, SMP-H-110; and SMP-H-TC-001, SMP-H-006, SMP-H-007, SMP-H-008, SMP-H-009, SMP-H-020, SMP-H-022, and SMP-H-032.

redeposited. It is also likely that visitation to these out-of-the-way places (off-road) suggest these locations were destinations rather than way-points, used for specific activities, such as placer mining. If true, the implication would be that the discarded materials are more likely to be associated with a single individual or group over a limited duration of time. In contrast, roadsides are assumed to be subject to greater quantities of traffic, and therefore, subject to more frequent discard events over a longer time frame, associated with a wide range of unrelated individuals. Lastly, dune refuse is more likely to reflect single discard episodes as the dunes are difficult to get to and unlikely to have been habitually visited.

Seven alluvial wash scatters (SMP-H-1006, SMP-H-1010, SMP-H-1011, SMP-H-2006, SMP-H-2021, SMP-H-DS-467, and SMP-H-TC-032), 19 roadside scatters (SMP-H-1003, SMP-H-1008, SMP-H-1013, SMP-H-1020, SMP-H-2003, SMP-H-2007, SMP-H-2010, SMP-H-2011/12, SMP-H-2017, SMP-H-2019, SMP-H-DS-465, SMP-H-DS-466, SMP-H-JR-109, SMP-H-JR-110, SMP-H-TC-008, SMP-H-TC-009, SMP-H-TC-020), and 9 off-road scatters between alluvial washes (SMP-H-1004, SMP-H-1009, SMP-H-1021, SMP-H-1022, SMP-H-1023, SMP-H-2002, SMP-H-2004, SMP-H-2008, and SMP-H-DS-712) are discussed below. Can types, contents, labels, and mode of opening are used to determine the date range[29] of discard events and consumption patterns that might inform on possible associated localized activities. At the end of each subsection, these sites are evaluated as resource classes to avoid report redundancy.

Alluvial Wash Refuse Scatters

SMP-H-1006 is another very sparse, elongate scattering of nine tin cans and a single glass medicine bottle spread along an ephemeral wash, over an area of 11,869 m^2. It is situated on the upper alluvial fan, at an elevation of 605–610 feet. Discarded items date to the 1920s and later. Artifacts include beverages and evaporated milk, with three church-key-opened cans, one knife-punched sanitary can, and a key-strip-opened can with no lid. Also included is one sanitary can and a medicine bottle (2.5-inches tall, 2-inch base with markings “CHESEBROUGH/MFG/CO CD/ NEW YORK”).

SMP-H-1010 is an elongate scattering of 33 tin cans and a medicine bottle widely dispersed over 37,680 m^2. It is located on the mid-portion of the alluvial fan, at an elevation of 570 feet, spanning several closely spaced northeast-trending washes. Discarded items likely date to the 1930s and later. Cans, including beverages and fish, were opened using punched-hole and church-key methods. On the east side of the washes, a segment of tank tracks (nine feet wide, with 18-20 inch treads) trail off in an east-southeasterly direction for a distance of 140 feet across desert pavement. It is not clear whether these tracks are associated with the refuse debris or not.

SMP-H-1011 is a very sparse scattering of 13 tin cans, a pail, and a glass bottle, widely dispersed over 11,304 m^2. It is located on the upper alluvial fan at an elevation of 580

[29] Field observations by the consultant regarding can sizes and fabrication methods are extremely limited, constraining ability to attribute date ranges. The best indication of discard date rests on observations of can opening methods. Staff offer very rough estimates based on the following guidelines regarding can openings: church-key openings post-date 1935; P-38 openings post-date 1942; pull-tab openings date to the late 1960s; center-hole and circle-slice-openings date from the late 1920s to early 1930s. Additional guidelines include can types: sanitary cans in general use by 1920s.

feet, straddling several small washes. Discarded items range in date from as early as 1908 to the 1940s. Probable can contents include kerosene, fish (one-pound tin embossed with "Vacuum Packed, California U.S.A."), and tobacco, with P-38 and knife-punched openings noted. The bottle, of amber glass, measures 6¾ inches tall with a 2½-inch base, exhibiting an Owens-Illinois maker's mark and label "Duraglas" on the base, dating to at least the 1940s.

SMP-H-2006 is a large (18,133 m^2) but sparse scattering of 14 tin cans, situated in the northwest quadrant of the APE, on an active alluvial fan cut by a braiding northeast-trending ephemeral wash. Can types include three-piece, cylindrical sanitary cans containing food, as well as motor oil cans, beverage cans, and an oblong F-style can. Most have crimped ends with lip-side seams. Two cans are hand-soldered, hole-in-cap. Opening methods include church-key, knife-cut, P-38, punched-hole, tear-top, and key-strip. The site appears to be in good overall condition with evidence of minor erosion. There does not appear to be a subsurface component.

SMP-H-2021 is a sparse scattering of about forty tin cans in a stable alluvial fan cut by an ephemeral wash. The site, 19,860 m^2 in size, situated in the northwest quadrant of the APE, encompasses two concentrations with a few outliers between them. The southwestern concentration consists of four three-piece, cylindrical cans and a church-key-opened beverage can, all machine-soldered, as well as one matchstick-filled can. The eastern concentration consists of eight three-piece, cylindrical containers, six key-strip-opened, non-reclosable containers, all machine soldered. Can-opening methods include punched-hole, X- or T-cut, and key-strip. Five of the cans are matchstick-filled and six are hole-in-cap. Three of the hole-in-cap cans are key-strip-opened and have "Brazil Inspeccionado" written on top of the can. A gray enameled metal bowl measures 5 3/16 inches across the top, 3⅝ inches across the base, and 2 inches high. A U-shaped handle has broken off the side of the bowl. Artifacts outside of the concentration include 12 cans. These include three-piece, cylindrical sanitary food cans and beverage cans with crimped and flush ends and lip- side seams, all machine-soldered. Opening methods include jab-lift, church-key, and punched-hole. Five of the cans are matchstick-filled.

SMP-H-DS-467 is a sparse scattering of about 20 cans spread over 1,860 m^2, crosscut by a series of small north/south trending ephemeral washes. The cans include: four vent-hole filler condensed milk cans, one soldered hole-in-cap condensed milk can, five church-key opened beverage cans, one con-top beverage can, five double seam sanitary-type food cans, and one external-friction lid can, all of which date from between the 1930s to 1950s. Two aluminum soft-top tear tab beverage cans were also found in the area post-dating the 1960s.

SMP-H-TC-32, 3,000 m^2 in size, is a sparse scattering of cans of mixed age, including: 19 bimetal pull ring aluminum cans, 6 12 oz. churchkey-opened beverage cans, 2 oil cans, 8 food cans (opened via jab-lift or rotary methods), an oval herring tin, and a rectangular sardine can. Several ephemeral drainages cross the site.

Alluvial wash refuse scatters, as a resource class, *may* be attributable to specific activities such as placer mining or military training exercises that contribute to the broader history of the region, and so could be eligible for both the CRHR under Criterion 1.

Roadside Refuse Scatters

SMP-H-1003 is a very sparse, elongate scattering of eleven tin cans and one clear glass fragment spread along an active ephemeral wash over an area of 12,560 m^2. It is located in the southwest corner of the APE, just northeast of the Corn Springs Road exit from I-10, on the upper alluvial fan, at an elevation of 672 feet. An east-west trending unimproved road crosses the site. Discarded items date to the 1930s and 1940s. Probable can contents include motor oil (4), beverages (3), and water-soluble coffee (1), with key-strip and church-key openings. Labeling on the motor oil cans include: “SAE 30” and “RICHFIELD OIL/ 20SAE/20 W/ CORPORATION”. All artifacts appear to be surficial and some may be redeposited debris from the wash.

SMP-H-1008 is a historic-period debris scatter consisting primarily of tin cans (unspecified number), widely spread over an area of 52,752 m^2. It is located in the center of the proposed PSGES plant site, mid-way along the alluvial fan, at an elevation of 548 feet, straddling an historic road (SMP-H-1032) as well as two northeast-trending ephemeral washes. Discarded items likely date to the 1930s or later. A military-issue metal spoon, with “U.S.” stamped on the handle, suggested the site is related to DTC/C-AMA activities between 1942 and 1944. Probable can contents include beverage and meat, with key-strip openings. Can types include cylindrical sanitary cans, flat round cans, oblong F-style cans, square tins, and hinged-lid cans. Other items present include a glass jar fragment and several pieces of milled lumber.

SMP-H-1013 is a sparse scattering of 29 tin cans, a fragment of iron, and a glass bottle, dispersed over 11,304 m^2. It appears to represent historic-period roadside refuse, situated on both sides of an historic road (SMP-H-1032), at an elevation of 532 feet. Several ephemeral washes, however, also cut through the site, trending northeasterly toward Palen Dry Lake. Discarded items range in date from the 1930s to the 1940s. Probable can contents include tobacco and sardines, with key-wind and P-38 openings. Various sizes and types of cans are noted, including three-piece cylindrical, sanitary cans, hinged-lid pocket tobacco tins, and rectangular sardine cans with crimped ends and lip-side seams. The clear glass condiment bottle (5 inches high

SMP-H-1020 is a large, elongate scattering of about 170 tin cans, widely dispersed along a braided wash, encompassing an area of 134,706 m^2. It is situated in the southeastern quadrant of the APE, on the upper alluvial fan, at an elevation of 574–590 feet, about 280 feet northeast of the I-10 corridor fence. A graded dirt road, trending west-northwest, bisects the northern end of the site. Its overall orientation along the wash axis, as opposed to the road axis, justified classification in this subsection.

Discarded items appear to date from the 1930s and 1940s. Known can contents include motor oil, fuel, beverages, and food. Openings include church-key, P-38, key-strip, tear-tabs, punched-hole, jab-lift, and rotary types. Can types noted include three-piece, cylindrical sanitary, crown cap/cone top, non-reclosable and reclosable, and flat round, crimped ends and crimped and lip-side seams. A rectangular fuel can (14 inches high with a 2-inch base and 2-inch thread-cap opening) has a faded maker’s mark (an oval with a horizontal diamond flanked by “20” and “2” and is embossed on the base with “DES PAT 103023,” above the maker’s mark and “3512 C2” below.

SMP-H-2003 is a sparse scattering of 19 tin cans, a clear glass, screw-cap condiment jar, an amber beverage bottle, and bailing wire, bisected by the an historic road (SMP-H-1032). These items, spread over 30,772 m^2, are situated on the alluvial fan cut by a shallow northeast-trending, ephemeral wash, at an elevation of 559 feet. Can types include three-piece, cylindrical sanitary food, motor oil, and beverage cans with flush or crimped ends and lip-side seams. Filling methods consist of hole-in-cap, matchstick-filled, and entire-end filled. Opening methods include punched-hole and church-key. The oval condiment jar (3½ inches high with a 2⅜-inch opening), is embossed on the sides with a Hazel-Atlas Glass Company maker’s mark, and the numbers “5899 and 7” on the base. The beverage bottle (6⅞ inches high by 2¾ inches in diameter and a one-inch opening) exhibits a side seam/case mold, and an Owens-Illinois Glass Company maker’s mark, with the word “DURAGLAS” written in cursive script. The numbers “6, 3” followed by a period, and “32” are embossed on the base. The words “NO DEPOSIT NO RETURN NOT TO BE REFILLED” are also embossed on the shoulder of the bottle. The age of this bottle post-dates 1940 (Toulouse 1971, p. 403).

SMP-H-2007 is a small (5,275 m^2), early twentieth-century scattering of eleven tin cans and other associated artifacts, situated on an historic road (SMP-H-1032). Can types include three-piece, cylindrical sanitary food cans, one beverage, a bimetal three-piece cylindrical can, key-opening, non-reclosable can, and a square can with an oval-end internal friction lid (Hershey’s Cocoa). Cans have crimped and flush ends and crimped and lip-side seams. Opening methods include tear-top, key-strip, punched-hole, and church-key. Additional artifacts include a crushed metal pail, 10 fragments of aqua glass, a shard of amethyst glass, a Colt-45 shell casing, and tar slag. The shell casing measures 15/16 inches by ½ inch in diameter. The center-fire casing has “WRA CO 45 COLT” (Winchester Repeating Arms) stamped on the end.

SMP-H-2010 and SMP-H-2011/2012 appear to be extensions of one large, discontiguous, elongate refuse scatter, associated features, and tank tracks, situated on the an historic road (SMP-H-1032) and continuing from the intersection of an unnamed southwest-trending, graded dirt road westward for a distance of 2,000 feet. Additionally, discontinuous segments of tank tracks roughly parallel SMP-H-1032, at the southern margin of the site(s). Track segments from the westernmost site (SMP-H-2010) are 466 feet long, with 18–24-inch treads spaced 6 feet apart. Two track segments from the easternmost site (SMP-H-2011/2012) measure 430 feet and 140 feet in length, respectively. Both exhibit 24-inch treads spaced 8 feet apart.[30] Discarded items have a wide range of dates spanning the first half of the twentieth century.

Artifacts with SMP-H-2010 (westernmost portion) include 111 tin cans/lids; a glass jar; aqua, green, and amethyst glass fragments; and ceramic fragments. Tin can types include three-piece, cylindrical sanitary food, key-opening, non-reclosable, oblong F-style, easy-open oblong, and flat round. Most have crimped ends with lip-side seams. A few of the cans are hand-soldered, hole-in-cap with a couple of matchstick-filled.

[30] The tank track treads match the width of M2 and M3 halftrack transports from DTC activities (Meller 1946).

Opening methods include key-strip, X-cut, jab-lift, hinged-lid, twist-open, church-key, knife-cut, and punched-hole. One small tin can (2 inches in diameter and ¾ inch high) is embossed with “BARRINGTON + HALL Soluble Coffee.” A glass screw-top jar (5½ inches high by 4 inches in diameter), is embossed with “P-1048,” a “Knox Glass Company” maker’s mark, and a “12” on the base. Additional items include 20 fragments of whiteware, found in a 3-foot-diameter area; pieces of a crock-pot (base and lip fragments); a discrete deposit of fragments from an amethyst glass bottle (19 pieces); another cluster of amethyst glass (25 pieces) containing rim fragments and a base fragment; fragments (20 pieces) of two green glass bottles; and fragments of two amber glass bottles.

Artifacts from SMP-H-2011/2012 include 60 cans/lids and other historic-period debris. Tin can types include two- and three-piece, cylindrical sanitary food and beverage cans, key-opening non-reclosable cans, and hinged-lid pocket (tobacco tins). The cans have crimped and flush ends with lip-side seams and are machine-soldered. A few of the cans are hand-soldered, hole-in-cap. Opening methods include key-strip, punched-hole, and circle slice. Among the assorted other items are a 6-ounce Coca Cola bottle with “Los Angeles” written on the base, fragments of an amber glass jug (Purex), a rusted pocketknife with a 3¾-inch blade, a ceramic sparkplug (3 inches long “Champion/Ford”), and miscellaneous modern debris.

Further, five historic/modern campfire rock rings are situated within the western site (SMP-H-2010), with three clustered south of the road and two north of the road at the eastern end. In addition, three upright survey posts of milled lumber align due north along the north-south half-section line, north of the road. It is also likely, given the roadside context and age of this road, and the wide apparent date range of associated artifacts, that multiple camping and discard events during the entire twentieth century are represented.

SMP-H-2017, a small (1,570 m^2) very sparse scattering of tin cans, is situated on the lower alluvial fan in the northwest quadrant of the APE, at an elevation of 563 feet, adjacent an old northwest-trending unimproved dirt road. Can types include a three-piece, cylindrical, internal friction lid, sanitary food and an oblong, key-opened, hole-in-cap meat tin. Can types present appear to date to the early twentieth century (Rock 1987, p. 113). Based on the age of artifacts, SMP-H-2017 is a single event deposit.

SMP-H-2019 is a refuse scatter, 6,400 m^2, on the edge of an unimproved road heading to Sidewinder Well (~0.5 miles to the north), between two ephemeral washes. It consists of 21 tin cans, a small medicine bottle, and a screw-top whiskey bottle. The cans include: 3-piece cylindrical sanitary food and motor oil, beverage, and a pear-shaped meat (ham) tin. Canisters have crimped and flush ends and lip-side seams. Opening methods include church-key, P38, knife cut, bayonet, and punched hole. Three of the cans are match-stick filled.

SMP-H-DS-465 is refuse scatter of glass fragments, bottles, and cans, situated on the west edge of Corn Springs Road near the intersection with a gas pipeline road, on the south side of a flood diversion dike that probably served as a wind break. It consists of three concentrations, spread over 3,073 m^2. Concentration 1 includes: a single Clorox bottle base, a metal bolt, 40 fragments of green and brown glass fragments, including a bottle base embossed with an Owen's Illinois maker's mark dated "53" (Toulouse 1971), 20 sanitary cans with rotary and church-key openings, and a single external friction lid embossed with "For Coffee Pot or Percolator Regular Grind". Concentration 2 contains 20 sanitary cans, a single cone top beverage can, a large juice can, and a fragmented aqua glass preserve jar. Concentration 3 includes 10 church-key opened beverage cans, a coffee can, a vent hole condensed milk can, and a small meat tin. Outside these concentrations is a scattering of additional refuse, including glass fragments (10 green, 50 brown glass), a clear glass soda bottle appliquéd with "Suncrest", a clear glass bottle appliquéd with "Nehi Beverage", and 25 sanitary cans (3 church-key opened, three vent-hole condensed milk cans, one meat tin, and one rectangular can with a screw top that is possibly a lighter fluid tin).

SMP-H-DS-466 is a very small refuse deposit, about 6 m^2, of approximately 10 metal fuel cans, an oil filter, and an air or exhaust filter, situated adjacent the gas line road south of I-10, probably representing a single event of vehicle maintenance. These items post-date 1945.

SMP-H-JR-101 is a small refuse deposit, 100 m^2, situated at the west-bound on-ramp of I-10 at the intersection with Chuckwalla Road. It consists of 4 cans (one sanitary food, two beverage, and one sardine), as well as three pieces of wood lath. These items post-date 1945.

SMP-H-JR-102 is a broad refuse scatter, 7,134 m^2, at the east-bound off-ramp of I-10 at the intersection with Chuckwalla Road. It consists of 26 metal cans and about 75 glass fragments. The cans include: bi-metal beverage cans, hole-in-cap milk cans, sanitary food cans, cone-top beer cans, oil cans, aerosol cans, and a paint bucket. Opening methods include P38, rotary, pull-tab, key-strip, and knife-punched. The glass is primarily from beverage bottles and two clear glass jars.

SMP-H-JR-109 is a small refuse scatter, 225 m^2, not far from the Blythe-Eagle Mountain 161-kV transmission line service road. It consists of four metal sanitary cans with stamped external ends and lipped seams, opened by P38 and church-key methods.

SMP-H-JR-110 is a refuse scatter, 1,505 m^2, situated at the intersection of an east/west trending road and a north/south trending dirt road, approximately 5 miles southwest of the Desert Center Airport and Gruendike's well. In consists of five cans, a shotgun shell cap, and a set of tank tracks. The cans include one meat tin top, two beverage cans, one baking powder can, and one sanitary food can. The beverage cans exhibited crimped ends, lapped seams, and were unopened. The baking powder can also exhibited crimped ends and lapped seams, with a twist-open end. The sanitary food can exhibited stamped external ends and crimped seas, and was opened by a P38.

SMP-H-TC-008 is a refuse scatter, 1,911 m^2, situated along a portion of historic road (SMP-H-1032) leading straight to the Desert Center Airport. It contains 15 cans including 13 metal sanitary cans opened by knife tip, key strip and jab lift, as well as one sardine tin with external stamped ends and crimped seams (marked "SARDINE NORWAY", and one tobacco tin with a match striker on the bottom.

SMP-H-TC-009 is a refuse scatter, 3,605 m^2, situated along an east-west dirt road, in the alluvial plain between Palen Dry Lake and Desert Center, approximately 3 miles north of I-10. It contains the following: 3 beer and beverage cans, a pocket tobacco tin, 3 food cans, 3 juice cans (one marked “S+W APPLE JUICE”), a 3-gallon bucket, and an amber glass whiskey bottle. Cans were opened using methods including a knife tip, key strip, church-key, and a bayonet.

SMP-H-TC-020 is a small refuse scatter, 1,224 m^2, along an east-west dirt road, just over a mile north of I-10. It contains two beverage cans and 6 sanitary cans opened using knife tip, jab lift, rotary, church key and P-38 methods. Two milled wood fragments with embedded nails were also found.

Off-Road Refuse Scatters between Alluvial Washes

SMP-H-1004 is another sparse, elongate scattering of historic-period debris consisting of an unspecified quantity of tin cans, porcelain ceramic fragments, a jadeite (opaque green glass) fragment, and six pieces of modern wood lath. It is situated on the upper alluvial fan, at an elevation of 573 feet, spread over an area of 27,632 m^2. An unnamed, unimproved two-track road runs alongside the eastern edge of the site with ephemeral washes on both sides. Discarded items post-date 1935 and may be associated with activities related to the DTC/C-AMA Cultural Landscape/Historic District. Probable can contents include motor oil, tuna, and beverages, with both church-key and P-38 openings. Labeling on motor oil cans include: Esso, SAE 40, and Shell Oil.

SMP-H-1009 is another widely dispersed elongate scattering of modern and historic-period debris, straddling a braiding northeast-trending wash, encompassing an area of 44,038 m^2. It is located on the upper alluvial fan at an elevation of 615 feet. An unspecified number of discarded items range in date from the 1930s to the late 1960s. Probable can contents include meat, fish, milk, and beverages, with pull-ring, church-key, key-strip, and punched-hole openings. A single olive-green glass bottle has an Obear-Nestor Glass Company maker’s mark dating to between 1915 and at least 1971 (Toulouse 1971).

SMP-H-1021 is a small (20 m^2 area) scattering of eight tin cans and 21 can lids (most stacked within the cans) situated on an ephemeral dune transitioning from the lower alluvial fan, at an elevation of 490 feet. All are three-piece, cylindrical sanitary food containers with center-hole and circle-slice opening methods dating from the late 1920s to early 1930s. This site appears to represent a single episode of refuse discard, retaining integrity because the cans appear to have remained in place for some time. It is possible that more tin cans are buried in the sand near the surface deposit.

SMP-H-1022 is a widely dispersed scattering of 24 tin cans and a few other miscellaneous artifacts on an alluvial fan within an active northeast-trending ephemeral wash, encompassing 63,271 m^2. It is situated in a transitional area between an alluvial fan and an ephemeral dune area, at an elevation of 550 feet. Can types include three-piece, cylindrical sanitary food and beverage, and oblong, key-opened, two-piece cylindrical, and key-opening, non-reclosable containers. Machine-soldered cans have flush and crimped ends and lip-side seams. Opening methods include P-38, key-strip, church-key, punched-hole, and X-cut. A screw-top jar (5 1/16 inches high, base diameter of 3⅞ inches, and 2⅞-inch opening) is embossed with an Anchor Hocking maker's mark and the numbers "3", "5", and "3900." A screw-top bottle (6 ⅞ inches high by 2¾ inches in diameter with a 1 ⅛-inch opening) is embossed with an Owens-Illinois maker's mark and the numbers "6", "3", and "32." The words "NOT TO BE REFILLED NO DEPOSIT NO RETURN" are embossed on the shoulder of this bottle. This bottle dates between 1929 and 1954 (Toulouse 1971, p. 403). A small piece of lumber (13 inches long by 2½ inches wide by 1½ inches thick) is also present.

SMP-H-1023 is a small site (408 m^2) containing seven 6-ounce Coca-Cola bottles. It is situated within a transitional area between an alluvial fan and an ephemeral dune area at an elevation of 551 feet. A discrete deposit of four bottles is in the northwest portion of the site with two bottles south and one east of the cluster. One bottle is not embossed. The remaining bottles are embossed with the following: four bottles with "El Centro Calif.," one with "Bakersfield Calif.," and one with "Los Angeles Calif." Five bottles at the site have manufacture dates of 1942, indicated by a mark of "42" on the heel and one bottle has a manufacturing date of 1941 (Lockhart 2007). This site appears to represent a single refuse discard event dating to the DTC/C-AMA years. The site is located near a set of tank tracks (SMP-H-1026). No apparent subsurface component was observed during recordation.

SMP-H-2002 is a widely dispersed scatter of 26 tin cans, a glass screw-top medicine bottle, clear glass fragments, and milled lumber. It is situated on a northeast-trending ephemeral wash, in the northwest quadrant of the APE, encompassing 387,005 m^2, transitioning between stable alluvium and sedimentary sand deposits, at an elevation of 567 feet. Can types include three-piece, cylindrical sanitary food and beverage, oblong F-style, key-opened coffee tin, and non-reclosable cans. All have crimped ends with lip-side seams. Can filling methods include one hole-in-cap, three matchstick-filled (evaporated milk cans), and the rest are entire-end filled. Opening methods include church-key, key-strip, P-38, punched-hole, knife-cut, and X-cut. The medicine bottle (5½ inches high by 2¼ inches by 1½ inch wide) exhibits a molded side seam. The intact metal cap (1¼ inches outside diameter) and sits on a glass lip. A maker's mark (the letter "I" inside an oval) and the letters/numbers "23, 7, 7 C, 51 S B 6856 – A" are embossed on the textured surface of the base. Two pieces of lumber are present, measuring 15½ inches long by 5¼ inches wide by 1½ inches thick, and 68 inches long by 5 inches wide by 1½ inches thick.

SMP-H-2004 is a small very sparse scattering of four tins cans, two bottles, and a brass belt buckle. These items were found situated within a small locus (2,826 m^2) on the alluvial fan at the western edge of the APE, alongside a shallow northeast-trending ephemeral wash. Four hole-in-cap, hand-soldered, three-piece, cylindrical sanitary cans with crimped ends and side seams are present, with P-38 and punched-hole openings. The two broken beverage bottles (3 7/16 inch diameter), of amber glass, had no visible maker's marks. The site appears to be in good overall condition with no indication of a subsurface component.

SMP-H-2008 is a refuse scatter with a concentration of 24 tin cans and fragments of a clear glass bottle, along with a more widely distributed 30 additional cans/lids and the base of a clear glass jar. These items were found situated within a small locus (2,750 m^2) on the alluvial fan at the western edge of the APE, between two shallow northeast-trending ephemeral washes. The site appears to be in good overall condition with no indication of a subsurface component.

DS-712 is a very small concentration of six rusted metal vehicle parts, possibly from a tractor or similar heavy equipment, found within a one-meter diameter area, about 275 meters south I-10 on a sandy terrace with young desert pavement. These parts include: a pedal embossed with a “C”, 2 leaf springs, 1 strap, and 2 pieces of unidentified metal (one marked with serial number “T-O-11527”. The site appears to be in good overall condition with no indication of a subsurface component.

Off-road refuse scatters, as a resource class, in this case, are likely associated with military training maneuvers during World War, thus, possibly eligible for the CRHR for an important event in our nation’s history, under Criteria 1. They are not typically reflective of a distinct construction style, type, or design under Criterion 3 of the CRHR. These resources may yield additional information regarding the past history of the area under Criterion 4. Therefore, Staff assumed, and the Commission agreed, that these resources are eligible for the CRHR. PSEGS impacts to these resources, if unavoidable, must be mitigated.

Mining Resources

Three possible placer mining claims, SMP-H-1005, SMP-H-1007, and DS-327, dating to the first half of the twentieth century, are discussed below.

SMP-H-1005 is located in a shallow, active wash, on the alluvial fan in the southwestern quadrant of the PAA, situated at an elevation of 600–629 feet. It consists of one standing wooden post with a large, widely dispersed scattering of associated historic-period and modern debris bordering the wash, encompassing an area 121,712 m^2. The post, measuring about 3½ inches in diameter and 55 inches tall, has a wire nail in it. Associated historic-period debris includes three bottles and 125 cans. The bottles include two half-pint, amber glass bottles (one with an Anchor Hocking maker’s mark dating from 1938 onward, and another with a maker’s mark “F” in a hexagon manufactured by Fairmount Glass works between 1945 and 1960). The third, a clear glass bottle with an Owens-Illinois maker’s mark, dates between 1929 and 1954. Scripts on all three bottles read “Federal law forbids sale or re-use of this bottle,” which post-dates 1935. The cans are primarily church-key-opened beverage cans, key-strip-opened cans, three water soluble coffee cans, one Hines apple juice can, a Coors beer can, several motor oil cans (SAE 50, SAE 30, Texaco and Pennzoil), and a lard pail.

SMP-H-1007 is located in another shallow active wash (about 2,000 feet east of SMP-P-1005), on the alluvial fan in the southwestern quadrant of the PAA, situated at an elevation of 605–625 feet. It consists of two standing wooden posts with a large, widely dispersed scattering of associated historic-period and modern debris, encompassing an area 252,770 m^2. One post has a cairn of rocks stacked at its base with a piece of bailing wire on top (3½ inches in diameter and 38 inches tall). The second post, eight feet away (same diameter and 78 inches tall), is lashed to a metal fence post with bailing wire. A clear glass jar (dating between 1900 and at least 1971) is attached to the post with bailing wire (maker’s mark believed to be Thatcher Manufacturing Company).

Portions of a wooden staircase are situated nearby, along with other construction debris, intermixed with galvanized rubber and a six-inch metal pipe, a shovel, a hand saw, automobile parts (a Ford vehicle grill, two air filters), and over 200 cans. The vast majority of the cans, of various sizes, are church-key-opened beverage cans and ring-pull cans. Other cans at the site include key-strip-opened cans, sanitary cans, motor oil cans, rotary-opened cans, P-38-opened cans, meat tins, and a pocket tobacco tin.

DS-327 is, likely, a historic period placer mining claim marker, located south of I-20, in desert pavement. It consists of a four-by-four inch wood post, standing five feet tall, supported at the base by large cobbles. A tin beverage can is attached to the side of the post with two nails. No associated artifacts were evident at the time of recordation.

It is possible that these mining claims relate to the Chuckwalla Placer boom that occurred during the 1910s and 1920s. Further research of records at the BLM could resolve this question. It is also possible that the owners of these claims were persons important to the history of Chuckwalla Valley. This information could also be ascertained through research of records at the BLM. It is also possible that these resources contain data important to history of the region. Therefore, Staff assumed, and the Commission agreed, that these resources, sites SMP-H1005, SMP-H1007, and DS-327, are eligible for the CRHR. PSEGS impacts to these resources, if unavoidable, must be mitigated.

Military Resources

Three resources comprised of tank tracks, SMP-H-1026, SMP-H-2009, and SMP-H-2020, are considered ineligible for the CRHR.

SMP-H-1026 consists of three tank track segments (175, 280, and 350 feet in length). Track segment 1 represents vehicle tracks, eight feet wide with 18-inch treads. Track segments 2 and 3 are 9.4 feet wide with 24-inch treads. These match the width of M2 and M3 halftrack transports from WWII Desert Training Center activities. The tracks are most visible crossing a north-south-trending, rocky outcrop of younger desert pavement (lacking patination) on a stable alluvial fan.

SMP-H-2009 is comprised of one tank track segment, 680 feet long, 9 feet wide with 18-inch treads, matching the width of M2 and M3 halftrack transports from WWII Desert Training Center activities. The tracks are oriented northwest-southeast, crossing a stable alluvial fan with desert pavement. These tracks are in good condition.

SMP-H-2020 is comprised of a tank track segment, 250 feet long and 9 feet wide with approximately 20-inch treads. These are situated on desert pavement on the flat gravel terrace in the northwest quadrant of the PAA. These tracks have good integrity. Sheet wash has eroded the tracks to the northeast and southwest.

All three resources are associated with an important chapter in our country's history, WWII training for desert fighting in North Africa between 1942 and 1944. While these resources are in relatively good condition, they are common features in the area, and better examples can be found elsewhere. Moreover, the recordation already completed has exhausted the data potential of these resources. Staff determined, and the Commission agreed, that they are non-contributing elements of the greater, interconnected DTC/C-AMA Cultural Landscape previously nominated to the NRHP and assumed by staff to be eligible for the CRHR (see DTC/C-AMA Cultural Landscape/Historic District, below).

Geological Survey Marker Feature

SMP-H-1025 consists of two U.S. Geological Survey/General Land Office survey markers made of two-by-four inch lumber, possibly dating to the early nineteenth century and subsequent updates. One, standing five feet tall, is situated at the corner of sections 3/4/33/34. The other, 175 feet to the southeast, is only one foot tall. A broken clear glass screw-top jar is found adjacent to this shorter marker. The base of the jar measures 2¾ inches in diameter and is embossed with “443-16A, H4.” Modern pieces of lath, wired together, are lying on the ground near a single standing piece, likely related to a recent USGS survey in 2008.

DS-459 consists of a U.S. Geological Survey marker date-stamped 1955. The marker is comprised of a metal capped pipe embedded in the ground, surrounded by a rock pile of approximately 40 cobbles. A few pieces of deteriorating wood measuring approximately 4 feet in length are connected to the marker by metal wire.

Staff recommended, and the Commission agreed, that these resources were ineligible as they do not contribute to the broad patterns of history under Criterion 1 of the CRHR; they are not related to individuals important to history under Criterion 2 of the CRHR, respectively; and do not represent a distinct or unique construction style, type, or design (Criterion 3). Further, they are not likely to yield data important to history under Criterion 4.

Rock Cairn Sites

The cultural resources analysis in the September 2010 RSA recommended that four rock cairn sites identified on the original facility site (CA-Riv-9091, DS-326, DS-334, and DS-714) be determined ineligible for listing in the CRHR.

Prospecting Small Quartz Reduction Loci

The cultural resources analysis in the September 2010 RSA recommended that five prospecting small quartz reduction loci identified on the original facility site (DS-452, DS-454, DS-455, DS-458, and DS-716) be determined ineligible for listing in the CRHR.

ASSESSMENT OF PROJECT IMPACTS TO CRHR-ELIGIBLE ARCHAEOLOGICAL RESOURCES AND RECOMMENDED MITIGATION

Analysis of Impacts to ethnographic Resources

Evaluation of Ethnographic Resources:

This section is in development, to be supplemented and included in the FSA. At this time, staff is unable to evaluate the ethnographic resources for eligibility to the CRHR due to a lack of data. Missing data includes information from tribal interviews, the data from DR 29, 30, and 31, and data from the proposed reconnaissance survey in the Coxcomb and Palen mountains.

All CRHR-Eligible Ethnographic Resources Subject To Potential Project Impacts

This section is in development, to be supplemented and included in the FSA. At this time, staff is unable to evaluate the ethnographic resources for eligibility to the CRHR due to a lack of data. Missing data includes information from tribal interviews, the data from DR 29, 30, and 31, and data from the proposed reconnaissance survey in the Coxcomb and Palen mountains.

Assessment of Project Impacts to CRHR-Eligible Ethnographic Resources and Recommended Mitigation

This section is in development, to be supplemented and included in the FSA. Because staff is unable to evaluate the ethnographic resources for eligibility to the CRHR, staff is also unable to assess impacts to these resources and to provide recommended mitigation measures.

Analysis of Impacts to Historic-Period built environment Resources

Evaluation of CRHR Eligibility of Individual Historic-Period/Built-Environment Resources

The following has been taken from the 2010 RSA that was completed for the original license. Research and evaluation is ongoing for the expanded PAA, the information from which will be included in the FSA.

Electric Power Transmission Line

One resource, related to electric power, SMP-H-1024, is a 1.75-mile segment of the Blythe-Eagle Mountain 161-kV transmission line and its service road that cuts approximately diagonally across the southwest corner of the proposed PSEGS plant site. The power line dates to the late 1950s. The segment consists of eleven sets of H-frame wooden supports consisting of two poles spaced about 15 feet apart with metal crossbeams at the top and ceramic insulators), carrying three conductors. Distances between supports are 775 feet. Many of the supports bear tags or markings indicating their date. Among these tags are nails with either “57” or “65” on the head. Other tags indicate that some of the poles were replaced in 2002, bearing the support numbers or inspection tags or markings indicating their date. Among these tags are nails with either “57” or “65” on the head. Other tags indicate that some of the poles were replaced in 2002, bearing the pole numbers or inspection tags that read “PMC 2002 – Visual” or “PMC 2002 – UFUME –IMPEL”. A graded access road parallels the line.

Generally speaking, electrical transmission and distribution facilities, as a mature technology, by themselves rarely meet the eligibility criteria for National Register listing. Typically, those that are determined National Register eligible achieve that status by way of their association with other historically significant facilities (eligible under Criterion A). Borrowed from telegraph transmission technology, wood-pole support structures such as those used in the 161-kV Blythe-Eagle Mountain transmission line have been used for electrical transmission or distribution lines from the outset, and the technology has changed very little. The common and indistinctive nature of wood-pole transmission or distribution line structures disqualifies them as potentially National

Register eligible under Criterion C: they are purely functional and utilitarian in use and common in appearance.

Staff recommended, and the Commission agreed, that the 161-kV Blythe-Eagle Mountain transmission line is also not eligible for inclusion in the CRHR. Evaluated under Criterion 1, this linear resource is not associated with events that have made a significant contribution to broad patterns in our history. Rather it represents a common trend within the context of development in the United States after World War II. Research did not indicate that this transmission line was associated with any historically significant persons, and so it does not appear to be eligible under Criterion 2. Under Criterion 3, this transmission line does not embody a distinctive type, period, or method of construction. Instead, it represents a fairly standardized type and construction method shared with telegraph lines. This resource is also not eligible under Criterion 4 because it is unlikely to yield information important to history.

Assessment of Project Impacts to Historic-Period/Built-Environment CRHR-Eligible Resources and Recommended Mitigation

During the siting case for the original project staff determined the Blythe-Eagle Mountain 161-kV transmission line to be ineligible for the CRHR, so no mitigation was recommended for PSEGS impacts to this resource. Known historic-age resources in the vicinity that are being examined including the Community of Desert Center and agricultural complexes in the Chuckwalla Valley. Other potential resource types include roads/trails, transmission lines, and mining operations. This should not be considered an exhaustive list as research is ongoing. Resources related to the military history of the area are contained under historic archaeological resources. Research and analysis is ongoing concerning historic-age resources in the expanded PAA; this information will be included in the FSA.

All CRHR-Eligible Resources Subject To Potential Project Impacts

Cultural Resources Table 11 lists, by resource type, the CRHR-eligible cultural resources potentially impacted by the project and the recommended conditions of certification that would mitigate, to the extent possible, the amended project’s significant impacts.

Cultural Resources Table 8
CRHR-Eligible Cultural Resources Potentially Subject to Impacts from the Proposed Project and Recommended Mitigation

Resource Type, Designation	**Resource Description** [type, size, age,]	**Recommended Conditions to Mitigate Impacts**
<u>Prehistoric Archaeological Resources</u>		*Recommended conditions of certification to mitigate impacts to CRHR-eligible prehistoric resources will be completed or refined for the FSA.
SMP-P-2018	Lithic & FAR scatter	**CUL-12**
SMP-P-2023	Lithic & FAR scatter	**CUL-12**
SMP-P-MT-001	Lithic scatter	**CUL-11**
Buried archaeological resources that may be discovered during construction monitoring or identified during survey of potential soil borrow and disposal sites	Unknown	**CUL-1** through **CUL-8**, and **CUL-12** and **CUL-13**; would provide for the appropriate identification and treatment of potential CRHR-eligible archaeological resources discovered during construction-related activities.
<u>Historical Archaeological Resources</u>		

Resource Type, Designation	**Resource Description** [type, size, age,]	**Recommended Conditions to Mitigate Impacts**
Ethnographic Resources	11 Potential Traditional Cultural Properties 1. Palen Dunes/Palen Lake 2. Ford Dry Lake 3. McCoy Spring (CA-Riv-0132) National Register District 4. Mule Tank (CA-Riv-0504 and CA-Riv-0773) ACEC 5. Corn Spring (CA-Riv-032) 6. North Chuckwalla Mountains Petroglyph District (CA-Riv-01383) 7. North Chuckwalla Mountains Prehistoric Quarry District (CA-Riv-01814) 8. Long Tank 9. Alligator Rock 10. Dragon Wash (CA-Riv-049) 11. San Pascual Well	Recommended conditions of certification to mitigate impacts to CRHR-eligible ethnographic resources will be completed for the FSA.

Resource Type, Designation	Resource Description [type, size, age,]	Recommended Conditions to Mitigate Impacts
Built-Environment Resources	To Be Determined in FSA	To Be Determined in FSA

CUMULATIVE IMPACTS AND MITIGATION

GEOGRAPHIC SCOPE OF ANALYSIS

Table 1, Palen Master List of Cumulative Projects, and the **Cumulative Projects Figure 1**, included in the Cumulative Impacts Assessment **Executive Summary** of the PSA, identify the development projects that may contribute to cumulative impacts on cultural resources in combination with the proposed PSEGS project. These include the Genesis Solar Power (09-AFC-8C), the Blythe Solar Power (09-AFC-6C), the . These projects are located within a geographic area that has been identified by staff 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 would be required to undergo their own independent environmental review under CEQA.

Cumulative impacts could occur if impacts resulting from the implementation of the proposed project combine with the impacts of other local or regional projects on the same or similar resources. Cumulative impacts would occur locally if the PSEGS impacts combined with the impacts of projects located within the area identified in **Cumulative Projects Figure 2**. Cumulative impacts could also occur as a result of the development of some of the many proposed and licensed solar and wind development projects that have been, or are anticipated to be, constructed in the foreseeable future. This geographic scope is appropriate because it is likely that cultural resources similar to those in the PSEGS PAA are present throughout the Chuckwalla Valley.

In the RSA for the original siting case it was determined that there would be a cumulatively considerable impact to cultural resources. At this time staff anticipates that the amended project will have a greater impact that the originally licensed project both at the project and cumulative levels; therefore the already cumulatively considerable impact from the originally proposed project will be an even greater cumulatively considerable impact with the amended project. As such, as it is discussed in the “Recommended Conditions of Certification” subsection below, the magnitude of the mitigation measures will be adjusted accordingly. This could mean a larger contribution to the DTC and PNTCL project per CUL-1 and CUL-2.

PROJECT CUMULATIVE IMPACTS AND MITIGATION

<u>I-10 Corridor</u>

At the local level, the construction of Chuckwalla Valley and Ironwood State prisons probably caused the most disturbance in the I-10 Corridor. Together these projects have disturbed approximately 1,720 acres of culturally sensitive desert. The analysis suggests that 29 sites were destroyed during these projects, five of which may have been eligible for the NHRP and the CRHR.

The construction of I-10, a four-lane divided highway, with associated bridges, off-ramps, and berm system, also resulted in significant ground disturbance in the Corridor. Assuming a width of a minimum of 200 feet and a length of 48 miles, within the I-10 Corridor this project disturbed approximately 10,137,600 square feet (2,328 acres). The analysis suggests that 40 sites were destroyed during this construction, seven of which were eligible for the NHRP and the CRHR.

Another linear project within the I-10 Corridor is the Devers-Palo Verde transmission line, a 500-kV line paralleling I-10. The disturbance caused by the construction of transmission lines is generally less than the disturbance caused by freeway construction. However, each line has an associated access road. Based on the construction of the access road and excluding the transmission tower pads, a width of 20 feet for each project and a length of 48 miles were assumed for this analysis. A similar calculation was made for the Blythe-Eagle Mountain Transmission Line and a natural gas line, both of which were constructed parallel to I-10. This analysis estimates that during the construction of these three linear projects, approximately 350 acres were disturbed, and 6 cultural resources were destroyed, 1 of which was likely to be eligible for the NHRP and the CRHR.

Finally, the mining activities at the Kaiser Eagle Mountain Mine may have disturbed more than 3,500 acres. Several plans for the use of this disturbed area have been proposed, but, from the perspective of cultural resources, new projects would be unlikely to cause more damage than has already occurred.

In total, together, the larger of the ground-disturbing projects within the I-10 Corridor disturbed at least 7,898 acres, or 6.4 percent of the Corridor. One hundred and thirty-three of the estimated 2,081 cultural resources were likely destroyed by these projects. Of the 367 cultural resources that would have been eligible for the NHRP and the CRHR, 23 would have been destroyed. Overall, previous projects in the I-10 Corridor do not appear to have a significant adverse affect on the cultural resources. However, certain site types, particularly those associated with dry lakes may have been disproportionately affected. A more detailed cumulative analysis would be needed to determine if this was the case.

Archaeological Resources

This section will be completed for the FSA.

Ethnographic Resources

This section will be completed for the FSA.

Built-Environment Resources

This section will be completed for the FSA.

Project Cumulative Impacts Conclusion

This section will be completed for the FSA.

COMPLIANCE WITH LORS

Staff concludes that with the adoption and implementation of staff's recommended cultural resources conditions, the PSEGS would be in conformity with all applicable LORS. **CUL-1** and **CUL-2** would reduce the project's cumulative impacts to the greatest extent possible, but those impacts would still be cumulatively considerable. **CUL-3** through **CUL-15** would reduce the direct impacts to less than significant.

NOTEWORTHY PUBLIC BENEFITS

While the development of the amended project is intended to address the requirements of federal and state mandates to develop renewable energy, it would not yield any noteworthy public benefits related to cultural resources.

RESPONSE TO AGENCY, TRIBAL AND PUBLIC COMMENTS

Staff has received three letters of comment from interested parties (Letter from La Cuna de Aztlan Sacred Sites Protection Circle, January 21, 2013, Letter from Agua Caliente Band of Cahuilla Indians, March 26, 2013, and Letter from Soboba Band of Luiseno Indians, April 11, 2013). The comments and staff responses are summarized below.

<u>Comments</u> in letter from La Cuna de Aztlan Sacred Sites Protection Circle:

The letter writer, Alfredo Acosta Figueroa, expresses opposition to the project, on the basis it could harm or destroy a number of culturally-important resources, including:

1. the main historic trail between Palen Mountain, Mule Mountains, Corn Springs and Aztec Well;

2. Poor-will Bird hibernating sites and pristine desert;

3. the contextual significance of a number of sacred sites and geographic features including the Chuckwalla, Eagle, Palen, Granite, McCoy, Mule, and Little Maria Mountains; Dragon Wash; Ripley Intaglio and geoglyphs, pictographs, rock art and petroglyphs known to exist in the area.

   <u>Staff Response</u>: During the data adequacy phase of review for the proposed amendment, staff identified significant concern with the potential for the two solar power towers and heliostat fields to degrade the visual environment of the areas and negatively impact the use of known cultural resources and sites within the expanded PAA. In a Data Request issued April 19. 2013, staff requested the applicant prepare a work plan for conduct of level II pedestrian surveys of southwestern portions of the Palen Mountains and southern portions of the Coxcomb Mountains that fall within the sight of the solar power towers (Data Request #27), to provide a sound assessment of the potential extent of resources in these areas and resultant impacts. Staff is working with the applicant on expediting completion of this study, for which the BLM requires a detailed work plan and a BLM-issued Fieldwork Authorization (FA). Palen Solar's archaeologist has now finally received the FA for doing the work in Data Request #27, and would finish the work before Energy Commission staff could complete BLM's required permits and field work described

above. Ideally, the results and findings of the study would be included in the FSA to provide a complete assessment to inform the Committee's decision on the amendment.

Comments in letter from Soboba Band of Luiseño Indians:

The letter write, Joseph Ontiveros, Director of Cultural Resources for the tribe, notes that the Palen project area is within the Soboba Band's Tribal Traditional Use Areas, and is regarded as highly sensitive o the people of Soboba. The Soboba Band of Luiseño Indians also requested that:

1. the project developer initiate a consultation with the tribe;

2. the tribe be apprised of any information pertinent to the progress of the project;

3. Native American Monitor(s) from the Soboba Band of Luiseño Indians Cultural Resource Department be present during any ground disturbing proceedings, including surveys and archaeological testing.

   Staff Response: The comments are duly noted, and staff has been in regular communication with the tribe on this and other related projects in the area. A representative from CEC also met in person with the tribe the week of May 20th-24th). **CUL-5** in the proposed conditions of certification requires the preparation of a Cultural Resources Monitoring and Mitigation Plan (CRMMP), including provisions for on-site monitoring, for review and approval by staff prior to commencement of any ground disturbing activities.

Comments in letter from Agua Caliente Band of Cahuilla Indians:

The letter writer, Patricia Garcia-Tuck, Director of the Tribal Historic Preservation Office (THPO) notes the project is within the Tribe's Traditional Use Area, and the THPO has identified recorded cultural resources and/or sacred place names in the project area and/or in very close proximity to the project boundaries. The THPO states they have requested formal consultation with the CEC and BLM on the project, and their desire to be included in project information and meetings. The letter further states that the THPO considers the cumulative impacts (the inference being this and other solar energy projects in the Interstate 10 vicinity such as Genesis Solar Energy Project and Blythe Solar Power Project) to cultural resources, historic resources, Traditional Cultural Places, sacred places, gathering places, trails and all of the cultural landscapes immeasurable and immitigable. The letter concludes by requesting several items of information concerning the amendment including maps of ethnographic, prehistoric and historic resources in the project area, GIS shapefiles of base and cultural mapping prepared to date, original source materials for the ongoing ethnographic study for the project amendment, and copy of the water impact report for the original project and for the amendment.

Staff Response: The comments are duly noted and acknowledged with regard to cumulative impacts of this and other projects in the vicinity. The level II pedestrian surveys of southwestern portions of the Palen Mountains and southern portions of the Coxcomb Mountains that fall within the sight of the solar power towers (Data Request #27), will enable staff to make a more concise and sound analysis of the potential extent of resources in the expanded PAA and resultant impacts. Information available at this time lacks specificity and has no analysis of the area has been performed in accord with a prescribed methodology.

Staff provided all of the tribes expressing interest in the project responses and links to the information requested in the THPO's letter, except those items which require a formal Petition request and Confidentiality Agreement due to sensitivity content regarding cultural resources and locations. At the time of this report, none of the tribes have filed a Petition for confidential information or requested a Confidentiality Agreement.

CONCLUSIONS, RECOMMENDATIONS, AND RECOMMENDED FINDINGS OF FACT

Energy Commission cultural resources staff has analyzed cultural resources data currently available for the proposed PSEGS and has concluded that the proposed modified project would have a significant direct impact on 49 resources either recommended eligible or assumed eligible for either the NHRP and/or CRHR. These impacts include:

- Direct impacts to nine prehistoric archaeological sites, all potential contributors to the PTNCL;
- Direct impacts to 40 historic-period archaeological sites, some of which are potential contributing elements to the DTCCL; and
- Cumulative impacts to the PTNCL and the DTCCL, resulting from the PSEGS's impacts to contributors to these register-eligible resources.

Staff concludes that the PSEGS construction impacts, when combined with impacts from past, present, and reasonably foreseeable projects, would be cumulatively considerable for cultural resources at both the local I-10 Corridor and regional levels. This analysis estimates that more than 800 sites within the I-10 Corridor, and 17,000 sites within the Southern California Desert Region, will potentially be destroyed. Mitigation measures can reduce the cumulative impacts of this destruction, but not to a less-than-significant level. To reduce cumulative impacts staff recommends the adoption of **CUL-1** and **CUL-2**. **CUL-1** and **CUL-2**, as originally approved for the already licensed project, would reduce PSEGS's cumulative impact by setting up programs to define, document, and nominate to the CRHP the two cultural landscapes that PSEGS shares with two other nearby solar projects. The cost of these programs would be shared by the three projects based on the acreage they would occupy.

To mitigate PSEGS's direct impacts, staff recommends that the Energy Commission adopt cultural resources Conditions of Certification **CUL-3** through **CUL-15**. **CUL-3** identifies the people who would implement all of the conditions except for **CUL-1** and **CUL-2**, and **CUL-4** specifies the information the project owner would supply to them. **CUL-5** provides for the preparation and implementation of the Cultural Resources Monitoring and Mitigation Plan (CRMMP), which would structure and govern the implementation of the broader treatment program. **CUL-6** provides for the preparation of a final report to analyze, interpret, and document the ultimate results of the whole

PSEGS cultural resources management program. **CUL-7** would provide training of project personnel to identify, protect, and provide appropriate notice about known and new potential cultural resources in the project construction area. **CUL-8** and **CUL-9** would provide construction monitoring and cultural resources discovery protocols. **CUL-10** through **CUL-15** are treatment conditions for direct impacts to historic-period and prehistoric resources that would reduce the severity of PSEGS direct impacts to less than significant.

Staff recommends that the Energy Commission strike **CUL-16** as the condition is largely a result of disjointed Energy Commission and BLM environmental analysis schedules in 2010 and has the potential to inadvertently impede constructive collaboration on historic preservation issues relative to the Energy Commission's and the BLM's respective statutory and regulatory contexts.

Staff has yet to fully identify, document and assess eligibility of the ethnographic resources identified to date. For the PSA, staff has identified 11 potential Traditional Cultural Properties within which the PSEGS project is located (Palen Dunes/Palen Lake, Ford Dry Lake, McCoy Spring, Mule Tank, Corn Spring, North Chuckwalla Mountains Petroglyph District, North Chuckwalla Mountains Prehistoric Quarry District, Long Tank, Alligator Rock, Dragon Wash, and San Pascual Well). Recommendations concerning the eligibility of these resources for inclusion in the CRHR will be completed for the FSA, as well as an analysis of impacts to these resources, and recommended mitigation measures.

Energy Commission staff's recommended Conditions of Certification **CUL-1** through **CUL-15** reflect staff's determination of what constitutes appropriate mitigation, under the California Environmental Quality Act, for PSEGS's identified impacts to register-eligible cultural resources. Staff recognizes that BLM's parallel but different process for resolving adverse project effects (consultation as outlined in a PA) may result in different conclusions regarding cultural resources evaluations, the nature and severity of project impacts, and appropriate mitigation measures. Staff recommends that the Commission encourage and work with the BLM to incorporate staff's recommended conditions of certification into the PSEGS PA and its associated plan documents.

RECOMMENDED CONDITIONS OF CERTIFICATION

With the Energy Commission's December 2010 adoption of the project, which constrained the applicant's development of the project to either Reconfigured Alternative No. 2 or 3, and the adoption of staff's recommended cultural resources conditions, the PSPP was found by the Commission to be in conformity with all applicable laws, ordinances, regulations, and standards (LORS). **CUL-1** and **CUL-2** would reduce the project's cumulative effects to the greatest extent possible, but those effects would still be cumulatively considerable. **CUL-3** through **CUL-15** were found by the Commission to reduce the direct and indirect effects of the approved project to a less than significant level.

Throughout the 2009 and 2010 analysis of the original project, staff's intent was to develop conditions of certification that were closely comparable to the mitigation measures that appeared likely, at the time of the September 2010 publication of the

Revised Staff Assessment (RSA), to ultimately coalesce under the Bureau of Land Management's (BLM) National Historic Preservation Act (NHPA) Section 106 consultation process. Although staff and the BLM were unable to jointly develop one set of mitigation measures, staff nonetheless continued to collaborate with the BLM in an attempt to reduce the differences between the mitigations that staff developed as conditions of certification in order to comply with the California Environmental Quality Act (CEQA) and the mitigations that the BLM developed for the agency's Section 106 programmatic agreement (PA). Staff made a well-intentioned recommendation to the Energy Commission in September 2010 to adopt **CUL-16** to try and avoid conflicts or duplications of effort between the separate CEQA and Section 106 mitigation measures. The character of the mitigation measures that would ultimately be in the PA had been unclear during the preparation of the draft RSA, and the PA was executed in October 2010, subsequent to the publication of the RSA. Operating under the assumption that the mitigation measures in the PA would closely mirror the recommended conditions of certification that staff had drafted for the RSA, **CUL-16** subordinated the Energy Commission's conditions of certification to the mitigation measures in the PA with a qualification that the Energy Commission would retain the authority to require mitigation efforts above and beyond the efforts set out in the PA, if that additional effort was necessary to satisfy the project owner's obligations to comply with CEQA under the Energy Commission's license. Although the BLM formally offered staff the opportunity to participate in the PA under the status of an Invited Signatory, the Energy Commission staff declined that offer due to the deferral in the PA of the development of precise mitigation measures until after the approval of the project. On the basis of our ongoing history of constructive collaboration with the BLM, staff believes that it would be able to more effectively regulate the project owner's compliance with the conditions of certification under the license for this project outside of the deferral inherent to **CUL-16**. In cases where the deferral of the development of the details of the mitigation measures in the BLM's PA would ultimately lead to the implementation of measures that would not comply with the Energy Commission's statutory and regulatory obligations under CEQA, rather than being subject to an automatic deferral to an inadequate mitigation, staff would be able to simply consult with the BLM to collaborate on a resolution that would satisfy both CEQA and Section 106. On the basis of the history of the condition's original development and the condition's inadvertent disincentive for constructive collaboration, staff recommends that the Energy Commission strike **CUL-16**.

Research and analysis is ongoing with regards to the expanded PAA and any additional visual impacts the modified project would have on cultural resources. Conditions of certification from the Commission Decision for the PSPP are provided below with some minor modifications where necessary as a starting point to facilitate meaningful discussions during the public comment period for the PSA. Staff anticipates the need for additional, and/or modification of the current, conditions of certification to mitigate the impacts of the modified project on archaeological, ethnographic, and built-environment resources; however, at this time there is insufficient information to develop those conditions of certification and they will be provided in the FSA. For example, if staff finds that additional resources that contribute to either of the Cultural Landscapes would be significantly impacted, then those conditions of certification may need to be expanded to account for greater impacts.

Staff has proposed modifications to the **Cultural Resources** conditions of certification as shown below. (**Note:** Deleted text is in ~~strikethrough~~; new text is **<u>bold and underlined</u>**)

CUL-1 PREHISTORIC TRAILS NETWORK CULTURAL LANDSCAPE (PTNCL) DOCUMENTATION AND NRHP NOMINATION

The project owner shall contribute to a special fund set up by the Energy Commission ~~and/or BLM~~ to finance the completion of the ~~PTNCL~~ Documentation and Possible NRHP Nomination program **<u>for the Prehistoric Trails Network Cultural Landscape (PTNCL)</u>** ~~presented in the Palen Solar Electric Generating System (PSEGS) Revised Staff Assessment (RSA)~~.

The amount of the contribution shall be $35 per acre that the project encloses or otherwise disturbs. Any additional contingency contribution is not to exceed an amount totaling 20 percent of the original contribution. The contribution to the special fund may be made in installments at the approval of the CPM, with the first installment to constitute one-third of the total original contribution amount.

If a project is not certified, or if a project owner does not build the project, or, if for some other reason deemed acceptable by the CPM, a project owner does not participate in funding the PTNCL documentation and possible NRHP nomination program, the other project owner(s) may consult with the CPM to adjust the scale of the PTNCL documentation and possible NRHP nomination program research activities to match available funding. A project owner that funds the PTNCL documentation and possible NRHP nomination program, then withdraws, will be able to reclaim their monetary contribution, to be refunded on a prorated basis.

<u>Verification:</u> No later than 10 days after receiving notice of the successful transfer of funds for any installment to the Energy Commission's ~~and/or BLM's~~ special PTNCL fund, the project owner shall submit a copy of the notice to the Energy Commission's Compliance Project Manager (CPM).

CUL-2 DESERT TRAINING CENTER CALIFORNIA-ARIZONA MANEUVER AREA CULTURAL LANDSCAPE (DTCCL) DOCUMENTATION AND POSSIBLE NRHP NOMINATION

The project owner shall contribute to a special fund set up by the Energy Commission and/or BLM to finance the completion of the Documentation and Possible NRHP Nomination program **<u>for the Desert Training Center California-Arizona Maneuver Area Cultural Landscape (DTCCL).</u>** ~~presented in the PSEGS RSA~~.

The amount of the contribution shall be $25 per acre that the project encloses or otherwise disturbs. Any additional contingency contribution is not to exceed an amount totaling 20 percent of the original contribution. The contribution to the special fund may be made in installments at the approval of the CPM, with the first installment to constitute one-third of the total original contribution amount.

If a project is not certified, or if a project owner does not build the project, or, if for some other reason deemed acceptable by the CPM, a project owner does not participate in funding the DTCCL documentation and possible NRHP nomination program, the other project owner(s) may consult with the CPM to adjust the scale of the DTCCL documentation and possible NRHP nomination program research activities to match available funding. A project owner that funds the DTCCL documentation and possible NRHP nomination program, then withdraws, will be able to reclaim their monetary contribution, to be refunded on a prorated basis.

Verification: No later than 10 days after receiving notice of the successful transfer of funds for any installment to the Energy Commission's ~~and/or BLM's~~ special DTCCL fund, the project owner shall submit a copy of the notice to the CPM.

CUL-3 CULTURAL RESOURCES PERSONNEL

Prior to the start of ground disturbance (includes "preconstruction site mobilization," "construction-related ground disturbance," and "construction-related grading, boring, and trenching," as defined in the General Conditions for this project), the project owner shall obtain the services of a Cultural Resources Specialist (CRS) and one or more alternate CRSs, if alternates are needed. The CRS shall manage all monitoring, mitigation, curation, and reporting activities in accordance with the Conditions of Certification (Conditions).

The CRS shall have a primarily administrative and coordination role for the **PSEGS**~~PSPP~~. The CRS may obtain the services of Cultural Resources Monitors (CRMs), if needed, to assist in monitoring, mitigation, and curation activities. The project owner shall ensure that the CRS implements the **Cultural Resources** Conditions providing for data recovery from known historical resources and ensure that the CRS makes recommendations regarding the eligibility for listing in the California Register of Historical Resources (CRHR) of any cultural resources that are newly discovered or that may be affected in an unanticipated manner. No ground disturbance shall occur prior to Compliance Project Manager (CPM) approval of the CRS and alternates, unless such activities are specifically approved by the CPM. Approval of a CRS may be denied or revoked for reasons including but not limited to noncompliance on this or other Energy Commission projects.

Cultural Resources Specialist

The resumés for the CRS and alternate(s) shall include information demonstrating to the satisfaction of the CPM that their training and backgrounds conform to the U.S. Secretary of Interior's Professional Qualifications Standards, as published in Title 36, Code of Federal Regulations, part 61. In addition, the CRS shall have the following qualifications:

1 A background in anthropology and prehistoric archaeology;

2 At least 10 years of archaeological resource mitigation and field experience, with at least three of those years in California; and

3 At least three years of experience in a decision-making capacity on cultural resources projects, with at least one of those years in California, and the appropriate training and experience to knowledgably make recommendations regarding the significance of cultural resources.

Required Cultural Resources Technical Specialists

The project owner shall ensure that the CRS obtains the services of a qualified prehistoric archaeologist to conduct the research specified in **CUL-11** and **CUL-12**. The Project Prehistoric Archaeologist‘s (PPA) training and background must meet the U.S. Secretary of the Interior‘s Professional Qualifications Standards for prehistoric archaeology, as published in Title 36, Code of Federal Regulations, part 61, and the résumé of the PPA must demonstrate familiarity with similar artifacts and environmental modifications (deliberate and incidental) to those associated with the prehistoric and protohistoric use of the Chuckwalla Valley. The PPA must meet OSHA standards as a “Competent Person” in trench safety.

The project owner shall ensure that the CRS obtains the services of a qualified historical archaeologist to conduct the research specified in **CUL-13** and **CUL-14**. The Project Historical Archaeologist‘s (PHA) training and background must meet the U.S. Secretary of Interior‘s Professional Qualifications Standards for historical archaeology, as published in Title 36, Code of Federal Regulations, part 61.

The résumés of the CRS, alternate CRS, the PPA, and the PHA shall include the names and telephone numbers of contacts familiar with the work of these persons on projects referenced in the résumés and demonstrate to the satisfaction of the CPM that these persons have the appropriate training and experience to undertake the required research. The project owner may name and hire the CRS, alternate CRS, the PPA, and the PHA prior to certification.

Field Crew Members and Cultural Resources Monitors

CRMs and field crew members shall have the following qualifications:

1. A B.S. or B.A. degree in anthropology, archaeology, historical archaeology, or a related field, and one year experience monitoring in California; or

2. An A.S. or A.A. degree in anthropology, archaeology, historical archaeology, or a related field, and four years experience monitoring in California; or

3. Enrollment in upper division classes pursuing a degree in the fields of anthropology, archaeology, historical archaeology, or a related field, and two years of monitoring experience in California.

Verification:

1. Preferably at least 120 days, but in any event no less than 75 days prior to the start of ground disturbance, the project owner shall submit the résumés for the CRS, the alternate CRS(s) if desired, the PPA, and the PHA to the CPM for review and approval.

2. At least 65 days prior to the start of data recovery on known archaeological sites, the project owner shall confirm in writing to the CPM that the approved CRS, the PPA, and the PHA will be available for on-site work and are prepared to implement the **Cultural Resources** Conditions **CUL-11** through **CUL-15**.

3. At least 10 days prior to a termination or release of the CRS, or within 10 days after the resignation of a CRS, the project owner shall submit the résumé of the proposed new CRS to the CPM for review and approval. At the same time, the project owner shall also provide to the proposed new CRS the AFC and all cultural resources documents, field notes, photographs, and other cultural resources materials generated by the project. If no alternate CRS is available to assume the duties of the CRS, a monitor may serve in place of a CRS so that ground disturbance may continue up to a maximum of three days without a CRS. If cultural resources are discovered then ground disturbance will remain halted until there is a CRS or alternate CRS to make a recommendation regarding significance.

4. At least 20 days prior to data recovery on known archaeological sites, the CRS shall provide a letter naming anticipated field crew members for the project and attesting that the identified field crew members meet the minimum qualifications for cultural resources data recovery required by this Condition.

5. At least 20 days prior to ground disturbance, the CRS shall provide a letter naming anticipated CRMs for the project and attesting that the identified CRMs meet the minimum qualifications for cultural resources monitoring required by this Condition.

6. At least five days prior to additional CRMs beginning on-site duties during the project, the CRS shall provide letters to the CPM identifying the new CRMs and attesting to their qualifications.

CUL-4 PROJECT DOCUMENTATION FOR CULTURAL RESOURCES PERSONNEL

Prior to the start of ground disturbance, the project owner shall provide the CRS, the PPA, and the PHA with copies of the AFC, data responses, confidential cultural resources documents, the ~~Revised~~ **Final** Staff Assessment (~~RSA~~**FSA**)~~, RSA Errata,~~ and the Commission Decision for the project. The project owner shall also provide the CRS, the PPA, the PHA, and the CPM with maps and drawings showing the footprints of the power plant, all linear facility routes, all access roads, and all laydown areas. Maps shall include the appropriate USGS quadrangles and maps at an appropriate scale (e.g., 1:2400 or 1" = 200') for plotting cultural features or materials. If the CRS requests enlargements or strip maps for linear facility routes, the project owner shall provide copies to the CRS and CPM. The CPM shall review map submittals and, in consultation with the CRS, approve those that are appropriate for use in cultural resources planning activities. No ground disturbance shall occur prior to CPM approval of maps and drawings, unless such activities are specifically approved by the CPM.

If construction of the project would proceed in phases, maps and drawings not previously provided shall be provided to the CRS, the PPA, the PHA, and CPM prior to the start of each phase. Written notice identifying the proposed schedule of each project phase shall be provided to the CRS and CPM.

Weekly, until ground disturbance is completed, the project construction manager shall provide to the CRS and CPM a schedule of project activities for the following week, including the identification of area(s) where ground disturbance will occur during that week.

The project owner shall notify the CRS and CPM of any changes to the scheduling of the construction phases.

Verification:

1. Preferably at least 115 days, but in any event no less than 60 days prior to the start of ground disturbance, the project owner shall provide the AFC, data responses, confidential cultural resources documents, the **Final Staff Assessment (FSA**)~~Revised Staff Assessment (RSA), RSA Errata,~~ and the Commission Decision for the project to the CRS, if needed, and to the PPA, and the PHA. The project owner shall also provide the subject maps and drawings to the CRS, PPA, PHA, and CPM. Staff, in consultation with the CRS, PPA, and PHA, will review and approve maps and drawings suitable for cultural resources monitoring and data recovery activities.

2. At least 15 days prior to the start of ground disturbance, if there are changes to any project-related footprint, the project owner shall provide revised maps and drawings for the changes to the CRS, PPA, PHA, and CPM.

3. At least 15 days prior to the start of each phase of a phased project, the project owner shall submit the appropriate maps and drawings, if not previously provided, to the CRS, PPA, PHA, and CPM.

4. Weekly, during ground disturbance, a current schedule of anticipated project activity shall be provided to the CRS and CPM by letter, e-mail, or fax.

5. Within five days of changing the scheduling of phases of a phased project, the project owner shall provide written notice of the changes to the CRS and CPM.

CUL-5 CULTURAL RESOURCES MONITORING AND MITIGATION PLAN

Prior to the start of ground disturbance, the project owner shall submit to the CPM for review and approval the Cultural Resources Monitoring and Mitigation Plan (CRMMP), as prepared by or under the direction of the CRS, with the contributions of the PPA, and the PHA. The authors' name(s) shall appear on the title page of the CRMMP. The CRMMP shall specify the impact mitigation protocols for all known cultural resources**, i.e., archaeological, ethnographic, and historic resources,** and identify general and specific measures to minimize potential impacts to all other cultural resources, including those discovered during construction. Implementation of the CRMMP shall be the responsibility of the CRS and the project owner. Copies of the CRMMP shall reside with the CRS, alternate CRS, the PPA, and the PHA, each CRM, and the project owner's on-site construction manager. No ground disturbance shall occur prior to CPM approval of the CRMMP, unless such activities are specifically approved by the CPM. Prior to certification, the project owner may have the CRS, alternate CRS, the PPA, and the PHA complete and submit to CEC for review the CRMMP, except for the portions to be contributed by the PTNCL and the DTCCL programs.

The CRMMP shall include, but not be limited to, the elements and measures listed below.

1. The following statement shall be included in the Introduction: "Any discussion, summary, or paraphrasing of the Conditions of Certification in this CRMMP is intended as general guidance and as an aid to the user in understanding the Conditions and their implementation. The Conditions, as written in the Commission Decision, shall supersede any summarization, description, or interpretation of the conditions in the CRMMP. The **Cultural Resources** Conditions of Certification from the Commission Decision are contained in **Appendix A**."

2. The duties of the CRS shall be fully discussed, including coordination duties with respect to the completion of the Prehistoric Trails Network Cultural Landscape (PTNCL) documentation and possible NRHP nomination program and the Desert Training Center California-Arizona Maneuver Area Cultural Landscape (DTCCL) documentation and possible NRHP nomination program, and oversight/management duties with respect to site evaluation, data collection, monitoring, and reporting at both known prehistoric and historic-period archaeological sites and any CRHR-eligible (as determined by the CPM) prehistoric and historic-period archaeological sites discovered during construction.

3. A general research design shall be developed that:

   a. Charts a timeline of all research activities, including those coordinated under the PTNCL and DTCCL documentation and possible NRHP nomination programs;

   b. Recapitulates the existing paleoenvironmental, prehistoric, ethnohistoric, ethnographic, and historic contexts developed in the PTNCL and DTCCL historic context and adds to these the additional context of the non-military, historic-period occupation and use of the Chuckwalla Valley, to create a comprehensive historic context for the **PSEGS** ~~PSPP~~ vicinity;

c. Poses archaeological research questions and testable hypotheses specifically applicable to the archaeological resource types known for the Chuckwalla Valley, based on the research questions developed under the PTNCL and DTCCL research and on the archaeological and historical literature pertinent to the Chuckwalla Valley; and

d. Clearly articulates why it is in the public interest to address the research questions that it poses.

4. Protocols, reflecting the guidance provided in **CUL-10** through **CUL-15** shall be specified for the treatment of known and newly discovered prehistoric and historic-period archaeological resource types.

5. Artifact collection, retention/disposal, and curation policies shall be discussed, as related to the research questions formulated in the research design. These policies shall apply to cultural resources materials and documentation resulting from evaluation and data recovery at ~~both~~ known prehistoric**-period, ethnographic,** and historic-period archaeological sites and any CRHR-eligible (as determined by the CPM) prehistoric and historic-period archaeological sites discovered during construction. A prescriptive treatment plan may be included in the CRMMP for limited data types.

6. The implementation sequence and the estimated time frames needed to accomplish all project-related tasks during the ground-disturbance and post-ground–disturbance analysis phases of the project shall be specified.

7. Person(s) expected to perform each of the tasks, their responsibilities, and the reporting relationships between project construction management and the mitigation and monitoring team shall be identified.

8. The manner in which Native American observers or monitors will be included, in addition to their roles in the activities required under **CUL-1**, the procedures to be used to select them, and their roles and responsibilities shall be described.

9. All impact-avoidance measures (such as flagging or fencing) to prohibit or otherwise restrict access to sensitive resource areas that are to be avoided during ground disturbance, construction, and/or operation shall be described. Any areas where these measures are to be implemented shall be identified. The description shall address how these measures would be implemented prior to the start of ground disturbance and how long they would be needed to protect the resources from project-related impacts.

10. The commitment to record on Department of Parks and Recreation (DPR) 523 forms, to map, and to photograph all encountered cultural resources over 50 years of age shall be stated. In addition, the commitment to curate all archaeological materials retained as a result of the archaeological investigations (survey, testing, **and** data recovery), in accordance with the California State Historical Resources Commission‘s Guidelines for the

Curation of Archaeological Collections, into a retrievable storage collection in a public repository or museum shall be stated.

11. The commitment of the project owner to pay all curation fees for artifacts recovered and for related documentation produced during cultural resources investigations conducted for the project shall be stated. The project owner shall identify a curation facility that could accept cultural resources materials resulting from **PSEGS**~~PSPP~~ cultural resources investigations.

12. The CRS shall attest to having access to equipment and supplies necessary for site mapping, photography, and recovery of all cultural resource materials (that cannot be treated prescriptively) from known CRHR-eligible archaeological sites and from CRHR-eligible sites that are encountered during ground disturbance .

13. The contents, format, and review and approval process of the final Cultural Resource Report (CRR) shall be described.

Verification:

1. Preferably at least 45 days, but in any event no less than 30 days prior to the start of ground disturbance, the project owner shall submit the CRMMP to the CPM for review and approval.

2. At least 20 days prior to the start of ground disturbance, in a letter to the CPM, the project owner shall agree to pay curation fees for any materials generated or collected as a result of the archaeological investigations (survey, testing, **and** data recovery).

3. At least 30 days prior to the start of ground disturbance, the project owner shall provide to the CPM a copy of a letter from a curation facility that meets the standards stated in the California State Historical Resources Commission's Guidelines for the Curation of Archaeological Collections, stating the facility's willingness and ability to receive the materials generated by **PSEGS**~~PSPP~~ cultural resources activities and requiring curation. Any agreements concerning curation will be retained and available for audit for the life of the project.

CUL-6 CULTURAL RESOURCES REPORT (CRR)

The project owner shall submit the final Cultural Resources Report (CRR) to the CPM for review and approval and to the BLM Palm Springs archaeologist for review and comment. The final CRR shall be written by or under the direction of the CRS. The final CRR shall report on all field activities including dates, times and locations, results, samplings, and analyses. All survey reports, revised and final Department of Parks and Recreation (DPR) 523 forms, data recovery reports, and any additional research reports not previously submitted to the California Historical Resource Information System (CHRIS) and the State Historic Preservation Officer (SHPO) shall be included as appendices to the final CRR.

If the project owner requests a suspension of ground disturbance and/or construction activities, then a draft CRR that covers all cultural resources activities associated with the project shall be prepared by the CRS and submitted to the CPM and to the BLM Palm Springs archaeologist for review and approval on the same day as the suspension/extension request. The draft CRR shall be retained at the project site in a secure facility until ground disturbance and/or construction resumes or the project is withdrawn. If the project is withdrawn, then a final CRR shall be submitted to the CPM for review and approval at the same time as the withdrawal request.

Verification:

1. Within 30 days after requesting a suspension of construction activities, the project owner shall submit a draft CRR to the CPM for review and approval.

2. Within 180 days after completion of ground disturbance (including landscaping), the project owner shall submit the final CRR to the CPM for review and approval and to the BLM Palm Springs archaeologist for review and comment. If any reports have previously been sent to the CHRIS, then receipt letters from the CHRIS or other verification of receipt shall be included in an appendix.

3. Within 10 days after the CPM and the BLM Palm Springs archaeologist approve the CRR, the project owner shall provide documentation to the CPM confirming that copies of the final CRR have been provided to the SHPO, the CHRIS, the curating institution, if archaeological materials were collected, and to the Tribal Chairpersons of any Native American groups requesting copies of project-related reports.

CUL-7 WORKER ENVIRONMENTAL AWARENESS PROGRAM (WEAP)

Prior to and for the duration of ground disturbance, the project owner shall provide Worker Environmental Awareness Program (WEAP) training to all new workers within their first week of employment at the project site, along the linear facilities routes, and at laydown areas, roads, and other ancillary areas. The training shall be prepared by the CRS, may be conducted by any member of the archaeological team, and may be presented in the form of a video. The CRS shall be available (by telephone or in person) to answer questions posed by employees. The training may be discontinued when ground disturbance is completed or suspended, but must be resumed when ground disturbance, such as landscaping, resumes.

The training shall include:

1. A discussion of applicable laws and penalties under the law;

2. Samples or visuals of artifacts that might be found in the project vicinity;

3. A discussion of what such artifacts may look like when partially buried, or wholly buried and then freshly exposed;

4. A discussion of what prehistoric and historical archaeological deposits look like at the surface and when exposed during construction, and the

range of variation in the appearance of such deposits;

5. Instruction that the CRS, alternate CRS, and CRMs have the authority to halt ground disturbance in the area of a discovery to an extent sufficient to ensure that the resource is protected from further impacts, as determined by the CRS;

6. Instruction that employees are to halt work on their own in the vicinity of a potential cultural resources discovery and shall contact their supervisor and the CRS or CRM, and that redirection of work would be determined by the construction supervisor and the CRS;

7. An informational brochure that identifies reporting procedures in the event of a discovery;

8. An acknowledgement form signed by each worker indicating that they have received the training; and

9. A sticker that shall be placed on hard hats indicating that environmental training has been completed.

10. No ground disturbance shall occur prior to implementation of the WEAP program, unless such activities are specifically approved by the CPM.

Verification:

1. At least 30 days prior to the start of ground disturbance, the CRS shall provide the training program draft text and graphics and the informational brochure to the CPM for review and approval.

2. At least 15 days prior to the start of ground disturbance, the CPM will provide to the project owner a WEAP Training Acknowledgement form for each WEAP trained worker to sign.

3. Monthly, until ground disturbance is completed, the project owner shall provide in the Monthly Compliance Report (MCR) the WEAP Training Acknowledgement forms of workers who have completed the training in the prior month and a running total of all persons who have completed training to date.

CUL-8 CONSTRUCTION MONITORING PROGRAM

~~The project owner shall ensure that the CRS, alternate CRS, or CRMs, to prevent construction impacts to undiscovered resources and to ensure that known resources are not impacted in an unanticipated manner, monitor full time all ground disturbance.~~

~~Full-time archaeological monitoring for this project shall be the archaeological monitoring of the earth-removing activities in the areas specified in the previous paragraph, for as long as the activities are ongoing. Where excavation equipment is actively removing dirt and hauling the excavated material farther than 50 feet from the location of active excavation, full-time archaeological monitoring shall require at least two monitors per excavation~~

~~area. In this circumstance, one monitor shall observe the location of active excavation and a second monitor shall inspect the dumped material. For excavation areas where the excavated material is dumped no farther than 50 feet from the location of active excavation, one monitor shall both observe the location of active excavation and inspect the dumped material.~~

~~A Native American monitor shall be obtained to monitor ground disturbance in areas where Native American artifacts may be discovered. Contact lists of interested Native Americans and guidelines for monitoring shall be obtained from the Native American Heritage Commission. Preference in selecting a monitor shall be given to Native Americans with traditional ties to the area that shall be monitored. If efforts to obtain the services of a qualified Native American monitor are unsuccessful, the project owner shall immediately inform the CPM. The CPM will either identify potential monitors or will allow ground disturbance to proceed without a Native American monitor.~~

~~The research design in the CRMMP shall govern the collection, treatment, retention/disposal, and curation of any archaeological materials encountered.~~

~~On forms provided by the CPM, CRMs shall keep a daily log of any monitoring and other cultural resources activities and any instances of noncompliance with the Conditions and/or applicable LORS. Copies of the daily monitoring logs shall be provided by the CRS to the CPM, if requested by the CPM. From these logs, the CRS shall compile a monthly monitoring summary report to be included in the MCR. If there are no monitoring activities, the summary report shall specify why monitoring has been suspended.~~

~~The CRS or alternate CRS shall report daily to the CPM on the status of the project‘s cultural resources-related activities, unless reducing or ending daily reporting is requested by the CRS and approved by the CPM.~~

~~In the event that the CRS believes that the current level of monitoring is not appropriate in certain locations, a letter or e-mail detailing the justification for changing the level of monitoring shall be provided to the CPM for review and approval prior to any change in the level of monitoring. The CRS, at his or her discretion, or at the request of the CPM, may informally discuss cultural resources monitoring and mitigation activities with Energy Commission technical staff.~~

~~Cultural resources monitoring activities are the responsibility of the CRS. Any interference with monitoring activities, removal of a monitor from duties assigned by the CRS, or direction to a monitor to relocate monitoring activities by anyone other than the CRS shall be considered non-compliance with these Conditions.~~

~~Upon becoming aware of any incidents of non-compliance with the Conditions and/or applicable LORS, the CRS and/or the project owner shall notify the CPM by telephone or e-mail within 24 hours. The CRS shall also recommend~~

~~corrective action to resolve the problem or achieve compliance with the Conditions. When the issue is resolved, the CRS shall write a report describing the issue, the resolution of the issue, and the effectiveness of the resolution measures. This report shall be provided in the next MCR for the review of the CPM.~~

~~**Verification:**~~

~~1. At least 30 days prior to the start of ground disturbance, the CPM will provide to the CRS an electronic copy of a form to be used as a daily monitoring log.~~

~~2. Monthly, while monitoring is on-going, the project owner shall include in each MCR a copy of the monthly summary report of cultural resources-related monitoring prepared by the CRS and shall attach any new DPR 523A forms completed for finds treated prescriptively, as specified in the CRMMP.~~

~~3. At least 24 hours prior to implementing a proposed change in monitoring level, the project owner shall submit to the CPM, for review and approval, a letter or e-mail (or some other form of communication acceptable to the CPM) detailing the CRS's justification for changing the monitoring level.~~

~~4. Daily, as long as no cultural resources are found, the CRS shall provide a statement that "no cultural resources over 50 years of age were discovered" to the CPM as an e-mail or in some other form of communication acceptable to the CPM.~~

~~5. At least 24 hours prior to reducing or ending daily reporting, the project owner shall submit to the CPM, for review and approval, a letter or e-mail (or some other form of communication acceptable to the CPM) detailing the CRS's justification for reducing or ending daily reporting.~~

~~6. No later than 30 days following the discovery of any Native American cultural materials, the project owner shall submit to the CPM copies of the information transmittal letters sent to the Chairpersons of the Native American tribes or groups who requested the information. Additionally, the project owner shall submit to the CPM copies of letters of transmittal for all subsequent responses to Native American requests for notification, consultation, and reports and records.~~

~~7. Within 15 days of receiving them, the project owner shall submit to the CPM copies of any comments or information provided by Native Americans in response to the project owner's transmittals of information.~~

Prior to the start of construction-related ground disturbance or grading, boring, and trenching, as defined in the General Conditions for this project; or surface grading or subsurface soil work during pre-construction activities or site mobilization; or mowing activities and heavy equipment use in loose or sandy soils, at the project site, access roads, and linear facilities, the project owner shall notify the CPM and all interested Native Americans of the date on which ground disturbance will ensue. The project owner shall ensure that the CRS, alternate CRS, or CRMs monitor full time all of the above specified ground disturbance at the project site, along the linear facilities routes, and at laydown

<u>areas, roads, and other ancillary areas, to ensure there are no impacts to undiscovered cultural resources and to ensure that known cultural resources are not affected in an unanticipated manner.</u>

<u>Full-time archaeological monitoring for this project shall be the archaeological monitoring of the ground-disturbing activities specified in the previous paragraph, for as long as the activities are ongoing. Where excavation equipment is actively removing dirt and hauling the excavated material farther than 50 feet from the location of active excavation, full-time archaeological monitoring shall require at least two monitors per excavation area. In this circumstance, one monitor shall observe the location of active excavation and a second monitor shall inspect the dumped material. For excavation areas where the excavated material is dumped no farther than 50 feet from the location of active excavation, one monitor shall both observe the location of active excavation and inspect the dumped material.</u>

<u>In the event that the CRS believes that the required number of monitors is not appropriate in certain locations, a letter or e-mail detailing the justification for changing the number of monitors shall be provided to the CPM for review and approval prior to any change in the number of monitors.</u>

<u>The project owner shall obtain the services of one or more NAMs to monitor construction-related ground disturbance in areas where Native American artifacts may be discovered. Contact lists of interested Native Americans and guidelines for monitoring shall be obtained from the NAHC. Preference in selecting an NAM shall be given to Native Americans with traditional ties to the area that shall be monitored. If efforts to obtain the services of a qualified NAM are unsuccessful, the project owner shall immediately inform the CPM. The CPM will either identify potential monitors or will allow construction-related ground disturbance to proceed without an NAM.</u>

<u>The research design in the CRMMP shall govern the collection, treatment, retention/disposal, and curation of any archaeological materials encountered. On forms provided by the CPM, CRMs shall keep a daily log of any monitoring and other cultural resources activities and any instances of non-compliance with the Conditions and/or applicable LORS. The daily monitoring logs shall at a minimum include the following:</u>

- **<u>First and last name of the CRM and any accompanying NAM.</u>**
- **<u>Time in and out.</u>**
- **<u>Weather. Specify if weather conditions led to work stoppages.</u>**
- **<u>Work location (project component). Provide specifics—.e.g., transmission ROW, solar unit A, power block.</u>**

- <u>**Proximity to site location. Specify if work conducted within 1000 feet of a known cultural resource.**</u>
- <u>**Work type (machine).**</u>
- <u>**Work crew (company, operator, foreman).**</u>
- <u>**Depth of excavation.**</u>
- <u>**Description of work.**</u>
- <u>**Stratigraphy.**</u>
- <u>**Artifacts, listed with the following identifying features:**</u>
  - <u>**Field artifact #: When recording artifacts in the daily monitoring logs, the CRS shall institute a field numbering system to reduce the likelihood of repeat artifact numbers. A typical numbering system could include a project abbreviation, monitor's initials, and a set of numbers given to that monitor: e.g., HECA-MB-123.**</u>
  - <u>**Description.**</u>
  - <u>**Measurements.**</u>
  - <u>**UTM.**</u>
- <u>**Whether artifacts are likely to be isolates or components of larger resources.**</u>
- <u>**Assessment of significance of any finds.**</u>
- <u>**Actions taken.**</u>
- <u>**Plan for the next work day.**</u>

<u>**A cover sheet shall be submitted with each day's monitoring logs, and shall at a minimum include the following:**</u>

- <u>**Count and list of first and last names of all CRMs and of all NAMs for that day.**</u>
- <u>**General description (in paragraph form) of that day's overall monitoring efforts, including monitor names and locations.**</u>
- <u>**Any reasons for halting work that day.**</u>
- <u>**Count and list of all artifacts found that day: include artifact #, location (i.e., grading in Unit X), measurements, UTMs, and very brief description (i.e., historic can, granitic biface, quartzite flake).**</u>
- <u>**Whether any artifacts were found out of context (i.e., in fill, caisson drilling, flood debris, spoils pile).**</u>

<u>**Copies of the daily monitoring logs and cover sheets shall be provided by email from the CRS to the CPM, as follows:**</u>

- <u>**Each day's monitoring logs and cover sheet shall be merged into one PDF document**</u>

- **The PDF title and headings, and emails shall clearly indicate the date of the applicable monitoring logs.**
- **PDFs for any revised or resubmitted versions shall use the word "revised" in the title.**

Daily and/or weekly maps shall be submitted along with the monitoring logs as follows:

- **The CRS shall provide daily and/or weekly maps of artifacts at the request of the CPM. A map shall also be provided if artifact locations show complexity, high density, or other unique considerations.**
- **Maps shall include labeled artifacts, project boundaries, previously recorded sites and isolates, aerial imagery background, and appropriate scales.**

From the daily monitoring logs, the CRS shall compile a monthly monitoring summary report to be included in the MCR. If there are no monitoring activities, the summary report shall specify why monitoring has been suspended.

- **The Cultural Resources section of the MCR shall be prepared in coordination with the CRS, and shall include a monthly summary report of cultural resources-related monitoring. The summary shall:**
  - **List the number of CRMs and NAMs on a daily basis, as well as provide monthly monitoring-day totals.**
  - **Give an overview of cultural resource monitoring work for that month, and discuss any issues that arose.**
  - **Describe fulfillment of requirements of each cultural mitigation measure.**
  - **Summarize the confidential appendix to the MCR, without disclosing any specific confidential details.**
  - **Include the artifact concordance table (as discussed under the next bullet point), but with removal of UTMs.**
- **Each MCR, prepared under supervision of the CRS, shall be accompanied by a confidential appendix that contains completed DPR 523A forms for all artifacts recorded or collected in that month. For any artifact without a corresponding DPR form, the CRS shall specify why the DPR form is not applicable or pending (i.e. as part of a larger site update).**
  - **A concordance table that matches field artifact numbers with the artifact numbers used in the DPR forms shall be included. The sortable table shall contain each artifact's date of collection and UTM numbers, and note if an artifact has been deaccessioned or otherwise does not have a corresponding DPR form. Any post-**

field log recordation changes to artifact numbers shall also be noted.

- DPR forms shall be submitted as one combined PDF.
  - The PDF shall organize DPR forms by site and/or artifact number.
  - The PDF shall include an index and bookmarks.
- If artifacts from a given site location (in close proximity of each other or an existing site) are collected month after month, and if agreed upon with the CPM, a final updated DPR for the site may be submitted at the completion of monitoring. The monthly concordance table shall note that the DPR form for the included artifacts is pending.

The CRS or alternate CRS shall report daily to the CPM on the status of the project's cultural resources-related activities, unless reducing or ending daily reporting is requested by the CRS and approved by the CPM.

In the event that the CRS believes that the current level of monitoring is not appropriate in certain locations, a letter or e-mail detailing the justification for changing the level of monitoring shall be provided to the CPM for review and approval prior to any change in the level of monitoring.

The CRS, at his or her discretion, or at the request of the CPM, may informally discuss cultural resources monitoring and mitigation activities with Energy Commission technical staff.

Cultural resources monitoring activities are the responsibility of the CRS. Any interference with monitoring activities, removal of a monitor from duties assigned by the CRS, or direction to a monitor to relocate monitoring activities by anyone other than the CRS shall be considered non-compliance with these Conditions.

Upon becoming aware of any incidents of non-compliance with the Conditions and/or applicable LORS, the CRS and/or the project owner shall notify the CPM. The CRS shall also recommend corrective action to resolve the problem or achieve compliance with the Conditions. When the issue is resolved, the CRS shall write a report describing the issue, the resolution of the issue, and the effectiveness of the resolution measures. This report shall be provided in the next MCR for the review of the CPM.

Verification:

1. At least 30 days prior to the start of ground disturbance, the CPM will notify all Native Americans with whom Energy Commission staff communicated during

the project review of the date on which the project's ground disturbance will begin.

2. At least 30 days prior to the start of ground disturbance, the CPM will provide to the CRS an electronic copy of a form to be used as a daily monitoring log and information to be included in the cover sheet for the daily monitoring logs.

3. While monitoring is on-going, the project owner shall submit each day's monitoring logs and cover sheet merged into one PDF document by email within 24 hours.

4. The CRS and/or project owner shall notify the CPM of any incidents of non-compliance with the Conditions and/or applicable LORS by telephone or email within 24 hours

5. The CRS shall provide daily maps of artifacts along with the daily monitoring logs if more than 10 artifacts are found per day, or as requested by the CPM.

6. The CRS shall provide weekly maps of artifacts if there more than 50 artifacts are found per week, or as requested by the CPM. The map shall be submitted within two business days after the end of each week.

7. Within 15 days of receiving from a local Native American group a request that a NAM be employed, the project owner shall submit a copy of the request and a copy of a response letter to the group notifying them that a NAM has been employed and identifying the NAM.

8. Monthly, while monitoring is on-going, the project owner shall submit MCRs and accompanying monthly summary reports. The project owner shall attach any new DPR 523A forms, under confidential cover, completed for finds treated prescriptively, as specified in the CRMMP.

    a. Final updated DPRs with sites (where artifacts are collected month after month) can be submitted at the completion of monitoring, as agreed upon with the CPM.

9. At least 24 hours prior to implementing a proposed change in monitoring level, the project owner shall submit to the CPM, for review and approval, a letter or e-mail (or some other form of communication acceptable to the CPM) detailing the CRS's justification for changing the monitoring level.

10. At least 24 hours prior to reducing or ending daily reporting, the project owner shall submit to the CPM, for review and approval, a letter or e-mail (or some other form of communication acceptable to the CPM) detailing the CRS's justification for reducing or ending daily reporting.

11. Within 15 days of receiving them, the project owner shall submit to the CPM copies of any comments or information provided by Native Americans in response to the project owner's transmittals of information.

CUL-9 AUTHORITY TO HALT CONSTRUCTION; TREATMENT OF

DISCOVERIES

The project owner shall grant authority to halt ground disturbance to the CRS, alternate CRS, PPA, PHA, and the CRMs in the event of a discovery. Redirection of ground disturbance shall be accomplished under the direction of the construction supervisor in consultation with the CRS.

In the event that a cultural resource over 50 years of age is found (or if younger, determined exceptionally significant by the CPM), or impacts to such a resource can be anticipated, ground disturbance shall be halted or redirected in the immediate vicinity of the discovery sufficient to ensure that the resource is protected from further impacts. Monitoring and daily reporting, as provided in other Conditions, shall continue during the project's ground-disturbing activities elsewhere. The halting or redirection of ground disturbance shall remain in effect until the CRS has visited the discovery, and all of the following have occurred:

1. The CRS has notified the project owner, and the CPM has been notified within 24 hours of the discovery, or by Monday morning if the cultural resources discovery occurs between 8:00 AM on Friday and 8:00 AM on Sunday morning, including a description of the discovery (or changes in character or attributes), the action taken (i.e., work stoppage or redirection), a recommendation of CRHR eligibility, and recommendations for data recovery from any cultural resources discoveries, whether or not a determination of CRHR eligibility has been made.

2. If the discovery would be of interest to Native Americans, the CRS has notified all Native American groups that expressed a desire to be notified in the event of such a discovery.

3. The CRS has completed field notes, measurements, and photography for a DPR 523 "Primary" form. Unless the find can be treated prescriptively, as specified in the CRMMP, the "Description" entry of the DPR 523 "Primary" form shall include a recommendation on the CRHR eligibility of the discovery. The project owner shall submit completed forms to the CPM.

4. The CRS, the project owner, and the CPM have conferred, and the CPM has concurred with the recommended eligibility of the discovery and approved the CRS's proposed data recovery plan, if any, including the curation of the artifacts, or other appropriate mitigation; and any necessary data recovery and mitigation have been completed.

Verification:

1. At least 30 days prior to the start of ground disturbance, the project owner shall provide the CPM and CRS with a letter confirming that the CRS, alternate CRS, PPA, PHA, and CRMs have the authority to halt ground disturbance in the vicinity of a cultural resources discovery, and that the project owner shall ensure that the CRS notifies the CPM within 24 hours of a discovery, or by Monday morning if the cultural resources discovery occurs between 8:00 AM on Friday and 8:00 AM on Sunday

morning.

2. Within 48 hours of the discovery of a resource of interest to Native Americans, the project owner shall ensure that the CRS notifies all Native American groups that expressed a desire to be notified in the event of such a discovery.

3. Unless the discovery can be treated prescriptively, as specified in the CRMMP, completed DPR 523 forms for resources newly discovered during ground disturbance shall be submitted to the CPM for review and approval no later than 24 hours following the notification of the CPM, or 48 hours following the completion of data recordation/recovery, whichever the CRS decides is more appropriate for the subject cultural resource.

CUL-10 FLAG AND AVOID

If resources within the transmission line corridor can be spanned rather than impacted, or in the event that new resources are discovered during construction where impacts can be reduced or avoided, the project owner shall:

1. Ensure that a CRS, alternate CRS, PPA, or CRM re-establish the boundary of each site, add a 10-meter-wide buffer around the periphery of each site boundary, and flag the resulting space in a conspicuous manner;

2. Ensure that a CRM enforces avoidance of the flagged areas during **PSEGS**~~PSPP~~ construction; and

3. Ensure, after completion of construction, boundary markings around each site and buffer are removed so as not to attract vandals.

Verification: Within 90 days of the completion of Project construction, the project owner shall submit for CPM review and approval a letter, with photographs and maps, evidencing the removal of boundary markings.

CUL-11 DATA RECOVERY FOR SIMPLE PREHISTORIC SITES

(Sparse Lithic Scatters, Cairns, and Pot Drops)

The project owner shall ensure the CRMMP includes a data recovery plan for the resource type “simple prehistoric sites,” consisting of **the** site~~s SMP-P-1015, SMP-P-1016, SMP-P-2014, SMP-P-2015, and~~ SMP-P-MT-001. This site list may be revised only with the agreement of the CRS and the CPM. The data recovery plan shall include the use of the CARIDAP protocol on sites that qualify, how to proceed if features or other buried deposits are encountered, and the materials analyses and laboratory artifact analyses that will be used.

The plan shall also specify in detail the location recordation equipment and methods used and describe any post-processing of the data. If allowed by the BLM, prior to the start of ground disturbance within 30 meters of the site boundaries of each of these sites, the project owner shall ensure that the CRS, the PPA, and/or archaeological team members implement the plan, which, for sites where CARIDAP does not apply, shall include, but is not limited to the following tasks:

1. Use location recordation equipment that has the latest technology with sub-meter accuracy (such as UTM 11 North or California Teale Albers) to add to the original site maps the following features: seasonal drainages, site boundaries, location of each individual artifact, and the boundaries around individual artifact concentrations;

2. Request the PTNCL PG, or equivalent qualified person approved by the CPM and hired by the project owner should the PTNCL geoarchaeologist not be available, to identify the specific landform for each site and its relationship to specific ancient lakeshores of Palen Dry Lake; if a lakeshore is present within 100 meters of the site boundary, include it on the site map;

3. Map and field-record all lithic artifacts (numbers of flakes, the reduction sequence stage each represents, cores, tool blanks, finished tools, hammerstones, and concentrations, and the material types of each) and the other types of prehistoric artifacts present.

4. Map any differential distribution of artifacts and suggest explanations for the distribution

5. Assess the integrity of the site and provide the evidence substantiating that assessment;

6. Collect for dating and source analyses any obsidian artifacts;

7. Field record the surface location of all other artifacts and collect all ceramic artifacts and botanical and faunal remains for laboratory analysis and curation;

8. Surface scrape to a depth of 5 centimeters a 5-meter-by-5-meter area centered on the artifact concentration, field-record the lithic artifacts as to location, material type, and the reduction sequence stage each represents, record the location of all other artifacts, and retain the obsidian and ceramic artifacts and botanical and faunal remains for laboratory analysis and curation;

9. Excavate one 1-meter-by-1-meter unit in 10-centimeter levels until the unit reaches a depth of 20 centimeters below any anthropogenic materials, placing the unit in the part of the site with the highest artifact density and recording its locations on the site map;

10. Place one 1-meter-by-1-meter excavation unit, as described above, in the center of each concentration if multiple artifact concentrations have been identified;

11. Notify the CPM by telephone or e-mail that subsurface deposits were or

were not encountered and make a recommendation on the site‘s CRHR eligibility;

12. If no subsurface deposits were encountered, and the CPM agrees the site is not eligible for the CRHR, data recovery is complete;

13. If subsurface deposits are encountered, test the horizontal limits of the site by excavating additional 1-meter-by-1-meter excavation units in 10-centimeter levels until the unit reaches a depth of 20 centimeters below any anthropogenic materials, using a shovel or hand auger, or other similar technique, at four spots equally spread around the exterior edge of each site, recording the locations of these units on the site map;

14. Sample the encountered features or deposits, using the methods described in the CRMMP, record their locations on the site map, retain samples, such as flotation, pollen, and charcoal, for analysis, and retain all artifacts for professionally appropriate laboratory analyses and curation, until data recovery is complete;

15. Present the results of the **CUL-11** data recovery in a letter report by the PPA or CRS, which shall serve as a preliminary report. Letter reports may address one site, or multiple sites depending on the needs of the CRS. The letter report shall be a concise document the provides description of the schedule and methods used in the field effort, a preliminary tally of the numbers and types of features and deposits that were found, a discussion of the potential range of error for that tally, a map showing the location of excavation units including topographic contours and the site landforms, and a discussion of the CRHR eligibility of each site and the justification for that determination;

16. Update the existing Department of Parks and Recreation (DPR) 523 site form for these sites, including new data on seasonal drainages, site boundaries, location of each individual artifact, the boundaries around individual artifact concentrations, the landform, and the eligibility determination;

17. Provide the recovered data to the PTNCL PI-Prehistoric Archaeologist; and

18. Present the final results of data recovery at these prehistoric sites in the CRR, as described in **CUL-6**.

Verification:

1. At least 45 days prior to ground disturbance, the project owner shall notify the CPM that data recovery for small sites has ensued.

2. After the completion of the excavation of the first 1-meter-by-1-meter excavation unit at each of the subject sites, the CRS shall notify the CPM regarding the presence or absence of subsurface deposits and shall make a recommendation on the site‘s CRHR eligibility.

3. Within one week of the completion of data recovery at a site, the project owner shall submit a letter report written by the PPA or CRS for review and approval of the CPM. When the CPM approves the letter report, ground disturbance may begin at this site location.

CUL-12 DATA RECOVERY FOR COMPLEX PREHISTORIC SITES

The project owner shall ensure the CRMMP includes a data recovery plan for the resource type “complex prehistoric sites,” consisting of ~~SMP-P-1017, SMP-P-1018,~~ SMP-P-2018~~,~~ and SMP-P-2023. This site list may be revised only with the agreement of the CRS and the CPM. The data recovery plan shall include how to proceed if buried deposits are encountered and shall also include the materials analyses and laboratory artifact analyses that will be used. The plan shall also specify in detail the location recordation equipment and methods used and describe any post-processing of the data. If allowed by the BLM, prior to the start of ground disturbance within 30 meters of the site boundaries of each of these sites, the project owner shall then ensure that the CRS, the PPA, and/or archaeological team members implement the plan, which shall include, but is not limited to, the following tasks:

1. Use location recordation equipment that has the latest technology with sub-meter accuracy (such as UTM 11 North or California Teale Albers) to add to the original site maps the following features: seasonal drainages, site boundaries, location of each individual artifact, and the boundaries around individual artifact concentrations;

2. Request the PTNCL PG, or equivalent qualified person approved by the CPM and hired by the project owner should the PG not be available, to identify the specific landform for each site and its relationship to specific ancient lakeshores of Palen Dry Lake. If a lakeshore is present within 100 meters of the site boundary, include it on the site map;

3. Map any differential distribution of artifacts and suggest an explanation for this distribution;

4. Assess the integrity of the site and state the evidence substantiating that opinion;

5. Collect all artifacts after their locations are marked and submit them for laboratory analysis;

6. Excavate one 1-meter-by-1-meter unit in 10-centimeter levels until three sterile levels are encountered, or until the unit reaches maximum depth of planned impact, placing this unit in the part of the site with the highest artifact density; or, if multiple artifact concentrations were identified, place one 1-meter-by-1-meter excavation unit in the center of each concentration and excavate as just described; retain any artifacts for laboratory analysis;

7. Determine the vertical and horizontal limits of the each site by placing test units at four locations equally spread around the surface exterior edge and

excavating or probing down to the Holocene basement, using a shovel, hand auger, or similar technique; continue exploration in all directions until the horizontal limits of the site are reached; retain any artifacts for laboratory analysis;

8. Excavate the surface feature or features, using the methods described in the CRMMP; record their locations on the site map, retain samples, such as flotation, pollen, and charcoal, for analysis, and retain all artifacts for professionally appropriate laboratory analyses and curation, until data recovery is complete;

9. Notify the CPM by telephone or e-mail that subsurface deposits were or were not encountered and make a recommendation on the site's CRHR eligibility;

10. If no subsurface deposits were encountered, and the CPM agrees the site is not eligible for the CRHR, data recovery is complete;

11. If subsurface deposits were found, develop a sampling design for additional data recovery in consultation with the CRS; plans for this contingency shall be described in detail in the CRMMP;

12. Present the results of the **CUL-12** data recovery in a letter report by the PPA or CRS that shall serve as a preliminary report. Letter reports may address one site, or multiple sites depending on the needs of the CRS. The letter report shall be a concise document that provides description of the schedule and methods used in the field effort, a preliminary tally of the numbers and types of features and deposits that were found, a discussion of the potential range of error for that tally, and a map showing the location of excavation units including topographic contours and the site landforms;

13. Update the existing Department of Parks and Recreation (DPR) 523 site form for these sites, including new data on seasonal drainages, site boundaries, location of each individual artifact, the boundaries around individual artifact concentrations, and the landform;

14. Provide the recovered data to the PTNCL PI-Prehistoric Archaeologist; and

15. Present the final results of data recovery for the complex prehistoric sites in the CRR, as described in **CUL-6**.

Verification:

1. At least 45 days prior to ground disturbance, the project owner shall notify the CPM that data recovery for large complex sites has ensued.

2. Within one week of the completion of data recovery at a site, the project owner shall verify this by submitting a letter report written by the PPA or CRS for review and approval of the CPM. When the CPM approves the letter report, ground disturbance may begin at these site locations.

CUL-13 DATA RECOVERY FOR HISTORIC-PERIOD REFUSE SCATTERS

Prior to the start of ground disturbance, the project owner shall ensure that a recovery plan is included in the CRMMP for upgrading the recordation of historic-period refuse scatter sites located on the proposed plant site. For Reconfigured Alternative # 3, these consist of sites SMP-H-1003, SMP-H-1004, SMP-H-1006, SMP-H-1008, SMP-H-1009, SMP-H-1010, SMP-H-1011, SMP-H-1012, SMP-H-1013, SMP-H-1020, SMP-H-1021, SMP-H 1022, SMP-H-1023, SMP-H-2002, SMP-H-2003, SMP-H-2004, SMP-H-2006, SMP-H-2007, SMP-H-2008, SMP-H-2010, SMP-H-2011/12, SMP-H-2017, SMP-H-2019, SMP-H-2021; ~~JR-101, JR-102,~~ JR-104, JR-109, JR-110; TC-008, TC-009, TC-020, and TC-032. For Reconfigured Alternative #2, the sites requiring upgraded recordation consist of the same sites as Reconfigured Alternative #3 plus site JR-107. These site lists may be revised only with the agreement of the CRS and the CPM.

The focus of the recordation upgrade is to determine if these sites can be attributed to the DTC/C-AMA use of the region and are therefore contributors to the DTCCL. The plan shall specify in detail the location recordation equipment and methods to be used and describe any anticipated post-processing of the data. The project owner shall then ensure that the CRS, the PHA, and/or archaeological team members implement the plan, if allowed by the BLM, which shall include, but is not limited to the following tasks:

1. The project owner shall hire a PHA with the qualifications described in **CUL-3** to supervise the field work.

2. The project owner shall ensure that, prior to beginning the field work, the PHA and crew chief are trained by the DTCCL Historical Archaeologist, or equivalent qualified person approved by the CPM and hired by the project owner should the DTCCL Historical Archaeologist not be available, to identify the specific landform for each site; in the identification, analysis and interpretation of the artifacts, environmental modifications, and trash disposal patterns associated with the early phases of WWII land-based U.S. army activities, as researched and detailed by the DTCCL PI-Historian and the DTCCL Historical Archaeologist.

3. The project owner shall ensure that, prior to beginning the field work, the field crew members are also trained in the consistent and accurate identification of the full range of late nineteenth and early-to-mid-twentieth-century can, bottle, and ceramic diagnostic traits.

4. The project owner shall ensure that the original site map shall be updated to include at minimum: landform features such as small drainages, any man-made features, the limits of any artifact concentrations and features, using location recordation equipment that has the latest technology with sub-meter accuracy (such as UTM 11 North or California Teale Albers).

5. The project owner shall ensure that a detailed in-field analysis of all artifacts shall be completed, documenting the measurements and the

types of seams and closures for each bottle, and the measurements, seams, closure, and opening method for all cans. Photographs shall be taken of maker‘s marks on bottles, any text or designs on bottles and cans, and of decorative patterns and maker‘s marks on ceramics. Artifacts shall not be collected.

6. The project owner shall ensure that the details of what is found at each site shall be presented in a letter report from the CRS or PHA, which shall serve as a preliminary report, that details what was found at each site, as follows:

   a. Letter reports may address one site, or multiple sites depending on the needs of the CRS; and

   b. The letter report shall be a concise document that provides a description of the schedule and methods used in the field effort, a preliminary tally of the numbers and types of features and deposits that were found, a discussion of the potential range of error for that tally, and a map showing the location of collection and/or excavation units, including topographic contours and the site landforms.

   c. The letter report shall make a recommendation on whether each site is a contributor to the DTTCL.

7. The project owner shall ensure that the data collected from the field work shall be provided to the DTCCL Historical Archaeologist to assist in the determination of which, if any, of the historic-period sites are contributing elements to the DTCCL.

8. The project owner shall ensure that the PHA analyzes all recovered data and writes, or supervisors the writing of a comprehensive final report. This report shall be included in the CRR (**CUL-6**). Relevant portions of the information gathered shall be included in the possible NRHP nomination for the DTCCL (funded by **CUL-2**).

<u>Verification:</u>

1. At least 45 days prior to ground disturbance, the project owner shall notify the CPM that mapping and upgraded in-field artifact analysis has ensued on the historic-period refuse scatter sites.

2. Within one week of completing data recovery at a site, the project owner shall submit to the CPM for review and approval a letter report written by the CRS, evidencing that the field portion of data recovery at each site has been completed. When the CPM approves the letter report, ground disturbance may begin at the site location(s) that are the subject of the letter report.

CUL-14 DATA RECOVERY FOR HISTORIC-PERIOD SITES WITH FEATURES

Prior to the start of ground disturbance, the project owner shall ensure that a data recovery plan is included in the CRMMP for evaluation and data recovery from historic-period archaeological sites with features. For

Reconfigured Alternative #3, these sites consist of sites SMP-H-1005, SMP-H-1007, SMP-H-2016. For Reconfigured Alternative #2, these sites consist of the same sites as Reconfigured Alternative #3, plus site JR-108. These site lists may be revised only with the agreement of the CRS and the CPM. The plan shall specify in detail the location recordation equipment and methods to be used and describe any anticipated post-processing of the data. The project owner shall then ensure that the CRS, the PHA, and/or archaeological team members implement the plan, if allowed by the BLM, which shall include, but is not limited to the following tasks:

1. The project owner shall hire a PHA with the qualifications described in **CUL-3** to supervise the field work.

2. The project owner shall ensure that, prior to beginning the field work, the PHA and crew chief are trained by the DTCCL Historical Archaeologist, or equivalent qualified person approved by the CPM and hired by the project owner should the DTCCL Historical Archaeologist not be available, in the identification, analysis and interpretation of the artifacts, environmental modifications, and trash disposal patterns associated with the early phases of WWII land-based U.S. army activities, as researched and detailed by the DTCCL PI-Historian and the DTCCL Historical Archaeologist.

3. The project owner shall ensure that, prior to beginning the field work, the field crew members are also trained in the consistent and accurate identification of the full range of late nineteenth and early-to-mid-twentieth-century can, bottle, and ceramic diagnostic traits.

4. The project owner shall ensure that the original site map shall be updated to include at minimum: landform features such as small drainages, any man-made features, the limits of any artifact concentrations and features (previously known and newly found in the metal detector survey), using location recordation equipment that has the latest technology with sub-meter accuracy (such as UTM 11 North or California Teale Albers).

5. The project owner shall ensure that a detailed in-field analysis of all artifacts shall be completed, if not done previously. Types of seams and closures for each bottle and all cans shall be documented. Photographs shall be taken of any text or designs. Unusual or unidentifiable artifacts may be collected for further analysis, but otherwise artifacts shall not be collected.

6. The project owner shall ensure a systematic metal detector survey be completed at each site, and that each “hit” is investigated. All artifacts and features thus found must be mapped, measured, photographed, and fully described in writing.

7. The project owner shall ensure that all features are recorded, and that any features having subsurface elements are excavated by a qualified

historical archaeologist. All features and contents must be mapped, measured, photographed, and fully described in writing.

8. The project owner shall ensure that the details of what is found at each site shall be presented in a letter report from the CRS or PHA which shall serve as a preliminary report, that details what was found at each site, as follows:

   a. Letter reports may address one site, or multiple sites depending on the needs of the CRS; and

   b. The letter report shall be a concise document that provides a description of the schedule and methods used in the field effort, a preliminary tally of the numbers and types of features and deposits that were found, a discussion of the potential range of error for that tally, and a map showing the location of collection and/or excavation units, including topographic contours and the site landforms.

   c. The letter report shall make a recommendation on whether each site is a contributor to the DTCCL.

9. The project owner shall ensure that the data collected from the field work shall be provided to the DTCCL Historical Archaeologist to assist in the determination of which, if any, of the historic-period sites are contributing elements to the DTCCL.

10. The project owner shall ensure that the PHA analyzes all recovered data and writes or supervises the writing of a comprehensive final report. This report shall be included in the CRR **(CUL-6**). Relevant portions of the information gathered shall be included in the possible NRHP nomination for the DTCCL (funded by **CUL-2**).

Verification:

1. At least 45 days prior to ground disturbance, the project owner shall notify the CPM that mapping and in-field artifact analysis has ensued on historic-period sites with features.

2. Within one week of completing data recovery at a site, the project owner shall submit to the CPM for review and approval a letter report written by the CRS, evidencing that the field portion of data recovery at each site has been completed. When the CPM approves the letter report, ground disturbance may begin at the site location(s) that are the subject of the letter report.

CUL-15 DATA RECOVERY ON HISTORIC-PERIOD ROADS

The project owner shall ensure that a qualified architectural historian (must meet the U.S. Secretary of the Interior‘s Professional Qualifications Standards for historian, as published in Title 36, Code of Federal Regulations, part 61) conducts research and writes a report on the age and use of SMP-H-1032.

The project owner shall provide the historian‘s report to the DTCCL PI-

Historian for possible use in the DTCCL NRHP nomination, if appropriate.

The project owner may undertake this task prior to Energy Commission certification of the project.

<u>Verification:</u>

1. At least 15 days prior to ground disturbance, the project owner shall submit to the CPM the historian's report documenting the age and historical use of the road.

2. Within 15 days after the CPM approves the report, the project owner shall forward it to the DTCCL PI-Historian.

~~CUL-16 COMPLIANCE WITH BLM PROGRAMMATIC AGREEMENT~~

~~If provisions in the BLM PSEGS Programmatic Agreement and associated implementation and monitoring programs conflict with or duplicate these Conditions of Certification, the BLM provisions shall take precedence. Provisions in these Conditions that are additional to or exceed BLM provisions and represent requirements under the Energy Commission's CEQA responsibilities shall continue to apply to the project's activities, contingent on BLM's approval as authorized by federal law.~~

CULTURAL RESOURCES ACRONYM GLOSSARY

PALEN SOLAR ELECTRIC GENERATING PROJECT

AC	Alternating Current
ACEC	Area of Critical Concern
ACHP	Advisory Council on Historic Preservation
A.D.	After the Birth of Christ
AFC	Application for Certification
AIRFA	American Indian Religious Freedom Act
ARMR	Archaeological Resource Management Report
ARPA	Archaeological Resources Protection Act
B.C.	Before the Birth of Christ
BLM	Bureau of Land Management
CCS	Cryptocrystalline silicate
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CHRIS	California Historical Resources Information System
Conditions	Conditions of Certification
CPM	Compliance Project Manager
CRHR	California Register of Historical Resources
CRIT	Colorado River Indian Tribes
CRM	Cultural Resources Monitor
CRMMP	Cultural Resources Monitoring and Mitigation Plan
CRR	Cultural Resource Report
CRS	Cultural Resources Specialist
DC	Direct Current
DPR 523	Department of Parks and Recreation cultural resource inventory form

DTCCL	Desert Training Center Cultural Landscape
DTC/C-AMA	Desert Training Center/California-Arizona Maneuver Area
EIC	Eastern Information Center, University of California, Riverside
FAR	Fire-affected Rock
FSA	Final Staff Assessment
GLO	General Land Office
GPS	Global Positioning System
KOP	Key Observation Point (see also VISUAL RESOURCES section of FSA)
LORS	laws, ordinances, regulations, and standards
MCR	Monthly Compliance Report
MLD	Most Likely Descendent
MW	Megawatt
NAGPRA	Native American Graves Protection and Repatriation Act
NAHC	Native American Heritage Commission
NAM	Native American Monitor
NHPA	National Historic Preservation Act
NILS	National integrated Land System
NPS	National Park Service
NRHP	National Register of Historic Places
OHP	Office of Historic Preservation
PA	Programmatic Agreement
PAA	Project Area of Analysis
PHA	Project Historical Archaeologist
PPA	Project Prehistoric Archaeologist
Project Site	The bounded area(s) identified by the applicant as the area(s) within which they propose to build the project.
PSA	Preliminary Staff Assessment

PSEGS	Palen Solar Electric Generating System
PSH	Palen Solar Holdings, LLC
PTNCL	Prehistoric Trails Network Cultural Landscape
REAP	Rapid Ethnographic Assessment Procedures
RSA	Revised Staff Assessment
SHPO	State Historic Preservation Officer
SRSG	solar receiver steam generator
Staff	Energy Commission cultural resources technical staff
TCP	Traditional Cultural Property
THPO	Tribal Historic Preservation Officer
WEAP	Worker Environmental Awareness Program

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HAZARDOUS MATERIALS MANAGEMENT

Alvin Greenberg, Ph.D.

SUMMARY OF CONCLUSIONS

California Energy Commission staff (staff) evaluated the proposed Palen Solar Electric Generating System (PSEGS) modified project (amendment dated December 17, 2012) in terms of hazardous materials use. Staff's analysis indicates that with the implementation of staff's proposed mitigation measures, hazardous materials use at the modified project site would not present a potential for significant impact to the public. Staff proposes Hazardous Materials Management Conditions of Certification to address the safe handling of hazardous materials and site security. With adoption of the proposed conditions of certification, the PSEGS project will comply with all applicable laws, ordinances, regulations, and standards and will not result in any unmitigated significant adverse impacts.

The proposed Hazardous Materials Management Conditions of Certification are slightly modified from the existing conditions of certification to account for the discontinuation of the project's use of heat transfer fluid (HTF) and propane, and the addition of natural gas and a gas pipeline.

INTRODUCTION

The purpose of this hazardous materials management analysis is to determine if the PSEGS has the potential to cause significant impacts to the public as a result of the use, handling, storage, or transportation of hazardous materials at the proposed site. If significant adverse impacts to the public are identified, staff must also evaluate the potential for facility design alternatives and additional mitigation measures to reduce those impacts to the extent feasible.

This analysis does not address the potential exposure of workers to hazardous materials used at the proposed facility. Employers must inform employees of hazards associated with their work and provide them with special protective equipment and training to reduce the potential for health impacts associated with the handling of hazardous materials. The **Worker Safety and Fire Protection** section of this document describes applicable requirements for the protection of workers from these risks.

In this analysis, staff examines plausible potential loss of containment incidents (spills) for the hazardous materials to be used at the proposed facility. The worst case plausible event, regardless of cause, is considered and analyzed to see whether the risk to local populations would be significant. Hazardous material handling and usage procedures are designed to reduce the likelihood of a spill, to reduce its potential size, and to prevent or reduce the potential for impacts of accidental releases off-site. These measures also address the potential for spills to mix with runoff water and be carried offsite. Generally, staff seeks to confirm that the project owner has proposed secondary containment basins for containing liquids, and that volatile chemicals would have restricted movement into the atmosphere after containment.

Various hazardous materials including mineral and lubricating oils, cleaning detergents, water treatment chemicals, welding gasses, and natural gas will be transported to, and will be present at, the proposed PSEGS project site. This document addresses all potential impacts associated with the transportation, use and handling of hazardous materials.

METHODOLOGY AND THRESHOLDS FOR DETERMINING ENVIRONMENTAL CONSEQUENCES

Staff reviewed and assessed the potential for the transportation, handling, and use of hazardous materials to impact the surrounding community. All chemicals were evaluated. Staff's analysis addresses the potential impacts on all members of the population including the young, the elderly, and people with existing medical conditions that may make them more sensitive to the adverse effects of hazardous materials. To accomplish this goal, staff utilizes exposure criteria (both acute and chronic) that are protective of the public.

In order to assess the potential for released hazardous materials to travel off site and affect the public, staff analyzed several aspects of the proposed use of these materials at the facility. Staff recognizes that some hazardous materials must be used at power plants. Therefore, staff conducted its analysis by examining the choice and amount of chemicals to be used, the manner in which the project owner will use the chemicals, the manner by which they will be transported to the facility and transferred to facility storage tanks, and the way the project owner plans to store the materials on site.

Staff reviewed the project owner's proposed engineering and administrative controls concerning hazardous materials usage. Engineering controls are the physical or mechanical systems, such as storage tanks or automatic shut-off valves, that can prevent the spill of hazardous material from occurring, or which can either limit the spill to a small amount or confine it to a small area. Administrative controls are procedures that will serve to prevent accidents and reduce the potential for impact if they do occur. Both engineering and administrative controls can act to prevent or minimize the need for emergency response actions.

Staff reviewed and evaluated the project owner's proposed use of hazardous materials as described by the project owner in its Petition to Amend (Palen 2012a, Section 5.6). Staff's assessment followed the five steps listed below:

- Step 1: Staff reviewed the chemicals and the amounts proposed for on-site use as listed in Table 5.6-3 of the Petition to Amend (Palen 2012a) and determined the need and appropriateness of their use.
- Step 2: Those chemicals proposed for use in small amounts or whose physical state is such that there is virtually no chance that a spill would migrate off site and impact the public were removed from further assessment.
- Step 3: Measures proposed by the project owner to prevent spills were reviewed and evaluated. These included engineering controls such as automatic shut-off valves and different-sized transfer-hose couplings and administrative controls such as worker training and safety management programs.

- Step 4: Measures proposed by the project owner to respond to accidents were reviewed and evaluated. These measures also included engineering controls such as catchment basins and methods to keep vapors from spreading and administrative controls such as training emergency response crews.
- Step 5: Staff analyzed the theoretical impacts on the public of a worst-case spill of hazardous materials, as reduced by the mitigation measures proposed by the project owner. When mitigation methods proposed by the project owner are sufficient, no further mitigation is recommended. If the proposed mitigation is not sufficient to reduce the potential for adverse impacts to an insignificant level, staff will propose additional prevention and response controls until the potential for causing harm to the public is reduced to an insignificant level. It is only at this point that staff can recommend that the facility be allowed to use hazardous materials.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

The following federal, state, and local laws and policies apply to the protection of public health and hazardous materials management. Staff's analysis examines the project's compliance with these requirements.

Hazardous Materials Management Table 1
Laws, Ordinances, Regulations, and Standards

Applicable LORS	Description
Federal	
The Superfund Amendments and Reauthorization Act of 1986 (42 USC §9601 et seq.)	Contains the Emergency Planning and Community Right To Know Act (also known as SARA Title III).
The Clean Air Act (CAA) of 1990 (42 USC 7401 et seq. as amended)	Established a nationwide emergency planning and response program and imposed reporting requirements for businesses that store, handle, or produce significant quantities of extremely hazardous materials.
The CAA section on risk management plans (42 USC §112(r)	Requires states to implement a comprehensive system informing local agencies and the public when a significant quantity of such materials is stored or handled at a facility. The requirements of both SARA Title III and the CAA are reflected in the California Health and Safety Code, section 25531, et seq.
49 CFR 172.800	The U.S. Department of Transportation (DOT) requirement that suppliers of hazardous materials prepare and implement security plans.
49 CFR Part 1572, Subparts A and B	Requires suppliers of hazardous materials to ensure that all their hazardous materials drivers are in compliance with personnel background security checks.
The Clean Water Act (CWA) (40 CFR 112)	Aims to prevent the discharge or threat of discharge of oil into navigable waters or adjoining shorelines. Requires a written spill prevention, control, and countermeasures (SPCC) plan to be prepared for facilities that store oil that could leak into navigable waters.
Federal Register (6 CFR Part 27) interim final rule	A regulation of the U.S. Department of Homeland Security that requires facilities that use or store certain hazardous materials to submit information to the department so that a vulnerability assessment can be conducted to determine what certain specified security measures shall be implemented.

Applicable LORS	Description
State	
Title 8, California Code of Regulations, section 5189	Requires facility owners to develop and implement effective safety management plans that ensure that large quantities of hazardous materials are handled safely. While such requirements primarily provide for the protection of workers, they also indirectly improve public safety and are coordinated with the Risk Management Plan (RMP) process.
California Health and Safety Code, section 41700	Requires that "No person shall discharge from any source whatsoever such quantities of air contaminants or other material which causes 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 Safe Drinking Water and Toxic Enforcement Act (Proposition 65)	Prevents certain chemicals that cause cancer and reproductive toxicity from being discharged into sources of drinking water.
Hazardous Material Business Plan, Cal HSC Sections 25500 to 25541; 19 CCR Sections 2720 to 2734	Requires the submittal of a chemical inventory and planning and reporting for management of hazardous materials.
Hazardous Substance Information and Training Act, 8 CCR Section 339; Section 3200 et seq., 5139 et seq., and 5160 et seq.	Requires listing and implementation of specified control measures for management of hazardous substances.
California HSC Sections 25270 through 25270.13	Requires the preparation of a Spill Prevention, Control, and Countermeasures (SPCC) Plan if 10,000 gallons or more of petroleum is stored on-site. The above regulations would also require the immediate reporting of a spill or release of 42 gallons or more to the California Office of Emergency Services and the Certified Unified Program Authority (CUPA).
Process Safety Management: Title 8 CCR Section 5189	Requires facility owners to develop and implement effective process safety management plans when toxic, reactive, flammable, or explosive chemicals are maintained on site in quantities that exceed regulatory thresholds.
Local	
Riverside County Fire Code, Riverside County Code Chapter 8.32: Ordinance No. 787	Adopts the California Fire Code, 2007 Edition, with some of its appendices, into Riverside County regulations.
Disclosure of Hazardous Materials and the Formulation of Business Emergency Plans: Riverside County Ordinance 651	Requires disclosure where businesses handle hazardous materials and requires the development of response plans; designates Riverside County Department of Environmental Health as responsible for administration and enforcement of local codes.

The Certified Unified Program Authority (CUPA) with the responsibility to review the Hazardous Materials Business Plan (HMBP) is the Riverside County Environmental Health Department (RCEHD). With regard to seismic safety issues, the site is located in a Seismic Zone 4. Construction and design of buildings and vessels storing hazardous materials will meet the appropriate seismic requirements of the 2007 California Building Code (Palen 2012a, Section 5.6.3.3).

PROPOSED MODIFIED PROJECT

On December 17, 2012, Palen Solar Holdings, LLC (PSH) filed a petition with the Energy Commission requesting to modify the Palen Solar Power Project (PSPP), now called PSEGS. The major modification is replacing the parabolic trough solar collection system using heat transfer fluid with Bright Source's solar tower technology. Heliostats—elevated mirrors guided by a tracking system mounted on a pylon—focus the sun's rays on a solar receiver steam generator located atop a 750-foot tower near the center of each solar field to create steam to drive a turbine that provides electricity.

Two adjacent solar fields producing 250 MW each are proposed for a combined nominal output of approximately 500 MW. Each of the 250 MW solar fields would have a dedicated tower, solar field/heliostat array of approximately 85,000 heliostats, and a dedicated steam turbine generator/power block. Both solar fields would share common facilities, including a common area containing an administration building, warehouse, evaporation ponds, maintenance complex, a meter/valve station for incoming natural gas service to the site, an onsite switchyard, and a 10-mile single-circuit 230-kV generation tie-line. Other onsite facilities would include access and maintenance roads (either dirt, gravel, or paved), perimeter fencing, tortoise fencing, and other ancillary security facilities.

SETTING AND EXISTING CONDITIONS

Several factors associated with the area in which a project is to be located affect the potential for an accidental release of a hazardous material that could cause public health impacts. These include:

- local meteorology;
- terrain characteristics; and,
- location of population centers and sensitive receptors relative to the project.

METEOROLOGICAL CONDITIONS

Meteorological conditions, including wind speed, wind direction, and air temperature, affect both the extent to which accidentally released hazardous materials would be dispersed into the air and the direction in which they would be transported. This affects the potential magnitude and extent of public exposure to such materials, as well as their associated health risks. When wind speeds are low and the atmosphere stable, dispersion is severely reduced, but can lead to increased localized public exposure.

Recorded wind speeds and ambient air temperatures are described in the **Air Quality** section (5.2.2.2) and Appendix E.1 of the Application for Certification (Solar Millennium 2009a).

TERRAIN CHARACTERISTICS

The location of elevated terrain is often an important factor in assessing potential exposure. An emission plume resulting from an accidental release may impact high elevations before impacting lower elevations. The topography of the site is mostly flat (ranges between 130 and 200 feet above sea level), with elevated terrain beginning to the northeast and southwest within 3-4 miles of the site (Solar Millennium 2009a, Section 2.4.1).

LOCATION OF EXPOSED POPULATIONS AND SENSITIVE RECEPTORS

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. In addition, the location of the population in the area surrounding a project site may have a major bearing on health risk. There are no sensitive receptors within a 3-mile radius of the project site. The nearest sensitive receptor is the Eagle Mountain Elementary School located about 10 miles west of the project site. There are two residences (which may or may not be occupied) within one mile of the project site, located about 25 feet and 3,500 feet northwest of the project fence line, respectively (Solar Millennium 2009a, Section 5.10.2 and Figure 5.10-2). In order to ensure a level of protection consistent with Energy Commission policies, staff assumes that these two residences either are occupied or can be occupied in the future.

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

SMALL QUANTITY HAZARDOUS MATERIALS

In conducting the analysis, staff determined in Steps 1 and 2 that some hazardous materials, although present at the proposed facility, pose a minimal potential for off-site impacts since they will be stored in a solid form or in smaller quantities, have low mobility, or have low levels of toxicity. These hazardous materials, which were eliminated from further consideration, are briefly discussed below.

During the construction phase of the project, hazardous materials proposed for use include the same type and amount as in the approved PSPP project. These include paint, solvents, gasoline, diesel fuel, motor oil, lubricants, and welding gases (CEC 2010f and Palen 2012a page 4.3-1). No acutely toxic hazardous materials will be used on site during construction, and none of these materials pose significant potential for off-site impacts as a result of the quantities on site, their relative toxicity, their physical state, and/or their environmental mobility. Any impact of spills or other releases of these materials will be limited to the site because of the small quantities involved, their infrequent use (and therefore reduced chances of release), and/or the temporary containment berms used by contractors. Petroleum hydrocarbon-based motor fuels, mineral oil, lube oil, and diesel fuel are all very low volatility and represent limited off-site hazards even in larger quantities.

During operations, hazardous chemicals such as cleaning agents, water treatment chemicals, welding gasses, oils, and other various chemicals (see **HAZARDOUS MATERIALS APPENDIX B** for a list of chemicals proposed to be used and stored at PSEGS during operations) would be used and stored in relatively small amounts and represent limited off-site hazards because of their small quantities, low volatility, and/or low toxicity. The modified project will be limited to using, storing, and transporting only those hazardous materials listed in **Appendix B** of this section as per staff's proposed Condition of Certification **HAZ-1**. The quantities listed in **Appendix B** are the amount that would be present on the entire site and would be equally divided between the two power blocks.

After removing from consideration those chemicals that pose no risk of off-site impact in Steps 1 and 2, staff continued with Steps 3, 4, and 5 to review the remaining hazardous materials: sulfuric acid, sodium hydroxide, natural gas and aqueous ammonia.

LARGE QUANTITY HAZARDOUS MATERIALS

Sulfuric Acid and Sodium Hydroxide

Because of their very low vapor pressures, these hazardous materials can pose a risk to the off-site public and on-site workers only through direct contact. Because they will be delivered in self-contained “totes” (see discussion below regarding totes) and will not be stored at any one location in a quantity greater than 400 gallons, staff concludes that the risk of impact to the off-site public is less than significant.

Natural Gas

Natural gas poses a fire and/or possible explosion risk because of its flammability. Natural gas is composed of mostly methane, but also contains ethane, propane, nitrogen, butane, isobutene, and isopentane. It is colorless, odorless, tasteless and lighter than air. Natural gas can cause asphyxiation when methane is 90 percent in concentration. Methane is flammable when mixed in air at concentrations of 5-14 percent, which is also the detonation range. Natural gas, therefore, poses a risk of fire and/or possible explosion if a release occurs under certain specific conditions. However, it should be noted that, due to its tendency to disperse rapidly, natural gas is less likely to cause explosions than many other fuel gases such as propane or liquefied petroleum gas, but can explode under certain confined conditions (as demonstrated by the natural gas detonation in Belgium in July 2004 and in San Bruno, California in September 2010).

While natural gas will be used in significant quantities, it will not be stored on site. It will be delivered by the Southern California Gas Company (SoCal Gas) via a new pipeline that will extend southward from the site and interconnect with an existing SoCal Gas transmission pipeline located just south of I-10. The new gas pipeline will be approximately 8-inches in diameter and be approximately 2,956 feet long and will be constructed within a previously-surveyed corridor as shown on **Figure 2.1-6**, dated and docketed on March 15, 2013. SoCal Gas will construct, own and operate the new gas pipeline as part of its extensive gas supply system.

The risk of a fire and/or explosion on site can be reduced to insignificant levels through adherence to applicable codes and the development and implementation of effective safety management practices. The National Fire Protection Association (NFPA) code 85A requires both the use of double-block and bleed valves for gas shut off and automated combustion controls. These measures will significantly reduce the likelihood of an explosion in gas-fired equipment. Additionally, start-up procedures would require air purging of the gas turbines prior to start up, thereby precluding the presence of an explosive mixture. The safety management plan proposed by the project owner would address the handling and use of natural gas, and would significantly reduce the potential for equipment failure because of either improper maintenance or human error.

Staff concludes that since the natural gas pipeline will be owned and operated by SoCal Gas, existing LORS are sufficient to ensure minimal risks of pipeline failure.

On June 28, 2010, the United States Chemical Safety and Hazard Board (CSB) issued Urgent Recommendations to the United States Occupational Safety and Health Administration (OSHA), the NFPA, the American Society of Mechanical Engineers (ASME), and major gas turbine manufacturers to make changes to their respective regulations, codes, and guidance to require the use of inherently safer alternatives to natural gas blows for the purposes of pipe cleaning. Recommendations were also made to the fifty states to enact legislation applicable to power plants that prohibits flammable gas blows for the purposes of pipe cleaning. In accordance with those recommendations, staff proposes new Condition of Certification **HAZ-4** which prohibits the use of flammable gas blow for pipe cleaning at the facility either during construction or after the start of operations. All fuel gas pipe purging activities shall vent any gases to a safe location outdoors, away from workers and sources of ignition. Fuel gas pipe cleaning and purging shall adhere to the provisions of most current versions of the National Fuel Gas Code (NFPA 54) including all Temporary Interim Amendments.

Aqueous Ammonia

Aqueous ammonia will be used to control the emission of oxides of nitrogen (NO_X) from the combustion of natural gas at the PSEGS. The accidental release of aqueous ammonia without proper mitigation can result in significant down-wind concentrations of ammonia gas. The modified project would have 19-percent aqueous ammonia solution in two stationary 400 gallon above-ground storage totes at each power block for a total maximum volume on-site of 1,600 gallons (Palen 2012a, page 4.3-2).

The use of aqueous ammonia can result in the formation and release of toxic gases in the event of a spill even without interaction with other chemicals. This is a result of its moderate vapor pressure and the volume of aqueous ammonia that will be used and stored on site. However, the use of aqueous ammonia poses far less risk than the use of the far more hazardous anhydrous ammonia (ammonia that is not diluted with water).

To assess the potential impacts associated with an accidental release of aqueous ammonia, staff uses four bench mark exposure levels of ammonia gas occurring offsite. These include:

- the lowest concentration posing a risk of lethality of 2,000 ppm;
- the immediately dangerous to life and health level of 300 ppm;
- the emergency response planning guideline level 2 of 150 ppm, which is also the RMP level 1 criterion used by United States Environmental Protection Agency (US EPA) and California; and,
- the level considered by the Energy Commission staff to be without serious adverse effects on the public for a one-time exposure of 75 ppm (considered by staff to be a level of significance – see **Appendix A**).

If the potential exposure associated with a potential release exceeds 75 ppm at any public receptor, staff assumes that the potential release poses a risk of significant impact. Staff also assessed the probability of occurrence of the release and/or the nature of the potentially exposed population in determining whether the likelihood and extent of potential exposure are sufficient to support a finding of potentially significant impact.

At this site, several factors influenced staff's conclusion that the risk of off-site impacts of a release of aqueous ammonia would be extremely low and thus air dispersion modeling would not be required:

1. The maximum of each tote is 400 gallons and totes are self-contained units that do not involve the transfer of aqueous ammonia from a tanker truck to a large storage tank. They are delivered already containing the aqueous ammonia.

2. Each tote will have secondary spill containment to limit the spread of any spilled aqueous ammonia, thus limiting the size of the pool of ammonia available for evaporation and dispersion.

3. Previous modeling at other power plants by staff of far greater amounts of aqueous ammonia spilling into secondary containment areas show very limited dispersion of ammonia and the distance to a level less than 75 ppm is usually only a few hundred feet from the source.

4. Totes have an excellent safety record of structural integrity and minimal spills and the chance that more than one would fail at the same time is extremely remote.

5. The nearest off-site public receptors are two homes located about 25 feet and 3,500 feet northwest of the project fence line. These are respectively approximately one mile (5,280 ft.) and one and two-thirds miles (8,720 ft.) from the nearest tote of aqueous ammonia at a power block. Also, a vehicle traveling on I-10 would get no closer than three quarters of a mile (4,000 ft) from the nearest ammonia tote at a power block (Palen 2012a, Figure 2 and Appendix A page 10).

Therefore, staff concludes that any spill of aqueous ammonia from any one of the four totes on the site would not result in an airborne concentration of 75 ppm or greater ammonia at any off-site location and thus would pose a less than significant risk to the public.

MITIGATION

Staff believes that this project's use of hazardous materials poses a less than significant risk, but only if mitigation measures are used. The potential for accidents resulting in the release of hazardous materials is greatly reduced by the implementation of a Safety Management Program that includes both engineering and administrative controls. Elements of facility controls and the safety management plan are summarized below.

Engineering Controls

Engineering controls help to prevent accidents and releases (spills) from moving off site and affecting communities by incorporating engineering safety design criteria in the design of the project. The engineered safety features proposed by the project owner for use at the PSEGS project include:

- Storage of small quantity hazardous materials in original, properly labeled containers ("totes");
- construction of secondary containment areas surrounding each of the bulk hazardous materials storage areas or totes designed to contain accidental releases that might happen during storage or delivery plus the volume of rainfall associated with a 25-year, 24-hour storm;
- physical separation of stored chemicals in isolated containment areas in order to prevent accidental mixing of incompatible materials, which could result in the evolution and release of toxic gases or fumes; and,
- installation of a fire protection system for hazardous materials storage areas.

Administrative Controls

Administrative controls also help prevent accidents and releases (spills) from moving off site and affecting neighboring communities by establishing worker training programs, process safety management programs, and complying with all applicable health and safety laws, ordinances, and standards.

A worker health and safety program will be prepared by the project owner and include (but not be limited to) the following elements (see the **Worker Safety and Fire Protection** section for specific regulatory requirements):

- worker training regarding chemical hazards, health and safety issues, and hazard communication;
- procedures to ensure the proper use of personal protective equipment;
- safety operating procedures for the operation and maintenance of systems utilizing hazardous materials;
- fire safety and prevention; and,
- emergency response actions including facility evacuation, hazardous material spill clean-up, and fire prevention including the preparation of a Spill Prevention, Control, and Countermeasure (SPCC) Plan.

At the facility, the project owner will be required to designate an individual with the responsibility and authority to ensure a safe and healthful work place. The project health and safety official will oversee the health and safety program and have the authority to halt any action or modify any work practice to protect the workers, facility, and the surrounding community in the event of a violation of the health and safety program.

Existing Condition of Certification **HAZ-1** ensures that no hazardous material would be used at the facility except as listed on pages 4.3-2 through 4.3-5 of the Petition to Amend(Palen 2012a)), which have been reviewed by staff to determine the need and appropriateness of their use. Condition of Certification **HAZ-1** also requires changes to the allowed list of hazardous materials and their maximum amounts to be approved by the Energy Commission Compliance Project Manager (CPM). Only those that are needed and appropriate would be allowed to be used. If staff feels that a safer alternative chemical can be used, staff would recommend or require its use, depending upon the impacts posed.

Additional administrative controls are required by revised Condition of Certification **HAZ-2** (preparation of a HMBP and a SPCC Plan) and existing Condition of Certification **HAZ-3** (development of a Safety Management Plan).

On-Site Spill Response

In order to address the issue of spill response, the facility will prepare and implement an emergency response plan that includes information on hazardous materials contingency and emergency response procedures, spill containment and prevention systems, personnel training, spill notification, on-site spill containment, and prevention equipment and capabilities, as well as other elements. Emergency procedures will be established which include evacuation, spill cleanup, hazard prevention, and emergency response. The presence of oil in a quantity greater than 1,320 gallons might invoke a requirement to prepare a SPCC Plan. The quantity of oil contained in any one of the planned 230/500 kV transformers would be in excess of the minimum quantity that requires such a plan. In addition, pursuant to California HSC Sections 25270 through 25270.13, the PSEGS would be required to prepare a SPCC because it will store 10,000 gallons or more of petroleum on-site. The above regulations would also require the immediate reporting of a spill or release of 42 gallons or more to the California Office of Emergency Services and the CUPA.

Plant personnel will be trained as a hazardous materials response team which would be the first responder to hazardous materials incidents. In the event of a large incident involving hazardous materials, backup support would be provided by the Riverside County Fire Department which has a hazmat response unit capable of handling any incident at the proposed PSEGS, but would respond in an inadequate time of about 1.5-2 hours (Solar Millennium 2009a, Section 5.6.4.2 and RCFD 2010).

TRANSPORTATION OF HAZARDOUS MATERIALS

Various containerized and bulk hazardous materials would be transported to the facility via the truck. While many types of hazardous materials will be transported to the site, staff believes that transport of aqueous ammonia poses the predominant risk associated with hazardous materials transport. It should be noted that previous modeling of spills involving much larger quantities of aqueous ammonia than will be used, stored and transported to the proposed PSEGS has demonstrated that significant airborne concentrations would occur only at short distances from the spill.

Staff believes it is appropriate to rely upon the extensive regulatory program that applies to the shipment of hazardous materials on California highways to ensure safe handling in general transportation (see Federal Hazardous Materials Transportation Law 49 USC §5101 et seq, DOT regulations 49 CFR subpart H, §172–700, and California Department of Motor Vehicles (DMV) regulations on hazardous cargo). These regulations also address the issue of driver competence.

Based on the environmental mobility, toxicity, the quantities at the site, and the use of totes, staff concludes that the risk associated with the transportation of hazardous materials to the proposed modified project is less than significant.

SEISMIC ISSUES

It is possible that an earthquake could cause the failure of hazardous materials storage tanks. An earthquake could also cause failure of the secondary containment system (berms and dikes), as well as the failure of electrically controlled valves and pumps. The failure of all of these preventive control measures might then result in leaks of chemicals or of natural gas that may cause fires or impact the environment.

Information obtained after the January 1994 Northridge earthquake showed that some damage was caused both to several large storage tanks and to smaller tanks associated with the water treatment system of a cogeneration facility. The tanks with the greatest damage, including seam leakage, were older tanks, while the newer tanks only sustained displacements and failures of attached lines. Staff reviewed the impacts of the February 2001 Nisqually earthquake near Olympia, Washington, a state with similar seismic design codes as California. No hazardous materials storage tanks failed as a result of that earthquake. Staff has also reviewed the impacts of the recent earthquakes in Haiti (January 12, 2010; magnitude 7.0) and Chili (February 27, 2010; magnitude 8.8). The building standards in Haiti are extremely lax while those in Chile are as stringent and modern as California seismic building codes. Yet, the preliminary reports show a lack of impact on hazardous materials storage and pipelines infrastructure in both countries. For Haiti, this most likely reflects a lack of industrial storage tanks and gas pipelines; for Chili, this most likely reflects the use of strong safety codes.

Staff also conducted an analysis of the codes and standards which should be followed when designing and building storage tanks and containment areas to withstand a large earthquake. Staff notes that the previously approved project (PSPP) would have been designed and constructed to the standards of the 2010 California Building Code for Seismic Risk Zone 4 (Solar Millennium 2009a, Section 5.6.3.3) and the modified project (PSEGS) will also meet these seismic design criteria.

Therefore, on the basis of what occurred in Northridge (with older tanks) and the lack of failures during the Nisqually earthquake (with newer tanks) and in the 2010 Chilean earthquake (with rigorous seismic building codes), and given that the construction of PSEGS would comply with stringent California Building Codes, staff determines that tank failures during seismic events are not probable and do not represent a significant risk to the public.

SITE SECURITY

The North American Electric Reliability Corporation (NERC) published *Security Guidelines for the Electricity Sector* in 2002 (NERC 2002) as well as issued a Critical Infrastructure Protection standard for cyber security (NERC 2009), and the U.S. Department of Energy published a draft *Vulnerability Assessment Methodology for Electric Power Infrastructure* in 2002 (DOE 2002). The energy generation sector is one of 14 areas of critical Infrastructure listed by the U.S. Department of Homeland Security (DHS). On April 9, 2007, the U.S Department of Homeland Security published, in the

Federal Register (6 CFR Part 27), an Interim Final Rule (Chemical Facility Anti-Terrorism Standards or CFATS) requiring facilities that use or store certain hazardous materials to conduct vulnerability assessments and implement certain specified security measures. This rule was implemented with the publication of Appendix A, the list of chemicals on November 2, 2007, and the PSEGS is not proposing to use any material on the list in an amount which would trigger the need for compliance with the CFATS regulation.

However, even though the CFATS regulation does not apply, staff believes that all power plants under the jurisdiction of the California Energy Commission should implement a minimum level of security consistent with the guidelines listed here.

In order to ensure that this facility (or a shipment of hazardous material) is not the target of unauthorized access, staff's existing Condition of Certification **HAZ-5** and revised Condition of Certification **HAZ-6** address both construction security and operations security plans. These plans would require the implementation of site security measures that are consistent with both the above-referenced documents and California Energy Commission guidelines.

The goal of these conditions of certification is to provide the minimum level of security for power plants needed to protect California's electrical infrastructure from malicious mischief, vandalism, or domestic/foreign terrorist attacks. The level of security needed for this power plant is dependent upon the threat imposed, the likelihood of an adversarial attack, the likelihood of success in causing a catastrophic event, and the severity of consequences of that event.

In order to determine the level of security, staff used an internal vulnerability assessment decision matrix modeled after the U.S. Department of Justice Chemical Vulnerability Assessment Methodology (July 2002), the NERC 2002 guidelines, the U.S. Department of Energy VAM-CF model, and U.S. Department of Homeland Security regulations published in the Federal Register (Interim Final Rule 6 CFR Part 27). Staff concluded that the PSEGS would fall into the "low vulnerability" category, so staff proposes that certain security measures be implemented but does not propose that the project owner conduct its own vulnerability assessment.

These security measures include perimeter fencing and breach detectors, possibly guards, alarms, site access procedures for employees and vendors, site personnel background checks, and law enforcement contact in the event of a security breach. Site access for vendors would be strictly controlled. Consistent with current state and federal regulations governing the transport of hazardous materials, hazardous materials vendors would have to maintain their transport vehicle fleets and employ only drivers who are properly licensed and trained. The project owner would be required, through its contractual language with vendors, to ensure that vendors, if required by law, supplying hazardous materials strictly adhere to the U.S. Department Of Transportation requirements that hazardous materials vendors prepare and implement security plans per 49 CFR 172.802 and ensure that all hazardous materials drivers are in compliance with personnel background security checks per 49 CFR Part 1572, Subparts A and B. The compliance project manager (CPM) may authorize modifications to these measures, or may require additional measures in response to additional guidance provided by the U.S. Department of Homeland Security, the U.S. Department of Energy, or NERC, after consultation with appropriate law enforcement agencies and the project owner.

CLOSURE AND DECOMMISSIONING IMPACTS AND MITIGATION

Closure of the proposed PSEGS (temporary or permanent) would follow a facility closure plan approved for the original PSPP project. The facility closure plan is designed to minimize public health and environmental impacts. Decommissioning procedures would be consistent with all applicable LORS and would include monitoring of hazardous materials storage vessels, safe cessation of processes which use hazardous materials, disposal of hazardous materials and hazardous wastes, and documentation of practices and inventory (Solar Millennium 2009a, Section 5.6.3.4). Staff expects that impacts from the closure and decommissioning process would represent a fraction of the impacts associated with the construction or operation of the proposed PSEGS. Therefore based on staff's analysis for the construction and operation phases of this project, staff concludes that hazardous materials-related impacts from closure and decommissioning of the PSEGS would be insignificant.

RED BLUFF SUBSTATION

Environmental Setting

The SCE Red Bluff Substation, expected to be completed in December 2013, is located in eastern Riverside County, California on undeveloped BLM desert, adjacent to the existing DPV1 500 kV transmission line and the proposed DPV 2 500 kV transmission line. Expansive, primarily undeveloped desert and mountainous areas characterize this portion of the Colorado Desert. Interstate 10 and SR 177 (Rice Road) are the primary highways providing vehicular access throughout this region.

A number of hazardous chemicals are being used during construction of the SCE Red Bluff Substation in small quantities. The existing safeguards and measures imposed on construction greatly reduce the opportunity for, or the extent of, exposure to hazardous materials or other hazards. To date, no incidents of releases have been reported.

Exposed Populations and Sensitive Receptors

The general population in the area of the Red Bluff Substation includes many sensitive subgroups that may be at a greater health risk from exposure to emitted pollutants. These sensitive subgroups include the very young, the elderly, and those with existing illnesses. In addition, the location of the population in the area surrounding a project site may have a large bearing on health risk. There are no sensitive receptors within 1,000 feet of the SCE Red Bluff Substation site. The nearest residences are located north of the I-10.

Environmental Impacts

A hazardous material is generally described as any substance or mixture of substances that have properties that are capable of having an adverse effect on human health and the environment. Hazardous materials handling is regulated at the federal, state, and local level. Regulations cover the transportation, labeling, handling, storage, disposal, and accidental releases of hazardous materials. Included within these regulations are reporting requirements for hazardous materials storage and usage, worker exposure protection, and reporting and spill response requirements. Hazardous material handling also covers response to incidental discovery of buried or unknown hazardous materials present in the subsurface environment.

Construction activities for the Red Bluff Substation include the handling and use of hazardous materials associated with general construction activities, such as heavy equipment operations. Hazardous materials including fuels, oils, and other vehicle and equipment maintenance fluids may be used during the on-going construction phase of the project and are stored at the project substation sites and construction staging areas. Improperly maintained vehicles and equipment could leak fluids during the on-going construction activities and while parked. There is a potential for incidents involving release of gasoline, diesel fuel, oil, hydraulic fluid, and/or lubricants from vehicles or other equipment at the staging areas and/or the project sites. Spills and leaks of hazardous materials during construction activities could potentially result in soil or groundwater contamination and improper handling of hazardous materials could expose project workers or the nearby public to hazards. To date no reported leaks or spills occurred.

Conclusion

Implementing mitigation measures avoided potential significant hazard impacts from work associated with the SCE Red Bluff Substation.

CUMULATIVE IMPACT ANALYSIS

The **Executive Summary** 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 modified project. In summary, these projects are placed into three categories:

- Past and present energy projects on BLM, State, and private lands: Forty-one projects are identified in the **Executive Summary**.
- Foreseeable future energy projects in the immediate area and in the desert region: Thirty-five foreseeable projects are identified in the **Executive Summary**.
- Past and present non-energy projects on BLM, State, and private lands: Ten projects are identified in the **Executive Summary**.

All of the above projects are defined within a geographic area that has been identified by the Energy Commission 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 the California Environmental Quality Act (CEQA). Even if the cumulative projects described in the **Executive Summary** have not yet completed the required environmental processes, they were considered in the cumulative impacts analyses in this section.

EFFECTS OF PAST AND PRESENT PROJECTS

For this analysis, staff notes that many – if not all - of these projects or developments in the area or region have, or will use, store, and/or transport, small quantities of hazardous materials. However, for the reasons stated below, staff has found that when combined with the proposed PSEGS, none would have a cumulative impact on the region. The use of hazardous materials in large quantities is neither frequent nor concentrated in this area and the distances between the projects are very great. Operating, under construction, or proposed power plants in the region that store, use, and/or transport hazardous materials in the area have had any direct hazardous materials management impacts mitigated to a level of less than significance.

Staff has analyzed the potential for hazardous materials cumulative impacts at many other power plant projects located in California and in the region of the proposed PSEGS. A significant cumulative hazardous materials impact is defined as the simultaneous uncontrolled release of hazardous materials from multiple locations in a form (gas or liquid) that could cause a significant impact where the release of one hazardous material alone would not cause a significant impact. Existing locations that use or store gaseous or liquid hazardous materials, or locations where such facilities might likely be built, were both considered. Staff believes that while cumulative impacts are theoretically possible, they are not probable because of the many safeguards implemented to both prevent and control an uncontrolled release. The chances of one uncontrolled release occurring are remote. The chance of two or more occurring simultaneously, with resulting airborne plumes mingling to create a significant impact, are even more remote. Staff believes the risk to the public is insignificant.

The project owner will develop and implement a hazardous materials handling program for the PSEGS independent of any other projects considered for potential cumulative impacts. Staff believes that the facility, as proposed by the project owner and with the additional mitigation measures proposed by staff, poses a minimal risk of accidental release that could result in off-site impacts. It is unlikely that an accidental release that has very low probability of occurrence (about one in one million per year) would independently occur at this site and another facility at the same time. Therefore, staff concludes that the facility would not contribute to a significant hazardous materials-related cumulative impact.

Contribution of the Palen Solar Electric Generating System to Cumulative Impacts

Construction. The construction of PSEGS is not expected to result in short term adverse impacts related to hazardous materials use during 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 PSEGS, however, short term impacts related to Hazardous Materials Management during construction of those cumulative projects are not expected to occur.

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

Decommissioning. The decommissioning of the PSEGS is not expected to result in adverse impacts related to Hazardous Materials Management 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, it is not expected that significant impacts related to Hazardous Materials Management during decommissioning of the PSEGS generated by the cumulative projects will occur.

OVERALL CONCLUSIONS

The potential for off-site impacts resulting from hazardous materials use at the PSEGS is less than significant due to the nature of the materials used and the engineering and administrative controls that would be implemented to prevent and control accidental releases of hazardous materials. Because of this determination, and the additional fact that there are no existing or future foreseeable facilities in the immediate proximity (less than 1 mile) using large amounts of hazardous chemicals, there is little (if any) possibility that vapor plumes would mingle (combine) to produce an airborne concentration that would present a significant risk should an accidental release occur.

COMPLIANCE WITH LORS

Staff concludes that construction and operation of the PSEGS project would be in compliance with all applicable laws, ordinances, regulations, and standards (LORS) regarding long-term and short-term project impacts in the area of hazardous materials management.

NOTEWORTHY PUBLIC BENEFITS

The construction and operation of a solar power plant such as the proposed PSEGS, requires in general, smaller quantities of hazardous materials and materials that are less dangerous to the public than a natural-gas fired power plant. Building solar power plants to supply the required energy in California therefore benefits the public by reducing the risks otherwise associated with the use and transport of very large quantities of aqueous ammonia or more hazardous materials such as anhydrous ammonia.

RESPONSE TO AGENCY AND PUBLIC COMMENTS

No comments from agencies or the public on hazardous materials management have been received as of the date of this PSA.

CONCLUSIONS

Staff's evaluation of the proposed modified project (with proposed additions and revisions to the mitigation measures) indicates that hazardous material use, storage, and transportation would not pose a significant impact on the public. Staff's analysis also shows that there would be no significant cumulative impact. With adoption of the proposed Hazard Materials Management Conditions of Certification, the PSEGS would comply with all applicable LORS. Other proposed Conditions of Certification address the issues of site security matters.

Staff recommends that the Energy Commission impose the proposed Hazard Materials Management Conditions of Certification to ensure that the PSEGS is designed, constructed, and operated in compliance with applicable LORS, and would protect the public from significant risk of exposure to an accidental release of hazardous materials. If all mitigation proposed by the project owner and by staff are implemented, the use, storage, and transportation of hazardous materials would pose a less than significant risk to the public.

Staff concludes that there is insignificant potential for hazardous materials release to have an impact beyond the facility boundary, and therefore concludes there is also insignificant potential for significant impacts to the environment. For any other potential impacts upon the environment, including vegetation, wildlife, air, soils, and water resulting from hazardous materials usage and disposal at the proposed facility, the reader is referred to the **BIOLOGY**, the **AIR QUALITY**, the **SOIL AND WATER**, and the **WASTE MANAGEMENT** sections of this PSA.

Staff proposes six Hazard Materials Management Conditions of Certification. Existing Condition of Certification **HAZ-1** ensures that no hazardous material would be used at the facility except as listed in **Appendix A** of this section, unless there is prior approval by the Energy Commission Compliance Project Manager. Revised Condition of Certification **HAZ-2** ensures that local emergency response services are notified of the amounts and locations of hazardous materials at the facility and safety plans, existing Condition of Certification **HAZ-3** requires the development of a Safety Management Plan that addresses the delivery of all liquid hazardous materials during the construction, commissioning, and operation of the project would further reduce the risk of any accidental release not specifically addressed by the proposed spill prevention mitigation measures, and further prevent the mixing of incompatible materials that could result in the generation of toxic vapors. Revised Condition of Certification **HAZ-4** addresses the use of natural gas and prohibits its use to clear pipes. Site security during both the construction and operation phases is addressed in existing Condition of Certification **HAZ-5** and revised Condition of Certification **HAZ-6.**

PROPOSED CONDITIONS OF CERTIFICATION

Staff has proposed modifications to the **Hazardous Materials Management** Conditions of Certification as shown below. (**Note:** Deleted text is in ~~strikethrough~~, new text is **<u>bold and underlined</u>**)

HAZ-1 The project owner shall not use any hazardous material not listed in **Appendix ~~A~~<u>B</u>**, below, or in greater quantities or strengths than those identified by chemical name in **Appendix ~~A~~<u>B</u>**, below, unless approved in advance by the Compliance Project Manager (CPM).

<u>Verification:</u> The project owner shall provide to the CPM, in the Annual Compliance Report, a list of hazardous materials contained at the facility.

HAZ-2 The project owner shall concurrently provide a Hazardous Materials Business Plan (HMBP)~~,~~ and **a** Spill Prevention, Control, and Countermeasure Plan (SPCC), ~~and a Process Safety Management Plan (PSMP)~~ to the Riverside County Department of Environmental Health (RCDEH), the Riverside County Fire Department (RCFD), and the CPM for review. After receiving comments from the RCDEH, RCFD, and the CPM, the project owner shall reflect all recommendations in the final documents. Copies of the final HMBP~~,~~ **and** SPCC Plan~~, and PSMP~~ shall then be provided to the RCDEH and RCFD for information and to the CPM for approval.

Verification: At least 30 days prior to receiving any hazardous material on the site for commissioning or operations, the project owner shall provide a copy of a final Hazardous Materials Business Plan, Spill Prevention, Control, and Countermeasures Plan, ~~and the Process Safety Management Plan~~ to the CPM for approval.

HAZ-3 The project owner shall develop and implement a Safety Management Plan for the delivery and handling of liquid and gaseous hazardous materials. The plan shall include procedures, protective equipment requirements, training and a checklist. It shall also include a section describing all measures to be implemented to prevent mixing of incompatible hazardous materials. This plan shall be applicable during construction, commissioning, and operation of the power plant.

Verification: At least 30 days prior to the delivery of any liquid or gaseous hazardous material to the facility, the project owner shall provide a Safety Management Plan as described above to the CPM for review and approval.

~~**HAZ-4** The project owner shall place an adequate number of isolation valves in the Heat Transfer Fluid (HTF) pipe loops so as to be able to isolate a solar panel loop in the event of a leak of fluid such that the volume of a total loss of HTF from that isolated loop will not exceed 1,250 gallons. These valves shall be actuated manually, remotely, or automatically. The engineering design drawings showing the number, location, and type of isolation valves shall be provided to the CPM for review and approval prior to the commencement of the solar array piping construction.~~

~~**Verification:** At least 30 days prior to the commencement of solar array piping construction, the project owner shall provide the design drawings as described above to the CPM for review and approval.~~

HAZ-4: The project owner shall not allow any fuel gas pipe cleaning activities on site, either before placing the pipe into service or at any time during the lifetime of the facility, that involve "flammable gas blows" where natural (or flammable) gas is used to blow out debris from piping and then vented to atmosphere. Instead, an inherently safer method involving a non-flammable gas (e.g. air, nitrogen, steam) or mechanical pigging shall be used. Exceptions to any of these provisions will be made only if no other satisfactory method is available, and then only with the approval of the CPM.

Verification: At least 30 days before any fuel gas pipe cleaning activities involving fuel gas pipe of four-inch or greater external diameter, the project owner shall submit a copy of the Fuel Gas Pipe Cleaning Work Plan which shall indicate the method of cleaning to be used, what gas will be used, the source of pressurization, and whether a mechanical PIG will be used, to the CBO for information and to the CPM for review and approval.

HAZ-5 Prior to commencing construction, a site-specific Construction Site Security Plan for the construction phase shall be prepared and made available to the CPM for review and approval. The Construction Security Plan shall include the following:

1. perimeter security consisting of fencing enclosing the construction area;
2. security guards;
3. site access control consisting of a check-in procedure or tag system for construction personnel and visitors;
4. written standard procedures for employees, contractors and vendors when encountering suspicious objects or packages on site or off site;
5. protocol for contacting law enforcement and the CPM in the event of suspicious activity or emergency; and
6. evacuation procedures.

Verification: At least 30 days prior to commencing construction, the project owner shall notify the CPM that a site-specific Construction Security Plan is available for review and approval.

HAZ-6 The project owner shall also prepare a site-specific **Operations** security plan for the ~~commissioning and~~ operational phase~~s~~ that ~~will~~**shall** be **made** available to the CPM for review and approval. The project owner shall implement site security measures that address physical site security and hazardous materials storage. The level of security to be implemented shall not be less than that described below (as per NERC 2002).

The Operation Security Plan shall include the following:

1. permanent full perimeter fence or wall, at least eight feet high and topped with barbed wire or the equivalent;
2. main entrance security gate, either hand operated or motorized;
3. evacuation procedures;
4. protocol for contacting law enforcement and the CPM in the event of suspicious activity or emergency;
5. written standard procedures for employees, contractors, and vendors when encountering suspicious objects or packages on site or off site;

6. A. a statement (refer to sample, **ATTACHMENT A**), signed by the project owner certifying that background investigations have been conducted on all project personnel. Background investigations shall be restricted to determine the accuracy of employee identity and employment history and shall be conducted in accordance with state and federal laws regarding security and privacy;

   B. a statement(s) (refer to sample, **ATTACHMENT B**), signed by the contractor or authorized representative(s) for any permanent contractors or other technical contractors (as determined by the CPM after consultation with the project owner), that are present at any time on the site to repair, maintain, investigate, or conduct any other technical duties involving critical components (as determined by the CPM after consultation with the project owner) certifying that background investigations have been conducted on contractors who visit the project site. **Background investigations shall be restricted to determine the accuracy of employee identity and employment history and shall be conducted in accordance with state and federal laws regarding security and privacy.**;

7. site access controls for employees, contractors, vendors, and visitors;

8. a statement(s), **if required,** (refer to sample, **ATTACHMENT C**), signed by the owners or authorized representative of ~~propane~~ **hazardous materials** transport vendors, certifying that they have prepared and implemented security plans in compliance with 49 CFR 172.802, and that they have conducted employee background investigations in accordance with 49 CFR Part 1572, subparts A and B;

9. closed circuit TV (CCTV) monitoring system, recordable, and viewable in the power plant control room and security station (if separate from the control room) with cameras able to pan, tilt, and zoom, have low-light capability, and are able to view the outside entrance to the control room, ~~the propane/LPG tank,~~ **100% of the perimeter fencing around each power block,** and the front gate; and

10. additional measures to ensure adequate perimeter security consisting of either:

    A. security guard(s) present 24 hours per day, 7 days per week; **or**

    B. power plant personnel on site 24 hours per day, 7 days per week,

    And one of the following:

    perimeter breach detectors **or** ~~the CCTV able to view 100% of the entrance gates and~~ **on-site motion detectors for** the power block areas.

The project owner shall fully implement the security plans and obtain CPM approval of any substantive modifications to those security plans. The CPM may authorize modifications to these measures, or may require additional measures, **such as protective barriers for critical power plant components (e.g. transformers, gas lines, compressors, etc.)** or cyber security depending upon circumstances unique to the facility or in response to industry-related standards, security concerns, or additional guidance provided by the U.S. Department of Homeland Security, the U.S. Department of Energy, or the North American Electrical Reliability Council, after consultation with both appropriate law enforcement agencies and the project owner.

Verification: At least 30 days prior to the initial receipt of ~~HTF or propane/LPG~~ **hazardous materials** on site **for commissioning or operations**, the project owner shall notify the CPM that a site-specific Operations Site Security Plan is available for review and approval. In the annual compliance report, the project owner shall include a statement that all current project employee and appropriate contractor background investigations have been performed, and that updated certification statements have been appended to the operations security plan. In the annual compliance report, the project owner shall include a statement that the operations security plan includes all current hazardous materials transport vendor certifications for security plans and employee background investigations.

SAMPLE CERTIFICATION (Attachment A)

Affidavit of Compliance for Project Owners

I,

____

(Name of person signing affidavit)(Title)

do hereby certify that background investigations to ascertain the accuracy of the identity and employment history of all employees of

____

(Company name)

for employment at

____

(Project name and location)

have been conducted as required by the California Energy Commission Decision for the above-named project.

____

(Signature of officer or agent)

Dated this ___________________ day of ___________________, 20 _______.

THIS AFFIDAVIT OF COMPLIANCE SHALL BE APPENDED TO THE PROJECT SECURITY PLAN AND SHALL BE RETAINED AT ALL TIMES AT THE PROJECT SITE FOR REVIEW BY THE CALIFORNIA ENERGY COMMISSION COMPLIANCE PROJECT MANAGER.

SAMPLE CERTIFICATION (Attachment B)

Affidavit of Compliance for Contractors

I,

____

(Name of person signing affidavit)(Title)

do hereby certify that background investigations to ascertain the accuracy of the identity and employment history of all employees of

____

(Company name)

for contract work at

____

(Project name and location)

have been conducted as required by the California Energy Commission Decision for the above-named project.

____

(Signature of officer or agent)

Dated this ____________________ day of ____________________, 20 ________.

THIS AFFIDAVIT OF COMPLIANCE SHALL BE APPENDED TO THE PROJECT SECURITY PLAN AND SHALL BE RETAINED AT ALL TIMES AT THE PROJECT SITE FOR REVIEW BY THE CALIFORNIA ENERGY COMMISSION COMPLIANCE PROJECT MANAGER.

SAMPLE CERTIFICATION (Attachment C)

Affidavit of Compliance for Hazardous Materials Transport Vendors

I,

____

(Name of person signing affidavit)(Title)

do hereby certify that the below-named company has prepared and implemented security plans in conformity with 49 CFR 172.802 and has conducted employee background investigations in conformity with 49 CFR 172, subparts A and B,

____

(Company name)

for hazardous materials delivery to

____

(Project name and location)

as required by the California Energy Commission Decision for the above-named project.

____

(Signature of officer or agent)

Dated this ____________________ day of ____________________, 20 ________.

THIS AFFIDAVIT OF COMPLIANCE SHALL BE APPENDED TO THE PROJECT SECURITY PLAN AND SHALL BE RETAINED AT ALL TIMES AT THE PROJECT SITE FOR REVIEW BY THE CALIFORNIA ENERGY COMMISSION COMPLIANCE PROJECT MANAGER.

REFERENCES

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California Air Resources Board 2001. “Guidance for the Permitting of Electrical Generation Technologies”. Nov. 15.

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Environmental Protection Agency (EPA). 2000a. Chemical Accident Prevention: Site Security. Environmental Protection Agency, Office of Solid Waste and Emergency Response. February 2000.

North American Electric Reliability Council (NAERC) 2002. Security Guidelines for the Electricity Sector, Version 1.0, June 14, 2002.

Palen 2012a – Palen Solar Holdings, LLC/Galati Blek, Scott Galati (TN 68910). Palen Solar Holdings LLC’s Petition for Amendment, dated December 17, 2012. Submitted to CEC/C. Stora on December 18, 2012

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U.S. Department of Energy (US DOE). 2002. Draft Vulnerability Assessment Methodology, Electric Power Infrastructure. Office of Energy Assurance, September 30, 2002.

U.S. Department of Justice (US DOJ). 2002. Special Report: Chemical Facility Vulnerability Assessment Methodology. Office of Justice Programs, Washington, D.C. July 2002.

HAZARDOUS MATERIALS Appendix A Table-1
Acute Ammonia Exposure Guidelines

Guideline	Responsible Authority	Applicable Exposed Group	Allowable Exposure Level	Allowable* Duration of Exposures	Potential Toxicity at Guideline Level/Intended Purpose of Guideline
IDLH[2]	NIOSH	Workplace standard used to identify appropriate respiratory protection.	300 ppm	30 minutes	Exposure above this level requires the use of "highly reliable" respiratory protection and poses the risk of death, serious irreversible injury, or impairment of the ability to escape.
IDLH/10[1]	EPA, NIOSH	Work place standard adjusted for general population factor of 10 for variation in sensitivity	30 ppm	30 minutes	Protects nearly all segments of general population from irreversible effects.
STEL[2]	NIOSH	Adult healthy male workers	35 ppm	15 minutes, 4 times per 8-hour day	No toxicity, including avoidance of irritation.
EEGL[3]	NRC	Adult healthy workers, military personnel	100 ppm	Generally less than 60 minutes	Significant irritation, but no impact on personnel in performance of emergency work; no irreversible health effects in healthy adults. Emergency conditions one-time exposure.
STPEL[4]	NRC	Most members of general population	50 ppm 75 ppm 100 ppm	60 minutes 30 minutes 10 minutes	Significant irritation, but protects nearly all segments of general population from irreversible acute or late effects. One-time accidental exposure.
TWA[2]	NIOSH	Adult healthy male workers	25 ppm	8 hours	No toxicity or irritation on continuous exposure for repeated 8-hour work shifts.
ERPG-2[5]	AIHA	Applicable only to emergency response planning for the general population (evacuation) (not intended as exposure criteria) (see preface attached)	200 ppm	60 minutes	Exposures above this level entail** unacceptable risk of irreversible effects in healthy adult members of the general population (no safety margin).

1) (EPA 1987) 2) (NIOSH 1994) 3) (NRC 1985) 4) (NRC 1972) 5) (AIHA 1989)

* The (NRC 1979), (WHO 1986), and (Henderson and Haggard 1943) all conclude that available data confirm the direct relationship to increases in effect with both increased exposure and increased exposure duration.

** The (NRC 1979) describes a study involving young animals, which suggests greater sensitivity to acute exposure in young animals. The WHO (1986) warned that the young, elderly, asthmatics, those with bronchitis, and those that exercise should also be considered at increased risk based on their demonstrated greater susceptibility to other non-specific irritants.

REFERENCES FOR HAZARDOUS MATERIALS APPENDIX A, TABLE 1

AIHA. 1989. American Industrial Hygienists Association, Emergency Response Planning Guideline, Ammonia, (and Preface) AIHA, Akron, OH.

EPA. 1987. U.S. Environmental Protection Agency, Technical Guidance for Hazards Analysis, EPA, Washington, D.C.

NRC. 1985. National Research Council, Criteria and Methods for Preparing Emergency Exposure Guidance Levels (EEGL), Short-Term Public Emergency Guidance Level (SPEGL), and Continuous Exposure Guidance Level (CEGL) documents, NRC, Washington, D.C.

NRC. 1972. Guideline for Short-Term Exposure of the Public to Air Pollutants. IV. Guide for Ammonia, NRC, Washington, D.C.

NIOSH. 1994. National Institute of Occupational Safety and Health, Pocket Guide to Chemical Hazards, U.S. Department of Health and Human Services, Washington D.C., Publication numbers 94-116.

WHO. 1986. World Health Organization, Environmental Health Criteria 54, Ammonia, WHO, Geneva, Switzerland.

ABBREVIATIONS FOR HAZARDOUS MATERIALS APPENDIX A, TABLE 1

ACGIH, American Conference of Governmental and Industrial Hygienists

AIHA, American Industrial Hygienists Association

EEGL, Emergency Exposure Guidance Level

EPA, Environmental Protection Agency

ERPG, Emergency Response Planning Guidelines

IDLH, Immediately Dangerous to Life and Health Level

NIOSH, National Institute of Occupational Safety and Health

NRC, National Research Council

STEL, Short Term Exposure Limit

STPEL, Short Term Public Emergency Limit

TLV, Threshold Limit Value

WHO, World Health Organization

HAZARDOUS MATERIALS
APPENDIX B

Hazardous Materials Proposed for Use at the PSEGS

(Total Amounts to be Located on the Entire Site)

Hazardous Materials Management
Appendix B
Hazardous Materials at the PSEGS
(Based on Title 22 Hazard Characterization)

Material	Hazard Characteristics	Purpose	Storage Location	Maximum Stored	Storage Type
Nalco Elimin-OX (Oxygen scavenger)	Ignitability	Oxygen scavenger for boiler chemistry control	Power Block: Containers near power tower	1,600 gal[1]	400 gallon totes
Aqueous Ammonia (19% concentration)	Reactivity, toxicity	control for boiler chemistry	Power Block: Containers near power tower	1,600 gal[1]	400 gallon totes
Sulfuric Acid 93% (66° Baumé)	Corrosivity, reactivity, toxicity	pH control	Power Block and Common Area: Containers located in Water Treatment Building	2,400 gal[1]	400 gallon totes
Sulfuric Acid (Batteries)	Corrosivity, reactivity, toxicity	Electrical power	Power Block: Contained within the main electrical room and the power tower Common Area: Contained within main electrical room	12,000 gal	Batteries
Sodium Hydroxide (50% concentration)	Corrosivity, reactivity, toxicity	pH control	Power Block and Common Area: Containers located in Water Treatment Building	2,400 gal[1]	400 gallon totes
Diesel Fuel (No. 2)	Ignitability	Emergency generator	Power Block: Near fire pump, beneath emergency diesel generator, and adjacent to the mirror wash machines water filling station Common Area: beneath emergency diesel generator and near fire pump	40,000 gal	Aboveground storage tanks and in equipment
Paint, solvents, adhesives, cleaners, sealants, lubricants	Toxicity	Equipment Maintenance,	Power Block: Maintenance Shop	500 gal	1 gal and 5 gal containers

Source: Palen 2012a, pages 4.3-2 through 4.3-5
Note 1: Assumes 2 totes at each power block

Hazardous Materials Usage and Storage During Operation Based on Material Properties					
Material	**Hazard Characteristics**	**Purpose**	**Storage Location**	**Maximum Stored[2]**	**Storage Type**
Cleaning Chemicals and Detergents	Toxicity, irritant	Periodic cleaning of steam turbine	Power Block: Maintenance shop	3,000 gal	Misc. Manufacturer’s containers
Nalco 5200M (Anti- scalant	Irritant, mildly toxic	Wastewater treatment anti-scalant	Power Block: Containers near WWTS Common Area: Containers in Water Treatment Building (storage)	1,500 gal	300 gal totes
Nalco 3DT-187 (Corrosion Inhibitor)	Irritant, mildly toxic	Wet-Surface Air Cooler (WSAC) Corrosion inhibitor	Power Block: Containers near WSAC Common Area: Containers in Water Treatment Building (storage)	2,100 gal	300 gallon totes
Nalco 73801WR (Dispersant)	Irritant, mildly toxic	WSAC Dispersant	Power Block: Containers near WSAC Common Area: Containers in Water Treatment Building (storage)	2,100 gal	300 gallon tote
Nalco TRAC107 (Corrosion Inhibitor)	Irritant, mildly toxic	Closed cooling water Corrosion Inhibitor	Power Block: Contained within CCW system Common Area: Containers in water treatment building (storage)	500 gal	55 drums
Avista Vitec (Scale Inhibitor)	Irritant, mildly toxic	Reverse osmosis scale inhibitor	Power Block and Common Area: Containers in Water Treatment Building	900 gal	300 gallon totes
Sodium Bisulfite	Irritant, mildly toxic	Dechlorination	Power Block and Common Area: Containers in Water Treatment Building	900 gal	300 gallon totes
Nalco 7468 (Anti- foaming agent)	Irritant, mildly toxic	Wastewater treatment system anti-foaming agent	Power Block: Containers near WWTS Common Area: Containers in Water Treatment Building (storage)	1,500 gal	300 gallon totes

Hazardous Materials Usage and Storage During Operation Based on Material Properties					
Material	**Hazard Characteristics[1]**	**Purpose**	**Storage Location**	**Maximum Stored[2]**	**Storage Type**
Lubricating Oil	Mildly toxic	Miscellaneous equipment lubrication	Power Block: Contained within equipment, drums during replacement Common Area: Contained within equipment, spare capacity stored in Maintenance shop	30,000 gal	Contained within equipment and misc. drums during replacement
Mineral Transformer Insulating Oil	Mildly toxic	Provides overheating and insulation protection for transformers	Power Block: Contained within transformers Common Area: Contained within transformers	112,000 gal	Transformers
Hydraulic Oil	Mildly toxic	Miscellaneous equipment control oil	Power Block: Contained within equipment, drums during replacement Common Area: Contained within equipment, spare capacity stored in Warehouse	6,000 gal	Contained within equipment and misc. drums during replacement
Sodium Hypochlorite 12% (trade) solution	Irritant, Corrosivity, reactivity	Biocide	Power Block: Containers in water treatment building Common Area: Potable water treatment area	2,400 gal	300 gal totes

Source: Palen 2012a, pages 4.3-2 through 4.3-5

LAND USE

James Adams

SUMMARY OF CONCLUSIONS

The proposed Palen Solar Electric Generating System (PSEGS) would be located on 3,794 acres of public land administered by the U.S. Bureau of Land Management (BLM), within the federal California Desert Conservation Area (CDCA) Plan area. The acreage for the PSEGS would be 572 acres less than the original footprint of the Palen Solar Power Project (PSPP or approved project). The project area is in the “Multiple-Use Class M” land use category. The Class M land use category may allow electrical generation plants in accordance with federal, state, and local laws subject to approval of a CDCA Plan amendment by the BLM.

The proposed power plant and overhead transmission line to serve the project each require the BLM’s approval of a CDCA Plan amendment. With the BLM’s approval of the amendments, the PSEGS would be consistent with the CDCA Plan. The project owner filed a revised plan of development with the BLM on February 13, 2013. Staff proposes Conditions of Certification **BIO-9** through **BIO-11** to mitigate the loss of desert tortoise habitat and ensure that the PSEGS is compatible with the Northern and Eastern Colorado Desert Coordinated Management Plan (NECO) area.

Unlike the approved project, the PSEGS does not involve the use of private land. Therefore, land use related state and local laws, ordinances, regulations, and standards (LORS) identified for the PSPP are not applicable to the PSEGS, and only federal LORS would apply. As conditioned, the PSEGS would comply with applicable land use-related LORS.

Staff concludes the PSEGS would not disrupt or divide an established community, or convert farmland to non-agricultural use or forest land to non-forest use. The PSEGS is not within a habitat conservation plan approved by the U.S. Fish and Wildlife Service (USFWS), or a natural community conservation plan approved by the California Department of Fish and Wildlife. The PSEGS would either not contribute to cumulative impacts or its incremental impacts would be less than cumulatively considerable.

The **Visual Resources** staff concludes that the PSEGS would result in significant unmitigable direct and cumulative impacts to existing scenic resource values as seen from several viewing areas in the project vicinity and Chuckwalla Valley area (approximately 30 mile radius from the PSEGS), including: Interstate 10 (I-10), State Route 177 (SR-177), Corn Springs Road, Joshua Tree National Park, Palen McCoy Wilderness, and Chuckwalla Mountains Wilderness. Staff concludes the PSEGS would create a land use incompatibility because of significant and unavoidable visual impacts to recreational users of park and wilderness areas.

According to 2010 census data, there are no occupied residences and no minority or below poverty level populations’ living within the six-mile buffer of the PSEGS site. Therefore there is no environmental justice population as defined by *Environmental Justice: Guidance Under the National Environmental Policy Act* that would trigger further scrutiny for purposes of an environmental justice analysis.

INTRODUCTION

In this section, staff discusses if the PSEGS would result in substantial adverse impacts under the California Environmental Quality Act, and if the project would be inconsistent with applicable laws, ordinances, regulations, and standards (LORS) pertaining to land use, agriculture, and forest resources.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS (LORS)

Land Use Table 1 lists the land use LORS applicable to the proposed project. The proposed project's consistency with these LORS is analyzed under "Assessment of Impacts and Discussion of Mitigation" in **Land Use Table 2**. The same federal LORS applicable to the PSPP would be applicable to the PSEGS. Because the PSEGS does not involve the use of private land and would be located entirely on BLM land, the State Subdivision Map Act and Riverside County Land Use LORS are not applicable to the PSEGS.

Land Use Table 1
Applicable Land Use (LORS)

Applicable LORS	Description
Federal	
Federal Land Policy and Management Act (FLPMA), 1976 – 43 CFR 1600, Sec. 501. [43 U.S.C. 1761]	Establishes public land policy; guidelines for administration; and provides for the management, protection, development, and enhancement of public lands. 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).
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 (NEC0) Coordinated Management Plan	The NECO plan is a landscape-scale planning effort for most of the California portion of the Sonoran Desert ecosystem. The planning area encompasses over five million acres. The NECO Plan amended the CDCA plan in 2002 The CDCA Plan/NECO is related to the BLM/U.S. Department of Energy (DOE).Final Programmatic Environmental Impact Statement for Solar Energy Development in Six Southwestern States, which was published in July 2012. It gives guidance as to how and where solar projects can be built on BLM lands.

PROPOSED MODIFIED PROJECT

The PSEGS proposal includes replacing the parabolic trough solar collection system with solar tower technology. Access to the site would use the same primary access road as the approved project. The project would continue to interconnect to the regional transmission grid at Southern California Edison's (SCE) Red Bluff Substation, which is currently under construction. The PSEGS would be comprised of two adjacent solar fields and associated facilities with a total combined nominal output of approximately 500 MW. Palen Solar Holdings (PSH) proposes to develop the PSEGS in two operational units, each consisting of one solar field, one tower, and a power block capable of producing approximately 250 MW of electricity.

SETTING

The PSEGS is to be constructed on a relatively flat, largely undeveloped portion of the Colorado Desert (a subdivision of the Sonoran Desert) in the Chuckwalla Valley between the Palen Mountains and U.S. Interstate 10 (I-10) (Corn Springs Road exit) in Riverside County, California.

The project site is dominated by sand, Sonoran creosote brush scrub, and has several desert dry wash and unvegetated ephemeral dry wash areas. High voltage electric transmission lines cross the area.

The project owner has requested a right of way grant on approximately 5,200 acres of land administered by the U.S. Bureau of Land Management (BLM). The construction and operation of the PSEGS would involve approximately 3,794 acres. As noted earlier, the BLM and the Department of Energy (DOE) published a Final Programmatic Environmental Impact Statement for Solar Energy Development in Six Southwestern States in July 2012. The small town of Desert Center is located at the far southwestern edge of the Riverside East Solar Energy Zone (SEZ), along Interstate (I-10), which runs east-west along the southern boundary of the Riverside East SEZ (USBLM/US DOE 2012). The PSEGS would be located within this SEZ.

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

Energy Commission staff has analyzed the information provided in the Application for Certification (AFC) and the Petition to Amend as well as information from other sources to determine consistency of the proposed PSEGS project with applicable land use LORS and the PSEGS potential to have significant adverse land use-related impacts.

METHODS AND THRESHOLDS FOR DETERMINING SIGNIFICANCE

Significance criteria used in this document are based on Appendix G of the CEQA Guidelines and performance standards or thresholds identified by Energy Commission staff, as well as applicable LORS utilized by other governmental regulatory agencies.

An impact may be considered significant if the proposed project results in:

- Conversion of Farmland or Forest Land;
    - Conversion of Prime Farmland, Unique Farmland, or Farmland of Statewide or

Local 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.[1]

- Conflict with existing zoning for agricultural use, or a Williamson Act contract.
- Conflict with existing zoning for, or cause rezoning of, forest land [as defined in Pub. Resources Code §12220 (g)), timberland (as defined by Pub. Resources Code §4526), or timberland zoned Timberland Production (as defined by Gov. Code §51104(g)).
- The loss of forest land or conversion of forest land to non-forest use.
- Other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland to non-agricultural use[2] or conversion of forest land to non-forest use.

- physical disruption or division of an established community;
- conflict with any applicable habitat conservation plan, natural community conservation plan, or biological opinion;
- 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. This includes, but is not limited to, a General Plan, redevelopment plan, or zoning ordinance; or
- incremental impacts that, although individually limited, are cumulatively considerable when viewed in connection with other project-related effects or the effects of past projects, other current projects, and probable future projects.[3]

In general, a power plant and its related facilities may also be incompatible with existing or planned land uses, resulting in potentially significant impacts, if they create unmitigated noise, dust, or a public health or safety hazard or nuisance; result in adverse traffic or visual impacts; or preclude, interfere with, or unduly restrict existing or future uses.

DIRECT/INDIRECT IMPACTS AND MITIGATION

This section discusses the applicable potential project impacts and associated methods and thresholds of significance referenced above.

[1] FMMP defines “land committed to non-agricultural use” as land that is permanently committed by local elected officials to non-agricultural development by virtue of decisions which cannot be reversed simply by a majority vote of a city council or county board of supervisors.

[2] A non-agricultural use in this context refers to land where agriculture (the production of food and fiber) does not constitute a substantial commercial use.

[3] Cumulative impacts refer to two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts. The individual effects may be changes resulting from a single project or a number of separate projects and can result from individually minor, but collectively significant actions taking place over a period of time (CEQA Guidelines §15355; 40 CFR 1508.7)

Agriculture and Forest

A. Would the project convert 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 nonagricultural use?

The PSEGS would not convert farmland. The project site and vicinity are characterized largely as undeveloped desert. Figure 2.1-3 in the Petition to Amend shows adjacent parcels to the north and west of the project site that are being farmed (Palen 2102a). The PSEGS would not convert farmland and would not result in a significant adverse impact under this CEQA criterion.

The BLM's Master Title Plats[4] showing Township 5 South Range 17 East, and Township 6 South Range 17 East of the San Bernardino Meridian, California, which includes the project area, provide notations that the townships are not suitable for agriculture. However, more recent land use shows parcels are being farmed near the PSEGS site.

B. Would the project conflict with existing zoning for agricultural use, or a Williamson Act contract?

The PSEGS would not convert prime farmland, conflict with existing county zoning for agricultural use or a Williamson Act contract, or result in the conversion of farmland to a non-agricultural use. The PSEGS would not conflict with this CEQA criterion and would not result in a significant impact. The PSEGS would be constructed entirely on BLM land and county zoning would not apply. Also, there are no Williamson Act contracts on BLM lands.

C. Would the project conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))?

The PSEGS would not conflict with zoning for, or cause rezoning of forest land, timberland or timberland zoned Timberland Production. The project area and vicinity are characterized as undeveloped desert though there are some agricultural activities near the PSEGS site.

The project area is located on BLM administered land designated "Multiple-Use Class M." This class provides for energy and utility development in accordance with federal, state and local law. The project's proposed use on this acreage is a use that would be consistent with uses permitted in Multiple-Use Class M and would not conflict with the CDCA Plan with the approval of an amendment by the BLM. With the BLM's approval the PSEGS would not be in conflict with this CEQA criterion and would not result in a significant adverse impact.

[4] The BLM's Master Title Plats are the foundation of their land records. It is a drawing of the most recent survey or protraction (unsurveyed lands) by township. It is a graphic plat illustrating current federal ownership, agency jurisdiction, and rights reserved to the Federal government on private land within a township (USDOI2010).

D. Would the project result in the loss of forest land or conversion of forest land to non-forest use?

The PSEGS would not result in the loss of forest land or conversion of forest land to non-forest use.[5] The project area and vicinity are characterized as undeveloped desert. The PSEGS would not create a loss or conversion of forest land and would not result in a significant adverse impact under this CEQA criterion.

E. Would the project involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use?

The PSEGS would be constructed on an undeveloped portion of the Colorado Desert in the eastern Chuckwalla Valley. The project area consists of relatively undisturbed, unimproved desert dominated by sand and Sonoran creosote brush scrub. The area also has desert dry wash woodland, unvegetated ephemeral dry wash areas, and stabilized and partially stabilized desert dunes, and transmission power lines. The PSEGS would not involve other changes in the existing environment creating a conversion of farmland or forest land and would not result in a significant impact under this CEQA criterion.

Physical Disruption Or Division Of An Established Community

The PSEGS would not physically divide an established community. The project site is in an undeveloped portion of the Colorado Desert in eastern Chuckwalla Valley. The unincorporated community of Desert Center (population 150) is the closest community to the project. Desert Center is approximately 10 miles west of the project site. The PSEGS would not conflict with this CEQA criterion and would not create a significant impact.

Conflict With Any Applicable Habitat Conservation Plan Or Natural Community Conservation Plan

The 3,794 acre PSEGS site is not within an approved U.S. Fish and Wildlife Service habitat conservation plan under section 10 of the Endangered Species Act, or within an approved California Department of Fish and Wildlife natural community conservation plan under section 2800 of the Natural Communities Conservation Act. The PSEGS would not conflict with this CEQA criterion and would not result in a significant impact.

Conflict With Any Applicable Land Use Plan, Policy Or Regulation

California Desert Conservation Area

In 1976 Congress passed the Federal Land Policy Management Act (FLPMA). In the FLPMA, Congress required the preparation of a comprehensive long-range plan for the California Desert Conservation Area (FLPMA section 601).

[5] In determining whether impacts to forest resources, including timberland, are significant environmental effects, lead agencies may refer to information compiled by the California Department of Forestry and Fire Protection regarding the state's inventory of forest land, including the Forest and Range Assessment Project and the Forest Legacy Assessment project; and forest carbon measurement methodology provided in Forest Protocols adopted by the California Air Resources Board (CCR2010).

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.

The CDCA Plan area totals 25 million acres of which 12 million acres are administered by the BLM. The project site is located within the CDCA Plan "Multiple-Use Class M (Moderate Use)" land use category. This class may provide for electrical generation plants 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. The Class M category is also designed to conserve desert resources and to mitigate damage to those resources that permitted uses may cause. (USDOI1980, pg. 13 and pg. 15) [See **Land Use Figure 1**– Current BLM Multiple Use Classes].

Although the site is classified as Multiple-Use Class M, a land use amendment to the CDCA would be required because the proposed use, a solar thermal electric generating facility, is not identified in the current CDCA Plan. The BLM's approval of an amendment for the power plant and the transmission line would make the project conform to the CDCA Plan. With the BLM's approval of the amendments, the PSEGS would not result in a conflict with the CDCA Plan under this CEQA criterion and would not result in a significant adverse impact.

Northern and Eastern Colorado Desert Coordinated Management Plan

The PSEGS area is within the Northern and Eastern Colorado Desert Coordinated Management Plan (NECO) area. The NECO is an 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. The project area is within the Desert Tortoise Eastern Colorado Recovery Unit.

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 (USFWS) [USDOI2002, pg. 1-1].

The NECO designates a portion of the PSEGS area as a Multiple-species Wildlife Habitat Management Area (WHMA). The WHMA was established to provide long-term conservation of various species of special concern. The entire PSEGS site is within a multi-species WHMA. The BLM designates portions of land under its control as Desert Wildlife Management Areas (DWMA). Approximately 1,400 feet of the proposed generation tie-line is within the Chuckwalla DWMA. The southwestern portion of the project site, natural gas line corridor, and proposed generation tie-line corridor overlaps with 226 acres of the Chuckwalla Desert Tortoise Critical Habitat Unit.

As indicated in the **BIOLOGICAL RESOURCES** section, without mitigation the PSEGS could contribute to the cumulatively significant loss of biological resources within the Chuckwalla Valley and the NECO area. The **Biological Resources** analysis proposes

Conditions of Certification **BIO-9** through **BIO-11** to mitigate the loss of desert tortoise habitat. Condition of Certification **BIO-7** would require the project owner to prepare and implement a Biological Resources Mitigation Implementation and Monitoring Plan (BRMIMP). The BRMIMP comprehensively describes avoidance, minimization, and mitigation measures. Staff concludes that with the proposed conditions of certification the PSEGS would be compatible with the NECO.PSEGS

Land Use Compatibility

A power plant and its related facilities may also be incompatible with existing or planned land uses, resulting in potentially significant impacts, if they create unmitigated noise, dust, or a public health or safety hazard or nuisance; result in adverse traffic or visual impacts; or preclude, interfere with, or unduly restrict existing or future uses. Staff has conferred with staff in the following technical areas: **Noise and Vibration**, **Public Health**, **Hazardous Materials Management**, **Traffic and Transportation**, and **Visual Resources** and concludes that the PSEGS would have no significant direct or cumulative impacts in any of these technical areas except **Visual Resources,** and perhaps **Traffic and Transportation.** The **Traffic and Transportation** analysis notes that traffic impacts are undetermined and will be addressed in the Final Staff Assessment.

The **Visual Resources** staff concludes that the PSEGS would result in significant unmitigable direct and cumulative impacts to existing scenic resource values as seen from several viewing areas in the project vicinity and Chuckwalla Valley area (approximately 30 mile radius from the PSEGS), including: Interstate 10 (I-10), State Route 177 (SR-177), Corn Springs Road, Joshua Tree National Park, Palen McCoy Wilderness, and Chuckwalla Mountains Wilderness. Staff concludes the PSEGS would be an incompatible land use for recreationists using these park and wilderness areas.

CUMULATIVE IMPACTS

Under CEQA Guidelines, "a cumulative impact consists of an impact which is created as a result of the combination of the project evaluated in the EIR [environmental impact report] together with other projects causing related impacts" (Cal. Code Regs., tit. 14, §15130(a)(1)). Cumulative impacts of the project must be discussed if the incremental effect of a project, combined with the effects of other projects is "cumulatively considerable" (Cal. Code Regs., tit. 14, §15130(a)). Such incremental effects are to be viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects" (Cal. Code Regs., tit. 14, §15164(b)(1)). Together, these projects comprise the cumulative scenario which forms the basis of the cumulative impact analysis.

The discussion of cumulative impacts shall reflect the severity of impacts and their likelihood of occurrence, "but the discussion need not provide as great detail as is provided for the effects attributable to the project alone. The discussion of cumulative impacts shall be guided by standards of practicality and reasonableness, and should focus on the cumulative impact to which the identified other projects contribute rather than the attributes of other projects which do not contribute to the cumulative impact" (Cal. Code Regs., tit. 14, §15130(b)).

Geographic Scope of Analysis

Executive Summary Tables 1, 2, and 3, identify existing projects, foreseeable projects in the project area, and foreseeable projects in the California Desert within 110 miles of the PSEGS site, respectively. The projects discussed below are contained in the **Executive Summary Tables 1, 2,** and **3**. The cumulative land use analysis considers past, current and probable future projects that are relatively near the proposed project that would contribute to cumulative impacts by impacting agricultural or forest lands, disrupting or dividing an established community, conflicting with applicable land use plans, policy or regulation, or conflicting with an applicable habitat conservation plan or natural community conservation plan.

Existing Projects

The eastern Chuckwalla Valley is characterized by undisturbed desert open space and wilderness, distinctive flora such as creosote bush scrub and Joshua tree, sand dunes, and mountainous terrain with large rock outcroppings. Urban and suburban development is absent and infrastructure other than energy transmission infrastructure is very limited. Farming is limited and primarily dedicated to jojoba and palm tree production. Much of the land has been identified as desert tortoise habitat by the U.S. Fish and Wildlife Service. Land south of I-10 is within the NECO desert tortoise southern recovery unit (*Eastern Colorado Recovery Unit*).

Desert Center, population 150, is a focused specialty center primarily serving the commercial needs of highway travelers on I-10 and State Highway 177. It is an aggregation of highway service commercial related uses clustered around the Desert Center-Rice Road interchange. The community also includes two mobile home parks, industrial/storage facilities, and a Caltrans equipment yard.

The Chuckwalla Valley Raceway, a motor raceway operation, constructed on 400 acres of the Desert Center Airport property opened for business in April 2010. The multiphase project includes three road courses, a large garage/enclosed field area, recreational vehicle hook-ups and a private airstrip. Private memberships and "track day" rentals are available.

The Devers-Palo Verde No. 1 (DPV1) is an existing 500 kilovolt (kV) transmission line that parallels I-10. The transmission line is within a developed transmission line right of way within a federally approved utility corridor[6] (The DPV1 was approved by the California Public Utilities Commission (CPUC) in 1979 and constructed in 1982.

The Blythe 230 kV Transmission Line is two 230 kV transmission lines that span approximately 70 miles between the Julian Hinds Substation and the Bucks Substation. The transmission line was completed in June 2010. The transmission line was constructed within the existing federally approved utility corridor along I-10.

The Blythe Energy Project is a 520 MW combined-cycle natural gas-fired electricity generating facility located north of I-10 and seven miles west of the California/Arizona border. It is connected to the Bucks Substation.

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[6] The utility corridor is one of 16 utility corridors designated in the California Desert Conservation Area Plan of 1980, as amended.

A Section 368 Energy Corridor[7] parallels I-10 and includes the existing federal utility corridor designated in the CDCA Plan. The no default corridor width shown for the Chuckwalla Valley segment of the Section 368 Corridor is 10,560 feet (USDOI2009, Table A).

The Devers-Palo Verde 2 Transmission Line Project, approved by the CPUC in January 2007, involves the construction of two 500 kilovolt electric transmission lines. The route for the Devers-Palo Verde 2 (DPV2) Transmission Line parallels the existing DPV1 transmission line route. Construction began in June 2011.

The Red Bluff Substation is located in the Desert Center area near I-10 within the Devers-Palo Verde transmission line corridor and will be operational in December 2013. The substation will be operated and owned by SCE. The 230/500 kV substation would allow electricity to be carried by the Devers-Palo Verde 2 transmission line. The substation also would allow interconnection of the proposed PSEGS project and other proposed renewable energy projects in the Desert Center area.

Foreseeable Projects in the Project Area

The U.S.DOE, Office of Energy Efficiency and Renewable Energy and the BLM, in response to direction from Congress under Title II, Section 211 of the Energy Policy Act of 2005, as well as Executive Order 13212, Actions to Expedite Energy-Related Projects (May 18, 2001), has published a Programmatic Environmental Impact Statement that evaluates utility-scale solar energy development; to develop and implement agency-specific programs that would establish environmental policies and mitigation strategies for solar energy projects; and, to amend relevant BLM land use plans with the consideration of establishing a new BLM solar energy development program (SEDPEISIC2010).

On March 11, 2009, Secretary of Interior Salazar announced Secretarial Order No. 3285, a policy goal of identifying and prioritizing specific locations best suited for large-scale production of solar energy on tracts of BLM administered land. The BLM identified a 202,295-acre area in eastern Riverside County as “Riverside East.” Riverside East includes the Chuckwalla Valley and lands on the north side of I-10 and west of the city of Blythe.

The proposed Desert Southwest Transmission Line project consists of construction of an approximate 118-mile 500 kV transmission line and a new substation/switching station. The BLM Palm Springs-South Coast Field Office approved a ROW grant for the transmission line to cross public land between Blythe and the western end of the Coachella Valley.

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[7] Section 368 of the Energy Policy Act of 2005 (the Act), Public Law 109-58 (H.R. 6), enacted August 8, 2005, directs the Secretaries of Agriculture, Commerce, Defense, Energy, and the Interior (the Agencies) to designate under their respective authorities corridors on federal land in 11 western states (Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming) for oil, gas, and hydrogen pipelines and electricity transmission and distribution facilities (energy corridors). Section 368 requires the Agencies to conduct any “environmental reviews” necessary to complete the designation of Section 368 energy corridors. The evaluation of future project-related environmental impacts must await site-specific proposals and the required site-specific environmental review (WECPEIS2010).

Foreseeable Projects in the California Desert The proposed Chuckwalla Solar 1, a 200 megawatt (MW) solar photovoltaic generating project, is to be constructed one mile north of Desert Center. The project is to be constructed on 4,083 acres of federal land administered by the BLM. A plan for development (POD) has been submitted to the BLM for their approval. The proposed PSEGS site is approximately 10 miles east of the project.

The proposed Desert Lily Soleil Project, a 100 MW photovoltaic generating project on 1,216 acres, is to be located six miles north of Desert Center. The project includes a five to eight mile transmission line to the proposed SCE Red Bluff Substation. A POD has been submitted to the BLM for their approval. The PSEGS is approximately 18 miles east of the project.

The proposed Desert Sunlight Solar Farm, a 550 MW solar photovoltaic generating project, is to be located approximately five miles north of Desert Center. The project is to be constructed on 4,410 acres of BLM administered land. A record of decision and a CDCA Plan amendment have been approved by the BLM. The PSEGS site is approximately 12 miles east of the project.

The proposed Genesis Solar Energy Project, a 250 MW solar parabolic trough generating project, is located north of the Ford Dry Lake exit on I-10. The project's facility footprint would be 1,800 acres. The project was approved by the Energy Commission on October 12, 2010 and is under construction. The PSEGS site is approximately 15 miles west of the Genesis project site.

Blythe Energy Project ll is a 520 MW combined-cycle power plant that would be located within the Blythe Energy Project site boundary located on 30 acres of a 76 acre site. It was approved by the Energy Commission on September 23, 2010. The project would be about 24 miles east of the PSEGS site.

Cumulative Impacts Analysis

The potential for the PSEGS to cause significant cumulative impacts has been considered using the following criteria from the CEQA Guidelines.

Agriculture and Forest Resources

A. Would the incremental effect of the project, combined with the effects of the other projects within the geographic scope convert 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 nonagricultural use?

The PSEGS would have no direct impact on farmland and it would not contribute to cumulative impacts on this resource.

B. Would the incremental effect of the project, combined with the effects of the other projects within the geographic scope conflict with existing zoning for agricultural use, or a Williamson Act contract?

The PSEGS would not conflict with existing zoning for agricultural use and there are no Williamson Act contracts on BLM land. The PSEGS would not contribute to cumulative impacts on agricultural uses.

C. Would the incremental effect of the project, combined with the effects of the other projects within the geographic scope conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))?

The PSEGS would not conflict with existing zoning for or cause rezoning of forest land or timberland and would not contribute to cumulative impacts on these resources.

D. Would the incremental effect of the project, combined with the effects of the other projects within the geographic scope result in the loss of forest land or conversion of forest land to non-forest use?

The PSEGS would not result in the loss or conversion of forest land and would not contribute to cumulative impacts on this resource.

E. Would the incremental effect of the project, combined with the effects of the other projects within the geographic scope involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use?

The PSEGS would not involve changes in the environment that would result in the conversion of farmland or forest land and would not contribute to cumulative impacts on these resources. Physical Disruption Or Division Of An Established Community Would the incremental effect of the project, combined with the effects of the other projects within the geographic scope physically divides an established community?

The PSEGS would not physically divide an established community and would not contribute to cumulative impacts under this criterion.

Conflict With Any Applicable Habitat Or Natural Community Conservation Plan

Would the incremental effect of the project, combined with the effects of the other projects within the geographic scope conflict with any applicable habitat conservation plan or natural community conservation plan?

The 3,794-acre PSEGS site is not within an approved U.S. Fish and Wildlife Service habitat conservation plan under section 10 of the Endangered Species Act, or within an approved California Department of Fish and Wildlife natural community conservation plan under section 2800 of the Natural Communities Conservation Act and would not contribute to cumulative impacts under this criterion.

Conflict With Any Applicable Land Use Plan, Policy Or Regulation

Would the incremental effect of the project, combined with the effects of the other projects within the geographic scope conflict with any applicable land use plan, policy or regulation of an agency with jurisdiction over the project adopted for the purpose of avoiding or mitigating an environmental effect?

As noted earlier the PSEGS is in the NECO Management Plan area. The NECO is an update to the CDCA Plan to make it compatible with desert tortoise conservation and recovery. The southwestern portion of the PSEGS site, natural gas line corridor, and proposed generation tie-line corridor overlap with 226 acres of the Chuckwalla Desert Tortoise Critical Habitat Unit. The **Biological Resources** analysis proposes Conditions of Certification **BIO-9** through **BIO-11** to mitigate for loss of desert tortoise habitat. With the three identified conditions of certification, staff concludes that the PSEGS would be consistent with the NECO and its impacts under this criterion would not be cumulatively considerable.

Cumulative Impacts Conclusion

The PSEGS would not divide an established community, convert farmland or forest land, is not within a habitat conservation plan or a natural community conservation plan, and would not contribute to cumulative impacts to these resources. The **Biological Resources** analysis proposes Conditions of Certification **BIO-9** through **BIO-11** to mitigate for loss of desert tortoise habitat. With the three identified conditions of certification, the PSEGS would be consistent with the NECO and its impacts under this criterion would not be cumulatively considerable.

COMPLIANCE WITH LORS

Land Use Table 2 provides an analysis of the PSEGS's consistency with applicable land use-related LORS.

Land Use Table 2
PSEGS's Consistency with Applicable Land Use LORS

LORS		Consistency Determination	Basis for Consistency or Inconsistency	Proposed Condition of Certification
Source	**Policy and Strategy Descriptions**			
Federal				
Federal Land Policy and Management Act 1976 **The California Desert Conservation Area Plan 1980 as amended**	In 1976 Congress passed the Federal Land Policy Management Act - a law to direct the management of the public lands of the United States. In section 601, Congress required the preparation of a comprehensive long-range plan for the California Desert Conservation Area (CDCA). The purpose of this plan was			

LORS		Consistency Determination	Basis for Consistency or Inconsistency	Proposed Condition of Certification
Source	**Policy and Strategy Descriptions**			
	to establish guidance for the management of the public lands in the California Desert administered by the U.S. Bureau of Land Management.			
Chapter 2 Multiple-Use Classes: - Multiple-Use Class M (Moderate Use)	Multiple-Use Class M (Moderate Use) 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 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.	The PSEGS would be consistent if the BLM approves a project-specific CDCA Plan amendment.	The PSEGS is to be constructed on federal land administered by the BLM. Sites associated with power generation or transmission not identified in the CDCA Plan is considered through the CDCA Plan amendment process (USDOI1980). All requests for amendment must be submitted to the District Manager of the California Desert District (USDOI1980). The project owner has submitted an application to the BLM requesting a project-specific CDCA Plan amendment and right of way.	Condition of Certification **LAND-1**

LORS		Consistency Determination	Basis for Consistency or Inconsistency	Proposed Condition of Certification
Source	**Policy and Strategy Descriptions**			
Chapter 3 Plan Elements - Energy Production And Utility Corridors Element	Sites associated with power generation or transmission not identified in the Plan will be considered through the CDCA Plan Amendment process. Utility needs which do not conform to an adopted corridor system will be processed by means of a Plan Amendment in conjunction with necessary permit hearings required by other agencies. The scope of the CDCA allows the designation of corridors which address the following types of utility facilities: • New electrical transmission towers and cables of 161 kV (kilovolt) or above; and • All pipelines with diameters greater than 12 inches. The following criteria are used in determining decisions contained in this element. These criteria also will be used when evaluating future applications: (1) Minimize the number of separate rights of way by utilizing existing rights of way as a basis for planning 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	The project would be consistent if the BLM approves a project-specific CDCA Plan amendment.	The transmission line route for the gen-tie line between the Palen solar project and the proposed SCE Red Bluff Substation has been identified and the substation will be operational by December 2013. Sites associated with power generation or transmission not identified in the CDCA Plan are considered through the CDCA Plan amendment process (USDOI1980). All requests for amendment must be submitted to the District Manager of the California Desert District (USDOI1980).	Condition of Certification **LAND-1**

LORS		Consistency Determination	Basis for Consistency or Inconsistency	Proposed Condition of Certificatio n
Source	Policy and Strategy Descriptions			
	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.			

NOTEWORTHY PUBLIC BENEFITS

Staff has not identified any noteworthy public benefits related to land use.

FACILITY CLOSURE

At some point in the future, the proposed facility would cease operation and close down. At that time, it would be necessary to ensure that closure occurs in such a way that public health and safety and the environment are protected from adverse impacts.

The planned lifetime of the project is estimated at 30 years. At least 12 months prior to the initiation of decommissioning, the project owner would prepare a Facility Closure Plan for Energy Commission review and approval. This review and approval process would be public and allow participation by interested parties and other regulatory agencies. At the time of closure, all applicable land use related LORS would be identified and the closure plan would discuss conformance of decommissioning, restoration, and remediation activities with these LORS. All of these activities would fall under the authority of the Energy Commission.

For more information on facility closure, please see the General Conditions provided in this PSA.response to Agency and public comments

RESPONSE TO AGENCY AND PUBLIC COMMENTS

VEENA DOIJODE E-MAIL COMMENT LETTER, April 22, 2013

Comment: The commenter would like the Energy Commission to assess the impact to their parcel close to the project as they intend to grow palm dates on this land.

Staff Response: Staff has reviewed an aerial image of the project area that shows the commenter's property is about five miles southeast of the PSEGS site. The PSEGS would be constructed on undeveloped desert land administered by the BLM and would not convert farmland or conflict with existing zoning for agricultural use. The solar technology would not affect agricultural activities. Staff concludes that the construction and operation of the PSEGS would not prevent local landowners from growing palm dates or other agricultural products.

CONCLUSIONS

This analysis focused on whether the PSEGS would result in substantial adverse impacts under the California Environmental Quality Act, and if the project would be inconsistent with applicable land use laws, ordinances, regulations, and standards. Staff concludes the following:

1. The PSEGS would be located on public land (federal land) administered by the U.S. Bureau of Land Management (BLM)

2. The approximately 3,794 acre PSEGS site is within the federal California Desert Conservation Area (CDCA) Plan area. The project area is in the "Multiple-Use Class M" land use category. The Class M land use category allows electrical generation plants in accordance with federal, state, and local laws subject to the approval of a CDCA Plan amendment by the BLM.

3. Staff concludes that with implementation of Conditions of Certification **BIO-9** through **BIO-11** the PSEGS would be compatible with the NECO.

4. The proposed power plant and the overhead transmission line to serve the project each require the BLM's approval of a CDCA Plan amendment. With the BLM's approval of the amendments, the PSEGS would be consistent with the CDCA Plan.

5. The PSEGS does not divide or disrupt the physical arrangement of an established community.

6. The PSEGS is not located within a habitat conservation plan approved by the U.S. Fish and Wildlife Service, or a natural community conservation plan approved by the California Department of Fish and Wildlife.

7. The PSEGS does not convert prime farmland, conflict with existing county zoning for agricultural use or a Williamson Act contract, or result in the conversion of farmland to a non-agricultural use.

8. The PSEGS does not conflict with zoning for or cause rezoning of forest land, timberland or timberland zoned Timberland Production. The project does not result in the loss of forest land or conversion of forest land to non-forest use.

The **Visual Resources** staff concludes that the PSEGS would result in significant unmitigable direct and cumulative impacts to existing scenic resource values as seen from several viewing areas in the project vicinity and Chuckwalla Valley area (approximately 30 mile radius from the PSEGS), including: Interstate 10 (I-10), State

Route 177 (SR-177), Corn Springs Road, Joshua Tree National Park, Palen McCoy Wilderness, and Chuckwalla Mountains Wilderness. Staff concludes the PSEGS would create a land use incompatibility because of significant and unavoidable visual impacts to recreational users of park and wilderness areas.

PROPOSED CONDITION OF CERTIFICATION

Staff has made minor edits to the one existing land use condition of certification from the Commission Decision for the Palen Solar Power Project should the Commission approve the project amendment. (Note: Deleted text is in ~~strikethrough~~; new text is **bold** and **underlined**.)

LAND-1 Prior to the start of construction, the ~~Applicant~~ **project owner** shall provide to the Compliance Project Manager (CPM) documentation of the U.S. Bureau of Land Management (BLM) Right-of-Way grant and the BLM-approved project-specific amendment to the California Desert Conservation Area Plan (CDCA) permitting the construction/operation of the proposed Palen Solar ~~Power Project~~ **Electric Generating System**.

Verification: Prior to the start of construction, the ~~Applicant~~ **project owner** shall submit to the CPM a copy of the BLM approved **Right-of-Way grant and** project specific amendment to the CDCA Plan permitting the Palen Solar ~~Power Project~~ **Electric Generating System**.

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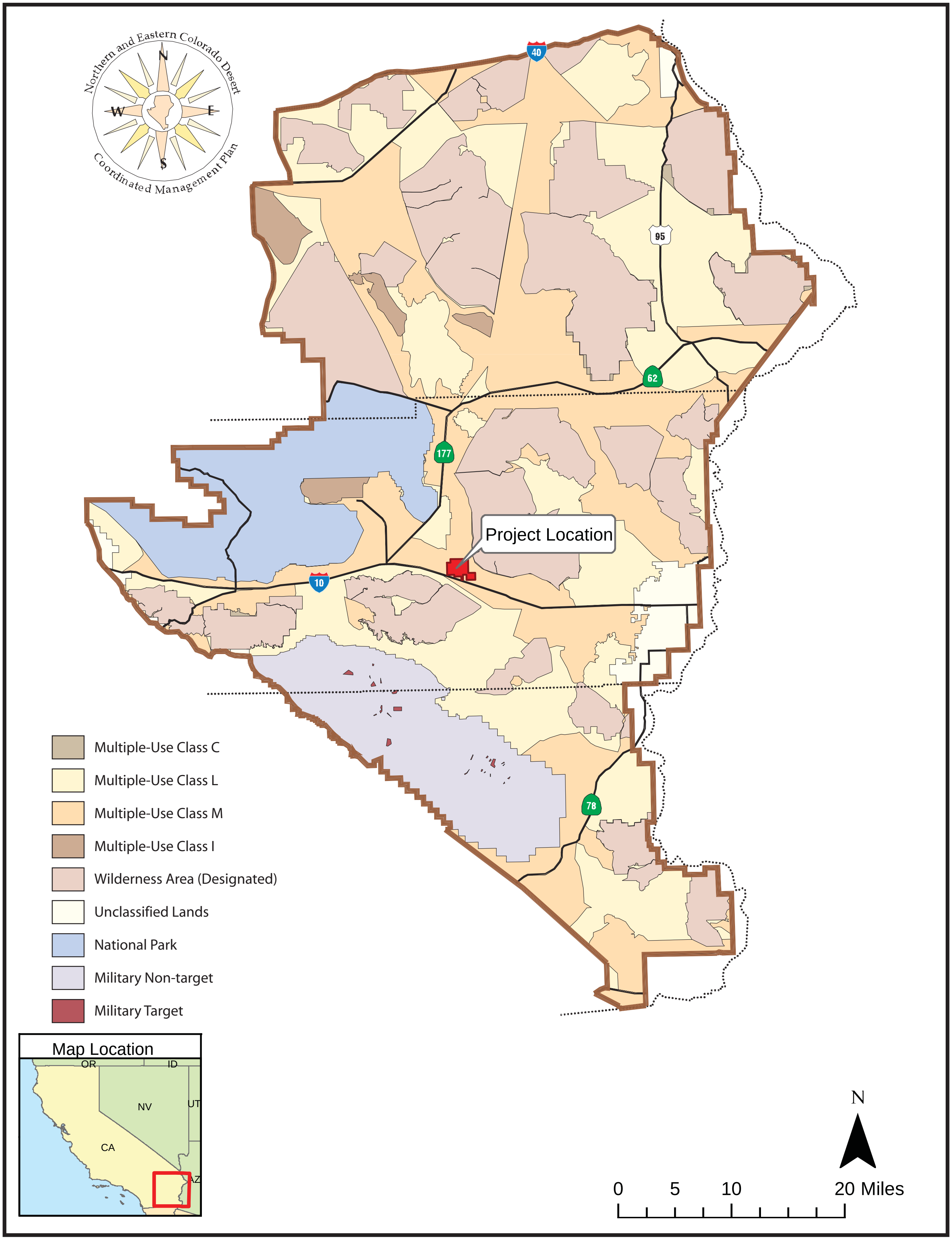
LAND USE- FIGURE 1

Palen Solar Electric Generating System - Current BLM Plan Multiple Use Classes



CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: AFC Figure 5.7-2 and California Desert Conservation Area Plan

NOISE AND VIBRATION

Shahab Khoshmashrab

SUMMARY OF CONCLUSIONS

Because construction and operational noise would be the same or lower than the approved project, the modified Palen Solar Electric Generating System (PSEGS), if built and operated in conformance with the existing conditions of certification, would comply with all applicable noise and vibration laws, ordinances, regulations and standards, and would produce no significant adverse noise impacts on people within the affected area, directly, indirectly, or cumulatively. The existing conditions of certification provide appropriate mitigation, in the form of good design practice and selection of appropriate project equipment that would avoid any significant adverse impacts.

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 all combine to determine whether the facility would meet applicable noise control laws and ordinances and whether it would cause significant adverse environmental impacts. In some cases, vibration may be produced as a result of power plant construction practices such as blasting or pile driving. The ground-borne 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 proposed modified project, 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). For an explanation of technical terms used in this section, please refer to **Noise Appendix A** immediately following.

METHODS AND THRESHOLDS FOR DETERMINING SIGNIFICANCE

CALIFORNIA ENVIRONMENTAL QUALITY ACT

The California Environmental Quality Act (CEQA) requires that significant environmental impacts be identified and either eliminated or mitigated to the extent feasible. Section XI of Appendix G of CEQA’s guidelines (Cal. Code Regs., tit. 14, App. G) describes some characteristics that could 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 more than 5 dBA at the nearest sensitive receptor.

Staff has concluded that an increase in background noise levels up to and including 5 dBA in a residential setting is insignificant; an increase of more than 10 dBA, however, is clearly significant. An increase of between 5 and 10 dBA should be considered adverse, but could be either significant or insignificant, depending upon the particular circumstances of a particular case.

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

1. the resulting noise level;

2. the duration and frequency of the noise;

3. the number of people affected; and,

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

Noise due to construction activities is usually considered to be insignificant in terms of CEQA compliance if:

- the construction activity is temporary; and,
- the use of heavy equipment and noisy[1] activities is limited to daytime hours.

Staff uses the above method and threshold to protect the most sensitive populations.

Noise and Vibration Table 1
Laws, Ordinances, Regulations and Standards (LORS)

Applicable LORS	Description
Federal	
Occupational Safety & Health Act (OSHA): 29 U.S.C. § 651 et seq.	Protects workers from the effects of occupational noise exposure
U.S. Environmental Protection Agency (USEPA)	Assists state and local government entities in development of state and local LORS for noise
State	
California Occupational Safety & Health Act (Cal-OSHA): 29 U.S.C. § 651 et seq., Cal. Code Regs., tit. 8, §§ 5095-5099	Protects workers from the effects of occupational noise exposure

[1] Noise that draws a legitimate complaint. For the definition of "legitimate complaint", please see Condition of Certification **NOISE-4**.

Applicable LORS	Description
Local	
Riverside County General Plan, Noise Element	Establishes goals, objectives, and procedures to protect the public from noise intrusion.
Riverside County Noise Ordinance, Ordinance 847 (Regulating Noise)	Specifies sound level limits. Limits hours of construction

FEDERAL

Under the Occupational Safety and Health Act of 1970 (OSHA) (29 U.S.C. § 651 et seq.), the Department of Labor, Occupational Safety and Health Administration, (OSHA) adopted regulations (29 C.F.R. § 1910.95) designed to protect workers against the effects of occupational noise exposure. 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.

Guidelines are available from the U.S. Environmental Protection Agency (USEPA) to assist state and local government entities in developing state and local LORS for noise. Because there are existing local LORS that apply to this project, the USEPA guidelines are not applicable.

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

The Federal Transit Administration (FTA) has published guidelines for assessing the impacts of ground-borne vibration associated with construction of rail projects, which have been applied by other jurisdictions to 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 ground-borne vibration. The FTA measure of the threshold of perception is 65 vibrational decibel (VdB), 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 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 of California, Office of Noise Control, prepared the Model Community Noise Control Ordinance, which provides guidance for acceptable noise levels in the absence of local noise standards. This model also defines a simple tone, or "pure tone," as one-third octave band sound pressure levels that can be used to determine whether a noise source contains annoying tonal components. The Model Community Noise Control

Ordinance further recommends that, when a pure tone is present, the applicable noise standard should be lowered (made more stringent) by 5 A-weighted decibels (dBA).

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 federal OSHA standards (see **Noise Appendix A, Table A4**).

LOCAL

The project is located within Riverside County. The Noise Element of the Riverside County General Plan (Riverside County 2007) and the Riverside County Noise Ordinance (Riverside County 2008) apply to this project.

Riverside County Noise Element

The County Noise/Land Use Compatibility Guidelines, provided in the Noise Element, are used to evaluate potential noise impacts and provide criteria for environmental impact findings and conditions for project approval. Land use compatibility defines the acceptability of a land use in a specified noise environment. For residential land uses, these guidelines categorize noise levels of up to 60 dBA day/night average sound level (Ldn) or CNEL as “normally acceptable” and up to 70 dBA Ldn or CNEL as “conditionally acceptable”.

Riverside County Noise Ordinance

The Noise Ordinance allows for different levels of acceptable noise depending upon land use. Section 4 of Ordinance No. 847 (Regulating Noise) limits noise on any property that causes the exterior noise level on any other occupied property to 55 dBA during the daytime hours and 45 dBA during the nighttime hours, for noise-sensitive receptors[2] within a very low density rural area, such as the area surrounding the project site.

This Noise Ordinance also limits the hours of construction activities to the hours of 6:00 a.m. to 7:00 p.m., June through September, 6:00 a.m. to 6:00 p.m., October through May, Mondays through Fridays, and to 9:00 a.m. to 5:00 p.m. on Saturdays.

PROPOSED MODIFIED PROJECT

The modifications proposed in the petition include replacing the parabolic trough solar collection system, steam turbine generator, and associated heat transfer fluid with BrightSource’s solar tower technology. Heliostats—elevated mirrors guided by a tracking system mounted on a pylon—focus the sun’s rays on a solar receiver steam generator (SRSG) located atop a 750-foot-tall tower near the center of each solar field to create steam to drive a turbine that generates electricity.

[2] A sensitive noise receptor, also referred to as a noise-sensitive receptor, is a receptor at which there is a reasonable degree of sensitivity to noise (such as residences, schools, hospitals, elder care facilities, libraries, cemeteries, and places of worship).

The modified project includes two power blocks similar in size and types of equipment as the approved project. However, the farthest power block to the nearest noise-sensitive receptor (LT1, a residence described in more detail below) would be located farther away from this receptor than the farthest power block for the approved project. The nearest power block to this receptor would be located approximately at the same distance to this receptor as the nearest block for the approved project. For this reason, project noise would be slightly lower at LT1 for the modified project as compared to the approved project.

The only notable difference between the tower technology and the parabolic trough technology is that one of the major sources of noise for the tower technology, the SRSG, would be located atop a 750-foot-tall tower. This may cause a different sound dispersion profile than the approved project (due to the height of the source) within a couple of thousands of feet. However, due to the long distance of LT1 to the nearest tower, approximately 6,000 feet, the project's overall noise would be heard much the same as the approved project at this receptor.

Construction noise impact from the modified project is expected to be the same as the approved project.

SETTING AND EXISTING CONDITIONS

The PSEGS site is located in Riverside County, approximately 0.5 mile north of Interstate 10 (I-10) near the Corn Springs Road intersection. The site is in a remote area of primarily undeveloped land, with open space and some land developed as a nursery. The small community of Desert Center is located approximately 10 miles west of the site, along I-10.The predominant noise source in proximity to the project site is vehicular traffic on I-10.

The land use of the PSEGS site is undeveloped open space, and the surrounding land uses include undeveloped land and some agricultural land to the west of the project site.

There is one residence, LT1, located approximately 25 feet from the northwest corner of the project right-of-way boundary, but over 1 mile from the nearest power block. The power block would be the major source of the power plant's noise during the facility's operation. Another residence is located approximately 3,500 feet northwest of the site boundary and well over a mile from the nearest power block (Solar Millennium 2009a, AFC § 5.8.2.3; **Project Description Figure 4**).

Ambient Noise Monitoring

In order to establish a baseline for the comparison of predicted project noise with existing ambient noise, the project owner presented the results of an ambient noise survey in 2009 (Solar Millennium 2009a, AFC § 5.8.2.4; Tables 5.8-5, 5.8-6). Because the noise environment is still the same, a new ambient noise survey is not necessary, and staff uses the 2009 survey to evaluate the noise and vibration impacts of the modified project at the project's noise-sensitive receptors.

Ambient noise levels were measured near the western boundary of the PSEGS site, near the two residences to the northwest of the project site, from May 18 to May 19, 2009. One long-term measurement was taken near the two residences over a 25-hour period between 6:51 p.m., May 18, and 7:51 p.m., May 19, 2009. The survey was performed using acceptable equipment and techniques. The noise survey monitored existing noise levels near the nearest sensitive receptors, shown in **Noise Figure 1**:

1. Location LT1: closest residence to the project site. This is a residence located approximately 25 feet from the northwest corner of the project right-of-way boundary, but over 1 mile from the nearest power block. A location near this residence (LT, as shown in **Noise Figure 1**) was monitored continuously between 6:51 p.m., May 18, and 7:51 p.m., May 19, 2009.

2. Location LT2: the second closest residence to the project site. This is a residence located approximately 3,500 feet northwest of the site boundary and well over a mile from the nearest power block. A location near this residence (LT, as shown in **Noise Figure 1**) was monitored continuously between 6:51 p.m., May 18, and 7:51 p.m., May 19, 2009.

Because of the similarity of the noise environments between these residences and the long-term survey location, staff finds it reasonable to use the results of this survey as the baseline for the existing ambient noise levels at these noise-sensitive receptors.

Noise Table 2 summarizes the ambient noise measurements (Solar Millennium 2009a, AFC § 5.8.2.4; Table 5.8-6).

Noise Table 2
Summary of Measured Noise Levels

Measurement Sites	Measured Noise Levels, dBA	
	Average During Daytime Hours L_{eq}	Average During Nighttime Hours L_{eq}
LT1, Nearest Residence	43[1]	34[2]
LT2, Second Nearest Residence	43[1]	34[2]

Source: Solar Millennium 2009a, AFC § 5.8.2.4; Table 5.8-6
1 - Staff calculations of average of the daytime hours
2 - Staff calculations of average of the nighttime hours

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 normal long-term operation of the project.

Construction Impacts and Mitigation

Construction noise is usually a temporary phenomenon. Construction of the PSEGS project is expected to be typical of similar projects in terms of equipment used and other types of activities (Solar Millennium 2009a, AFC § 5.8.3.2; Palen 2012a, § 6.4.2).

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.

Construction noise from the modified project is expected to be the same as the approved project. There are no new pieces of equipment or methods of construction that were not analyzed previously for the approved project. Therefore, in this PSA, staff uses the same data and analysis as those described for the approved project, to evaluate the project's impacts at the nearest noise-sensitive receptors.

In the AFC, the project owner predicted a construction noise level of 59 dBA at the nearest residential receptor, LT1. It is shown here in **Noise Table 3**.

Noise Table 3
Predicted Construction Noise Level

Receptor	Highest Construction Noise Level L_{eq} (dBA)[1]	Measured Existing Ambient, Average Daytime L_{eq} (dBA)[2]	Cumulative, Using Highest Noise Level of 48 dBA	Change
LT1	59	43	59	+16
LT2	46	43	48	+5

Sources:
1 - Solar Millennium 2009a, AFC § 5.8.3.1, and staff's calculations
2 - **Noise Table 2**, above

The applicable local noise LORS do not limit the loudness of construction noise, but staff compares the projected noise levels with ambient levels

The project owner commits to performing noisy construction work during the times specified in the Riverside County Noise Ordinance, to the hours of 6:00 a.m. to 7:00 p.m., June through September, and 6:00 a.m. to 6:00 p.m., October through May, Mondays through Fridays, and 9:00 a.m. to 5:00 p.m. on Saturdays, with no construction allowed on Sundays and Federal holidays (Solar Millennium 2009a, AFC § 5.8.3.1; Palen 2012a, § 6.4.3). To ensure that these hours are, in fact, enforced, staff proposes Condition of Certification **NOISE-6**.

Therefore, the noise impacts of the PSEGS project construction activities would comply with the noise LORS.

Since construction noise typically varies with time, it is most appropriately measured by, and compared with, the L_{eq} (energy average) metric. Even though project construction would likely last 33 months (Palen 2012a, § 6.3.2), the construction activities within an area that would potentially considerably impact the nearest residential receptor would not last more than several months. The nearest location to the nearest residence (LT1) where there would be more than minimal activities is the northwestern extent of the solar arrays of Unit #2, near the residence. Construction noise from site grading and array installation would not exceed 59 dBA L_{eq} at the residence, temporarily resulting in a 16 dBA increase in the ambient noise level at LT1 (see **Noise Table 3** above); this is a considerable increase. However, this impact would be only for the short time that construction activities occur in that portion of the site. Noise levels would decrease the farther away construction activities occur from the residence.

The second nearest residence (LT2) is also located northwest of the project site, but it is further away from the site than LT1 is. The above activities in the northwestern extent of the solar arrays of Unit #2 would likely generate a noise level of 46 dBA L_{eq} at the LT2. This will result in a temporary increase in the ambient noise level at LT2 of 5 dBA (see **Noise Table 3** above). Staff considers an increase of 5 dBA to be less than significant.

Therefore, because of the temporary nature of these activities and because construction would be limited to the daytime hours, the noise effects of plant construction are considered to be less than significant at the above receptors.

To ensure the project construction would create less than significant adverse impacts at the most noise-sensitive receptors, in addition to Condition of Certification **NOISE-6**, staff proposes Conditions of Certification **NOISE-1** and **NOISE-2**, which would establish a public notification and noise complaint process to resolve any complaints regarding construction noise.

In light of the following proposed conditions of certification, the noise impacts of the PSEGS project construction activities would be less than significant.

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 feed water and steam systems, the piping and tubing that comprise the steam path have 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. Traditionally, high pressure steam is then raised in the boiler or a temporary boiler and allowed to escape to the atmosphere through the steam piping. This flushing action, referred to as a *high pressure steam blow*, is quite effective at cleaning out the steam system. A series of short steam blows, lasting 2 or 3 minutes each, are performed several times daily over a period of 2 or 3 weeks. At the end of this procedure, the steam lines are connected to the steam turbine, which is then ready for operation. Alternatively, high pressure compressed air can be substituted for steam.

High pressure steam blows, if unsilenced, can typically produce noise levels as high as 129 dBA at a distance of 50 feet; this would amount to roughly 88 dBA at LT1 and 84 at

LT2. Unsilenced steam blows could be disturbing at the nearest noise-sensitive receptors, depending on the frequency, duration, and noise intensity of venting. With a silencer installed on the steam blow piping, noise levels are commonly attenuated to 89 dBA at 50 feet.

A quieter steam blow process, referred to as *low pressure steam blow* and marketed under names such as QuietBlow™ or Silentsteam™, has become popular. This method utilizes lower pressure steam over a continuous period of about 36 hours. Resulting noise levels reach about 86 dBA at 50 feet.

To minimize the impact of steam blows, staff has proposed Condition of Certification **NOISE-7**, which limits steam blow noise to 89 dBA measured at a distance of 100 feet. A noise level of 89 dBA at 100 feet results in about 53 dBA at LT1, which is tolerable. This condition of certification also limits steam blows to between 8:00 a.m. and 5:00 p.m.

Linear Facilities

Construction of linear facilities typically moves along at a rapid pace, thus not subjecting any one receptor to noise impacts for more than 2 or 3 days. Further, construction activities would be limited to daytime hours. To ensure that these hours are, in fact, adhered to in compliance with the LORS, staff proposes Condition of Certification **NOISE-6**.

Vibration

The only construction operation likely to produce vibration that could be perceived off site would be pile driving. The project owner anticipates that pile driving would not be required for construction of the PSEGS project (Solar Millennium 2009a, AFC § 5.8.3.2; Palen 2012a, § 6.4.2). Therefore, no vibration impacts are expected.

Worker Effects

The project owner has acknowledged the need to protect construction workers from noise hazards and has recognized applicable LORS that would protect construction workers (Solar Millennium 2009a, AFC §§ 5.8.1, 5.8.4). To ensure that construction workers are, in fact, adequately protected, staff has proposed Condition of Certification **NOISE-3**.

Operation Impacts and Mitigation

The primary noise source of the PSEGS plants would be the power blocks, where the steam turbine generators, the air-cooled condensers, electric transformers, and various pumps and fans would be located. The modified project’s major noise sources are similar to those for the approved project, and thus, the noise modeling used for the approved project is still applicable. Staff uses the results of that modeling for this analysis. The project’s two power blocks (one for each 250 MW unit) would be centrally located in the middle of each solar unit; these blocks would be surrounded by the solar reflector fields. The overall noise generated by these various noise sources would be based on the configuration of the sources, the number and power rating of the equipment, and any noise-reducing measures incorporated. Staff compares the projected project noise with applicable LORS, in this case the Riverside County noise 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.

The project would avoid the creation of annoying tonal (pure-tone) noises by balancing the noise emissions of various power plant features during plant design (Condition of Certification **NOISE-4**).

For the approved project, the project owner performed noise modeling to determine the project's noise impacts on sensitive receptors (Solar Millennium 2009a, AFC § 5.8.3.3). Based on that modeling, the project owner predicted the operational noise levels at the nearest sensitive receptors; they are shown in **Noise Table 4** below. As explained above, the modified project's major noise sources are similar to those for the approved project, and thus, the noise modeling used for the approved project is still applicable. Staff uses the results of that modeling for this analysis (**Noise Table 4**).

The Noise Ordinance allows for different levels of acceptable noise depending upon land use. Section 4 of Ordinance No. 847 (Regulating Noise) limits noise on any property that causes the exterior noise level on any other occupied property to 55 dBA during the daytime hours and 45 dBA during the nighttime hours, for noise-sensitive receptors within a very low density rural area, such as the area surrounding the project site. The project owner predicts the project's operational noise level at receptor LT1, the nearest receptor, to be 42 dBA L_{eq} (Solar Millennium 2009a, AFC § 5.8.3.3). This level is less than the above LORS requirements.

The above predicted operational noise level also complies with the Riverside County's guideline that considers a noise level of up to 60 dBA day/night average (Ldn) or CNEL (Community Noise Equivalent Level) to be normally acceptable.

To ensure compliance, staff proposes Condition of Certification **NOISE-4**. Also to ensure compliance, staff proposes Conditions of Certification **NOISE-1** and **NOISE-2**, which would establish a public notification and noise complaint process requiring the project owner to resolve any problems caused by operational noise.

With the implementation of the following conditions of certification, noise due to the operation of the PSEGS project would be in compliance with applicable LORS.

As explained, the PSEGS project would operate during the daylight hours. Thus, staff compares the project's noise levels to the existing daytime ambient noise levels at the project's noise-sensitive receptor. (Please see below for limited nighttime activities.)

Typically, daytime ambient noise consists of both intermittent and constant noises. The noise that stands out during this time is therefore best represented by the average noise level, referred to as L_{eq}. Staff's evaluation of the above noise surveys shows that the daytime noise environment in the project area consists of both intermittent and constant noises. Thus, staff compares the project's noise levels to the daytime ambient L_{eq} levels at the project's noise-sensitive receptors.

The project owner has predicted the operational noise level at LT1; it is shown here in **Noise Table 4**.

Noise Table 4
Predicted Operational Noise Levels at the Identified Sensitive Residential Receptors

Receptor	Project Alone Operational Noise Level (dBA)[1]	Measured Existing Ambient, Daytime L_{eq} (dBA)[2]	Cumulative L_{eq} (dBA)	Increase in Existing Ambient (dBA)
LT1	42	43	46	+3
LT2	33[3]	43	43	0

Sources:
1 - Solar Millennium 2009a, AFC § 5.8.3.2
2 - **Noise Table 2**, above
3 - Staff's calculations based on the noise modeling in the AFC.

Combining the ambient noise level of 43 dBA L_{eq} (**Noise Table 4**, above) with the project noise level of 42 dBA at LT1 would result in 46 dBA L_{eq}, 3 dBA above the ambient. As described above (in **METHODS AND THRESHOLDS FOR DETERMINING SIGNIFICANCE**), staff regards an increase of up to 5 dBA as a less-than-significant impact. Therefore, staff considers the above noise impact at LT1 to be less than significant.

Combining the ambient noise level of 43 dBA L_{eq} (**Noise Table 4**, above) with the project noise level of 33 dBA at LT2 would result in 43 dBA L_{eq}; the project would not cause an increase in the ambient noise level. Therefore, there would be no impact at this location.

Adverse impacts on residential receptors can also be identified by comparing predicted power plant noise levels with the nighttime ambient background noise levels at the nearest sensitive residential receptors. The project would have limited nighttime activities related to maintenance. The project owner's projection of the noise level from these activities at LT1 is 22 dBA (Solar Millennium 2009a, AFC § 5.8.3.3). This is significantly lower than the average nighttime ambient noise level of 34 at LT1 (**Noise Table 2**, above), and thus, the project's nighttime activities would have a less than significant impact on the project's most noise-sensitive receptor. Subsequently, these activities would likely have no impact on LT2, due to its further distance from the project site than LT1.

Staff proposes Condition of Certification **NOISE-4** to ensure that the noise level due to project operation would not exceed the above level (in **Noise Table 4**, second column).

Tonal Noises

One possible source of annoyance could be strong tonal noises. Tonal noises are individual sounds (such as pure tones) which, while not louder than permissible levels, stand out in sound quality. To ensure that tonal noises do not cause public annoyance, staff proposes Condition of Certification **NOISE-4**, which would require mitigation measures, if necessary, to ensure the project would not create tonal noises.

Linear Facilities

All water pipes and gas pipes would be underground and therefore silent during plant operation. Noise effects from electrical interconnection lines typically do not extend beyond the lines' right-of-way easements and would be inaudible to receptors.

Vibration

Vibration from an operating power plant could be transmitted through two primary means: ground (ground-borne vibration), and air (airborne vibration).

The operating components of the PSEGS plant would consist of high-speed steam turbine generators and various pumps and fans. All of these pieces of equipment would be carefully balanced in order to operate; permanent vibration sensors would be attached to the turbines and generators. Based on experience with numerous previous projects employing similar equipment, staff agrees with the project owner that ground-borne vibration from the PSEGS project would be undetectable by any likely receptor.

Airborne vibration (low frequency noise) can rattle windows and objects on shelves and can rattle the walls of lightweight structures. However, none of the project equipment is likely to produce noticeable low frequency noise beyond the project site boundaries. This makes it highly unlikely that the PSEGS would cause perceptible airborne vibration effects at any offsite noise-sensitive receptor.

Worker Effects

The project owner acknowledges the need to protect plant operating and maintenance workers from noise hazards and commits to compliance with all applicable LORS (Solar Millennium 2009a, AFC § 5.8.4; Palen 2012a, § 6.4.3). Signs would be posted in areas of the plant with noise levels exceeding 85 dBA (the level that OSHA recognizes as a threat to workers' hearing), and hearing protection would be required and provided. To ensure that plant operation and maintenance workers are adequately protected, Energy Commission staff has proposed Condition of Certification **NOISE-5**. For further discussion of proposed worker safety conditions of certification, please see **WORKER SAFETY AND FIRE PROTECTION** section of this document.

Facility Closure

All operational noise from the project would cease when the PSEGS project closes, and no further adverse noise impact from its operation would be possible. The remaining potential temporary noise source would be the dismantling of the project structures and equipment, as well as any site restoration work that may be performed. Since this noise would be similar to that caused by the original construction, it could be similarly treated – that is, noisy work would be performed during daytime hours with machinery and equipment that are properly equipped with mufflers. Any noise LORS in existence at that time would apply. Unless modified, applicable conditions of certification included in the Energy Commission decision would also apply.

CUMULATIVE IMPACTS

Since the original project was approved, there are no new projects or new “reasonably foreseeable probable future projects” within a distance that would cause cumulative noise and vibration impacts when combined with the modified project.

Furthermore, the change in technology (from parabolic trough to solar tower) will not result in cumulative impacts that were not analyzed in the original project.

NOTEWORTHY PUBLIC BENEFITS

The proposed modified project would affect the daytime ambient noise levels in the project area. While this change would be barely noticeable at the project’s most noise-sensitive receptor, and thus not significant, development of the proposed modified project would not result in any noteworthy public benefits.

RESPONSE TO AGENCY AND PUBLIC COMMENTS

No public or agency comments related to noise and vibration have been received to date.

CONCLUSIONS

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

EXISTING CONDITIONS OF CERTIFICATION

All the **Noise and Vibration** conditions of certification remain unchanged (see below).

PUBLIC NOTIFICATION PROCESS

NOISE-1 At least 15 days prior to the start of ground disturbance, the project owner shall notify all residents within one mile of the project site and the linear facilities, by mail or by 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. If the telephone is not staffed 24 hours a 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 where it is 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. This communication shall also verify that the telephone number has been established and posted at the site, and shall provide that telephone number.

NOISE COMPLAINT PROCESS

NOISE-2 Throughout the construction and operation of the project, 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 in the complaint;
- if the noise is project related, take all feasible measures to reduce the source of the noise; and
- submit a report documenting the complaint and actions taken. The report shall include: a complaint summary, including the final results of noise reduction efforts and, if obtainable, a signed statement by the complainant stating that the noise problem has been resolved to the complainant's satisfaction.

Verification: Within five days of receiving a noise complaint, the project owner shall file a Noise Complaint Resolution Form, shown below, with both the local jurisdiction and the CPM that documents the resolution of the complaint. If mitigation is required to resolve the 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 performed and complete.

EMPLOYEE NOISE CONTROL PROGRAM

NOISE-3 The project owner shall submit to the CPM for review and approval a noise control program. The noise control program shall be used to reduce employee exposure to high (above permissible) noise levels during construction in accordance to the applicable OSHA and Cal-OSHA standards.

Verification: At least 30 days prior to the start of ground disturbance, the project owner shall submit the noise control program to the CPM. The project owner shall make the program available to Cal-OSHA upon request.

NOISE RESTRICTIONS

NOISE-4 The project design and implementation shall include appropriate noise mitigation measures adequate to ensure that the operation of the project will not cause the noise levels due to plant operation alone, during the daytime hours of 7 a.m. to 10 p.m., to exceed an average of 48 dBA L_{eq} measured at or near monitoring location LT1.

No new pure-tone components shall be caused by the project. No single piece of equipment shall be allowed to stand out as a source of noise that draws legitimate complaints[3].

A. When the project first achieves a sustained output of 85 percent or greater of rated capacity, the project owner shall conduct a 25-hour community noise survey at monitoring location LT1, or at a closer location acceptable to the CPM. This survey shall also include measurement of one-third octave band sound pressure levels to ensure that no new pure-tone noise components have been caused by the project.

   The measurement of power plant noise for the purposes of demonstrating compliance with this Condition of Certification may alternatively be made at a location, acceptable to the CPM, closer to the plant (e.g., 400 feet from the plant boundary) and this measured level then mathematically extrapolated to determine the plant noise contribution at the affected residence. The character of the plant noise shall be evaluated at the affected receptor locations to determine the presence of pure tones or other dominant sources of plant noise.

B. If the results from the noise survey indicate that the power plant noise at the affected receptor site exceeds the above value during the above time period, mitigation measures shall be implemented to reduce noise to a level of compliance with this limit.

C. If the results from the noise survey indicate that pure tones are present, mitigation measures shall be implemented to eliminate the pure tones.

Verification: The survey shall take place within 30 days of the project first achieving a sustained output of 85 percent or greater of rated capacity. Within 15 days after completing the survey, the project owner shall submit a summary report of the survey to the CPM. Included in the survey report shall be a description of any additional mitigation measures necessary to achieve compliance with the above listed noise limit and a schedule, subject to CPM approval, for implementing these measures. When these measures are in place, the project owner shall repeat the noise survey.

Within 15 days of completion of the new survey, the project owner shall submit to the CPM a summary report of the new noise survey, performed as described above and showing compliance with this condition.

OCCUPATIONAL NOISE SURVEY

NOISE-5 Following the project's attainment of a sustained output of 85 percent or greater of its rated capacity, the project owner shall conduct an occupational noise survey to identify any noise hazardous areas in the facility.

[3] A legitimate complaint refers to a complaint about noise that is caused by the PSEGS project as opposed to another source (as verified by the CPM). A legitimate complaint constitutes a violation by the project of any noise condition of certification (as confirmed by the CPM), which is documented by an individual or entity affected by such noise.

The survey shall be conducted by a qualified person in accordance with the provisions of Title 8, California Code of Regulations, sections 5095-5099 (Article 105) 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 mitigation measures to be employed in order 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.

CONSTRUCTION RESTRICTIONS

NOISE-6 Heavy equipment operation and noisy construction work relating to any project features within one-quarter of a mile of an existing residence shall be restricted to the times delineated below, unless a special permit has been issued by the County of Riverside:

Mondays through Fridays:

June through September: 6 a.m. to 7 p.m.

October through May: 6 a.m. to 6 p.m.

Saturdays:

9 a.m. to 5 p.m.

Sundays and Federal holidays:

No Construction Allowed

Haul trucks and other engine-powered equipment shall be equipped with adequate mufflers. Haul trucks shall be operated in accordance with posted speed limits. Truck engine exhaust brake use shall be limited to emergencies.

Verification: Prior to ground disturbance, the project owner shall transmit to the CPM a statement acknowledging that the above restrictions will be observed throughout the construction of the project.

NOISE-7 If a traditional high-pressure steam blow process is used, the project owner shall equip steam blow piping with a temporary silencer that quiets the noise of steam blows to no greater than 89 dBA measured at a distance of 100 feet. The steam blows shall be conducted between 8:00 a.m. and 5:00 p.m. unless arranged with the CPM such that off-site impacts will not cause annoyance to receptors. If a low-pressure continuous steam blow process is used, the project owner shall submit to the CPM a description of the process, with expected noise levels and planned hours of steam blow operation.

Verification: At least 15 days prior to the first steam blow, the project owner shall notify all residents or business owners within one mile of the project site boundary. The notification may be in the form of letters, phone calls, fliers, or other effective means as approved by the CPM. The notification shall include a description of the purpose and nature of the steam blow(s), the planned schedule, expected sound levels, and explanation that it is a one-time activity and not part of normal plant operation.

REFERENCES

Palen 2012a – Palen Solar Holdings, LLC/Galati Blek, Scott Galati (TN 68910). Palen Solar Holdings LLC's Petition for Amendment, dated December 17, 2012. Submitted to CEC/C. Stora on December 18, 2012.

Riverside County 2007 – Riverside County General Plan, Noise Element.

Riverside County 2008 – Riverside County Municipal Code, Noise Ordinance, Title 9, Chapter 9.52 Noise Regulation.

Solar Millennium 2009a – Solar Millennium (TN 52937). Application for Certification Vol. 1 & 2, dated 8/24/2009.

EXHIBIT 1 - NOISE COMPLAINT RESOLUTION FORM

Palen Solar Electric Generating System (09-AFC-7C)
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).

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, they 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 what would be expected for commercial or industrial zones. Nighttime ambient levels in urban environments are about 7 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 (Effects of Noise on People, U.S. Environmental Protection Agency, December 31, 1971).

In order to help the reader understand the concept of noise in decibels (dBA), **Noise Table A2** has been provided to illustrate 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 one 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). The rules for decibel addition used in community noise prediction are:

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:

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.

PUBLIC HEALTH

Huei-An (Ann) Chu, Ph.D.

SUMMARY OF CONCLUSIONS

California Energy Commission (Energy Commission) staff (staff) analyzed potential public health risks associated with construction and operation of the modified Palen Solar Electric Generating System (PSEGS) and does not expect any significant adverse cancer, or short- or long-term noncancer health effects from project toxic air emissions. Staff's analysis of potential health impacts from the proposed site configuration of the PSEGS 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 PSEGS would not contribute significantly to morbidity or mortality in any age or ethnic group residing in the project area.

With the incorporation of the existing Condition of Certification **PUBLIC HEALTH-1**, the proposed facility would not present a significant health risk to the public. Staff concludes that construction and operation of the PSEGS would be in compliance with all applicable LORS regarding long-term and short-term project impacts in the area of **Public Health**.

INTRODUCTION

On December 17, 2012, Palen Solar Holdings, LLC (PSH), filed a petition with the Energy Commission requesting to modify the approved Palen Solar Power Project (PSPP) and rename the project the Palen Solar Electric Generating System (PSEGS). PSPP was approved as a 500-megawatt (MW) solar thermal power-generating facility utilizing parabolic trough technology. The project owner has requested to amend the approved facility by replacing the approved parabolic trough with BrightSource's solar power tower technology.

The purpose of this Preliminary Staff Assessment (PSA) is to determine if emissions of toxic air contaminants (TACs) from the proposed PSEGS 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 would evaluate mitigation measures to reduce such impacts to insignificant levels.

In addition to the analysis contained in this Public Health 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 PSEGS 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 PSEGS 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 PSEGS 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 project owner 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 modified project construction and operation including ensuring that wastes would be managed in an environmentally safe manner.

METHODOLOGY AND THRESHOLDS FOR DETERMINING ENVIRONMENTAL CONSEQUENCES

METHODOLOGY

The analysis of PSEGS effects must comply with the California Environmental Quality Act (CEQA) which requires that the significance of individual effects be determined by the Lead Agency, in this case the Energy Commission.

It also 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).

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. The thresholds include staff’s evaluation of the environmental effects of the proposed PSEGS on land uses (i.e. rural land and desert around the site).

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 (HRA) is used to determine if people might be exposed to those types of pollutants at unhealthy levels. The standard approach currently used for HRA involves four steps: 1) hazard identification; 2) exposure assessment; 3) dose-response assessment; and 4) risk characterization. These four steps are briefly discussed below (OEHHA, 2003).

First, hazard identification is conducted to determine the potential health effects that could be associated with project emissions. For air toxics sources, the main purpose is to identify whether or not a hazard exists. If this hazard exists, staff evaluates the exact toxic air contaminant(s) of concern and whether a TAC is a potential human carcinogen or is associated with other types of adverse health effects.

Second, an exposure assessment is conducted to estimate the extent of public exposure to project emissions, including: (1) the worst-case concentrations of project emissions in the environment using dispersion modeling; and (2) the amounts of pollutants that people could be exposed to through inhalation, ingestion, and dermal contact. Therefore, this step involves emissions quantification, modeling of environmental transport and dispersion, evaluation of environmental fate, identification of exposure routes, identification of exposed populations and sensitive subpopulations, and estimation of short-term and long-term exposure levels.

Third, a dose-response assessment is conducted to characterize the relationship between exposure to an agent and incidence of an adverse health effect in exposed populations. The assumptions and methodologies of dose-response assessment are different between cancer and noncancer health effects. In carcinogenic risk assessment, the dose-response relationship is expressed in terms of a potency (or slope) factor that is used to calculate the probability of getting cancer associated with an estimated exposure. It is assumed in cancer risk assessments that risk is directly proportional to dose and that there is no threshold for carcinogenesis below which there is no risk. In non-carcinogenic risk assessment, dose-response data developed from animal or human studies are used to develop acute and chronic noncancer Reference Exposure Levels (RELs). The acute and chronic RELs are defined as the concentration at which no adverse noncancer health effects are anticipated. Unlike cancer health effects, noncancer acute and chronic health effects are generally assumed to have thresholds for adverse effects. In other words, acute or chronic injury from a TAC would not occur until exposure to the pollutant has reached or exceeded a certain concentration (i.e., threshold).

Finally, risk characterization is conducted to integrate the health effects and public exposure information and to provide quantitative estimates of health risks resulting from project emissions. Staff characterizes potential health risks by comparing worst-case exposure to safe standards based on known health effects.

Staff conducts its public health analysis by evaluating and then adopting the information and data provided in the petition by the project owner. Staff also relies upon the expertise of the California Environmental Protection Agency (Cal/EPA) Office of Environmental Health Hazard Assessment (OEHHA) to: (1) identify contaminants that are known to the state to cause cancer or other noncancer health effects; and (2) identify the toxicity and cancer potency factors of these contaminants. Staff relies upon the expertise of the California Air Resources Board (ARB) and the local air districts to conduct ambient air monitoring of toxic air contaminants and the California 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 would 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 and noncancer-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 would, 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 multi-pathway 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 health risk assessment process for this project addresses three categories of health impacts: (1) acute (short-term) health effects; (2) chronic (long-term) noncancer effects; and (3) cancer risk (also long-term).

Acute Noncancer Health Effects

Acute health effects are those that result from short-term (one-hour) exposure to relatively high concentrations of pollutants. Such effects are temporary in nature and include symptoms such as irritation of the eyes, skin, and respiratory tract.

Chronic Noncancer Health Effects

Chronic noncancer health effects are those that result from 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 both acute and chronic 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 the analysis 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, and 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) 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.

<u>Cancer Risk and Estimation Process</u>

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

The screening analysis is performed to assess worst-case risks to public health associated with the proposed modified project. If the screening analysis were to predict a risk below significance levels, then no further analysis would be necessary and the source would be considered acceptable with regard to carcinogenic effects. However, if the risk were to be above the significance level, then further analysis, using more realistic site-specific assumptions, would be performed to obtain a more accurate estimate of potential public health risks.

SIGNIFICANCE CRITERIA

Energy Commission staff determines the health effects of exposure to toxic emissions based on impacts to the maximally exposed individual (MEI). This is a person hypothetically exposed to project emissions at a location where the highest project-related impacts were calculated using the worst-case assumptions as described above. Since the exposure of MEI would produce the maximum impacts possible around the source, staff uses this risk estimate as a marker for acceptability of the project's impacts.

As described earlier, noncriteria pollutants for this project are evaluated for short-term (acute) and long-term (chronic) noncancer health effects, and cancer (long-term) health effects. The significance of project-related health impacts are determined separately for each of these three health effects categories.

<u>Acute and Chronic Noncancer Health Effects</u>

Staff assesses the significance of noncancer health effects by calculating a *hazard index (HI)*. A hazard index is a ratio comparing exposure from facility emissions to the safe exposure level (i.e. Reference Exposure Level, or REL). A ratio of less than 1.0 suggests that the worst-case exposure would be below the limit for safe levels and would thus be insignificant with regard to health effects. The hazard indices for all toxic substances with the same type of health effect are added together to yield a total hazard index for the source. The total hazard index is calculated separately for acute effects and chronic effects. A total hazard index of less than 1.0 would indicate that cumulative worst-case exposures would be less than the reference exposure levels and not lead to significant noncancer health effects. In such cases, noncancer health impacts from project emissions would be considered unlikely even for sensitive members of the population. Staff would therefore conclude that there would be no significant noncancer project-related public health impacts. This assessment approach is consistent with risk management guidelines of both California OEHHA and U.S. EPA.

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}. In other words, under state regulations, an incremental cancer risk greater than 10 in 1 million from a project should be regarded as suggesting a potentially significant carcinogenic impact on public health. The 10 in 1 million risk level is also used by the Air Toxics "Hot Spots" (AB 2588) program as the public notification threshold for air toxic emissions from existing sources.

An important distinction between staff's and the Proposition 65 risk characterization approach 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 the manner applied by Proposition 65. The significant risk level of 10 in 1 million is consistent with the level of significance adopted by the South Coast Air Quality Management District (SCAQMD) in Rule 1401 (Solar Millennium 2009a, Section 5.10.1.3).

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 could be ensured. Staff's analysis also addresses potential impacts on all members of the population including the young, the elderly, and 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 (both acute and chronic) set to protect the public from the effects of air toxics in question. When a screening analysis shows cancer risks to be above the significance level, refined assumptions would be applied for what would likely be a lower, more realistic risk estimate. If, after refined assumptions, the project's risk is still found to exceed the significance level of 10 in 1 million, staff would require appropriate measures to reduce the risk to less than significance levels. If, after all feasible risk reduction measures have been considered and a refined analysis still 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 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 Proposition 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 local air pollution control 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 ARB/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	
South Coast Air Quality Management District (SCAQMD) Rule 402	Prohibits the discharge of air contaminants or other material which cause injury, detriment, nuisance, or annoyance to the public; endanger the comfort, repose, health or safety of the public; or cause injury or damage to business or property.
SCAQMD Rule 1401	Discusses new source review for air toxics; specifies limits for maximum individual cancer risk, cancer burden, and noncancer acute and chronic hazard index from new permit units, relocations, or modifications to existing permit units which emit toxic air contaminants listed in Table I of the rule.
SCAQMD Rule 1470	Establishes fuel requirements, operating requirements and emission standards for stationary diesel-fueled internal combustion engines greater than 50 brake-horsepower.

PROPOSED MODIFIED PROJECT

The modification of PSEGS includes replacing the parabolic trough solar collection system and associated heat transfer fluid (HTF) with solar tower technology. The solar tower technology would create steam to run an electricity generator by using a field of heliostats—elevated mirrors, each approximately 12 feet tall, mounted on pylons and guided by a sun-tracking system—to focus the sun's rays on a solar receiver steam generator (SRSG) on top of a 750-foot solar tower located near the center of each of two solar fields. The modified PSEGS would be comprised of two adjacent solar fields and associated facilities with a total combined nominal output of approximately 500 MW. The project owner proposes to develop the PSEGS in two operational units, each consisting of one solar field, one tower, and a power block capable of producing approximately 250 MW of electricity.

In summary, the primary modifications to the already-approved Palen Solar Power Project (PSPP) needed for PSEGS related to Public Health are as follows:

- Two 250-MW power-generating units, each consisting of a dedicated field of approximately 85,000 heliostats, a 750-foot solar tower and receiver, a power block, a natural-gas fired auxiliary boiler, a natural gas-fired night preservation boiler, a diesel-fired emergency fire pump system, a diesel-fired emergency electric generator system, and a wet surface air condenser unit;
- An approximately 15-acre common facilities area located in the southwestern corner of the site, with an administrative/warehouse building and two 2-acre evaporation ponds (reduced from four 2-acre evaporation ponds for the PSPP). Additional equipment to be installed and operated include a diesel-fired emergency fire pump system, a diesel-fired emergency electric generator system, mirror washing machines and site support vehicles.
- An approximately 203-acre temporary construction laydown area located in the southwestern portion of the site immediately north of the common facilities area.
- Re-routing of the generation tie-line near the western end of the route and around the newly constructed Red Bluff Substation; the purpose of this re-routing is to align the PSEGS generation tie-line route immediately adjacent to the NextEra Desert Sunlight generation tie-line to minimize crossings over Interstate 10 and to ensure easy entry into the Red Bluff Substation nearest the PSEGS breaker position;
- Elimination of the secondary emergency access road;
- Reduction of the project footprint from 4,366 acres to 3,794 acres;
- Reduction of the amount of grading by 4.3 million cubic yards because the heliostat technology does not require an entirely flat surface;
- An increase in NOx emissions from the use of nighttime preservation and auxiliary boilers.

SETTING AND EXISTING CONDITIONS

This section describes the environment in the vicinity of the proposed modified 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 Colorado Desert portion of eastern Riverside County, approximately 10 miles east of Desert Center and about 0.5 miles north of Interstate 10. Lands in the vicinity of the project consist predominantly of open desert and agricultural lands. The topography of the site is mostly flat (ranges between 130 and 200 feet above sea level), with elevated terrain beginning to the northeast and southwest within 3-4 miles of the site (Solar Millennium 2009a, Section 2.4.1).

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. There are no sensitive receptors within a 6-mile buffer zone of the project site. Several residential and worker receptors were identified within the regional area of the project site and are listed in Table 4.1-25 of Supplement Number Two (Palen 2013c, p. 37).

METEOROLOGY

Meteorological conditions, including wind speed, wind direction, and atmospheric stability, affect the extent to which pollutants are dispersed into ambient air and 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 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 clear skies, two rainy seasons (in winter and late summer), and strong seasonal winds. Winds generally flow from the west and southwest across the region and tend to transport air pollutants from the Los Angeles area into the Mojave Desert Air Basin (MDAB), in which the project is located (Solar Millennium 2009a, section 5.2.2.1).

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 South Coast Air Quality Management District (SCAQMD), although it is part of the MDAB. 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. When examining such risk estimates, staff considers it important to note that the overall lifetime risk of developing cancer for the average female in the United States is about 1 in 3, or 333,333 in 1 million and about 1 in 2, or 500,000 in 1 million for the average male (American Cancer Society, 2011). From 2004 to 2008, the cancer incidence rates in California are 51.28 in 1 million for males and 39.69 for females. Also, for the year 2004, the American Cancer Society estimated that the death rate due to cancer was 23.1 percent, about 1 in 4. From 2004 to 2008, the cancer death rates for California are 19.74 in 1 million for males and 14.34 in 1 million for females (American Cancer Society, 2012).

There are no monitoring stations within the MDAB that measure TACs, and therefore the background cancer risk in the MDAB cannot be determined. The nearest California Air Resources Board (ARB) air toxics monitoring station that actively reports values is located in Calexico, approximately 70 miles south of the project site. Staff does not consider this location to be representative of air quality in the area of the proposed site because emissions of toxic substances in Calexico are much greater than emissions in the vicinity of the project. However, data from Calexico serve to show the upper-bound levels of toxic air contaminants found in the general region. In 2008, the background cancer risk calculated by ARB for the Calexico monitoring station was about 135 in 1 million (ARB 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 1 million, while the risk from benzene was about 44 in 1 million. Formaldehyde accounted for about 13 percent of the 2008 average calculated cancer risk based on air toxics monitoring results, with a risk of about 18 in 1 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 1 million, or ~10 percent 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 1 million based on 1992 data and in 2002, the average inhalation cancer risk decreased to 162 in 1 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 sometimes 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 modified project, which provides a basis on which to evaluate the significance of any additional health impacts from the proposed modified project. Because of the very low population in the immediate vicinity of the project and the fact that no existing health concerns are identified within a 6-mile buffer zone of the project, staff has concluded that an analysis of existing public health issues was not needed.

PSEGS is proposed at a location where the fungus that causes Valley Fever[1] (*Coccidioidomycosis)* may occur naturally. It was reported by the Desert Sun newspaper in a February 23, 2011 article that Riverside County saw an increase in one year in Valley Fever cases, from 67 to 106 cases, which is a 58 percent jump in the number of Valley Fever cases in 2010. The increase might be due to heavy spring rains followed by dry summers and a windy autumn, or because of a change in state reporting in 2010[2] (The Desert Sun, 2011).

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 (Solar Millennium 2009a, Section 5.16.2.3).

To address the possibility that soil contamination would be encountered during construction of the PSEGS, existing condition **WASTE-1** and modified condition **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 would be adequate to address any soil or groundwater contamination that may exist on this site. See the staff assessment section on **WASTE MANAGEMENT** for a more detailed analysis of this topic.

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

[1] Valley Fever is an infection that occurs when the spores of the fungus *Coccidioides immitis* enter human's through inhalation. When people breathe in these *Coccidioides* spores, they are at risk of developing lung Valley Fever.
[2] Valley Fever (*Coccidioidomycosis*) became laboratory-reportable in California in 2010 (Hector el al., 2011). California Code of Regulations, Title 17, Section 2505 requires laboratories to report laboratory testing results suggestive of the disease of Valley Fever (*Coccidioidomycosis*) to the local health department. Source: http://www.cdph.ca.gov/HealthInfo/Documents/TITLE_17_SECTION_2505.pdf

“Setting” section above), and 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 would 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 ARB as toxic air contaminants. Diesel exhaust is also characterized by ARB as “particulate matter from diesel-fueled engines.”Exposure to diesel exhaust may cause both short- and long-term adverse health effects. Short-term effects can include increased coughing, 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. Diesel exhaust is listed by the EPA as “likely to be carcinogenic to humans (US. EPA, 2003).”

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 (OEHHA 2009, Appendix A). In 2000, ARB developed a “Risk Reduction Plan to Reduce Particulate Matter Emissions From Diesel-Fueled Engines and Vehicles” and has been developing regulations to reduce diesel particulate matter emissions since that time. Construction of the PSEGS, including site preparation, is anticipated to take place over a period of 33 months (Palen 2013c, Section 4.1.6). As noted earlier, assessment of chronic (long-term) health effects assumes continuous exposure to toxic substances over a significantly longer time period, typically from 8 to 70 years.

Applicant Analysis

The project owner conducted a health risk assessment for diesel exhaust from construction activities and the results are listed in the upper portion of **Public Health Table 2**. The project owner did not run the Hotspots Analysis Reporting Program (HARP) model to evaluate construction-related public health impacts, but rather took the maximum three locations from diesel PM modeling and hand calculated the results

(Palen 2013l). The maximum modeled annual average concentration of diesel particulate matter at any location calculated by the project owner was 0.041 μg/m^3. The cancer unit risk value for an assumed 3-year exposure is $9.3x10^{-6}$ per μg/m^3[3]. This is lower than the cancer unit risk of $3x10^{-4}$ $(\mu g/m^3)^{-1}$ from SRP since the results from SRP are derived for longer-term exposures. The calculated cancer risk is approximately 0.38 in one million[4], which is for below the significance level of 10 in one million (Palen 2013l).

Staff Analysis

Staff also calculated the risk of diesel exhaust from construction activities by assuming an exposure for a 9-year period, which is recommended by OEHHA for short-term exposure (OEHHA, 2003). The cancer risk calculated by staff is approximately 1.58 in one million, which is still below the significance level of 10 in one million. As described above, construction of PSEGS is anticipated to take place over a period of under three years (i.e. 33 months), which is shorter than the 9-year period assumed in the staff's calculations. Therefore, staff's analysis should be regarded as conservative because of the inherently conservative exposure-related assumptions made in the modeling analysis. Staff regards the related conditions of certification in the **AIR QUALITY** section as adequate to ensure that cancer-related public health impacts of diesel exhaust emissions are mitigated during construction to a point where they are not considered significant.

The chronic hazard index for diesel exhaust during construction activities is $8.17x10^{-3}$ as calculated by staff using a chronic noncancer REL of 5 μg/m^3. This index is lower than the significance level of 1.0. It means that there would be no chronic noncancer impacts from construction activities. The potential levels of criteria pollutants from operation of construction-related equipment are discussed in staff's **AIR QUALITY** section along with mitigation measures and related conditions of certification. The pollutants of most concern in this regard are particulate matter (PM), carbon monoxide (CO), sulfur dioxide (SO_2), and nitrogen dioxide (NO_2).

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[3] The cancer unit risk value of $9.3x10^{-6}$ per μg/m^3 was calculated by assuming an exposure of 3 years (20 hours per day, 6 days per week, 52 weeks per year). By using this exposure assumption, the lifetime exposure factor could be calculated by the following formula:

The Lifetime Exposure Factor = (3×52×6×20)/(70×52×7×24) =0.031.

The cancer unit risk value then could be calculated by the following formula:

The Cancer Unit Risk Value = The Cancer Unit Risk from SRP × The Lifetime Exposure Factor = $3x10^{-4}$ per μg/m^3 x0.031=$9.3x10^{-6}$ per μg/m^3.

[4] The risk of 0.38 in one million was calculated using the following formula:
Cancer Risk = Concentration of Diesel Exhaust × Cancer Unit Risk = 0.041 μg/m^3 × $9.3x10^{-6}$ per μg/m^3 = $0.38x10^{-6}$.

Public Health Table 2
Construction Hazard/Risk from Diesel Particulate Matters (DPMs)

	Cancer Unit Risk $(\mu g/m^3)^{-1}$	Cancer Risk (in one million)	Significance Level	Significant?
Project owner's Analysis [a]	$9.3x10^{-6}$	0.38	10	No
Staff's Analysis [b]	$38.7x10^{-6}$	1.58	10	No
	Chronic Noncancer REL ($\mu g/m^3$)	**Hazard Index (HI)**		
	5	$8.17x10^{-3}$	1	No

[a] Assumed for a 3-year exposure period (20 hours per day, 6 days per week, 52 weeks per year). Source: Palen 2013l.
[b] Assumed for a 9-year exposure period.

Mitigation measures are proposed by both the project owner and Air Quality staff to reduce the maximum calculated PM10 and PM2.5 concentrations. These include the use of extensive fugitive dust control measures that are assumed to result in a 50 percent reduction of fugitive dust emissions. In order to mitigate potential impacts from construction-related particulate emissions during the operation of diesel-powered construction equipment, the use of ultra low-sulfur diesel fuel is now required and the installation of an oxidation catalyst and soot filters on diesel equipment is included when possible. 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% to 92%. Such filters would reduce diesel combustion emissions during construction and further reduce the impacts associated with diesel exhaust. (See the **AIR QUALITY** section of this PSA for staff's proposal to control particulate matter.)

The project owner proposes to use a concrete batch plant during the construction phase of the project. The operation of the concrete batch plant would result in increased TAC emissions during construction as well as increased diesel exhaust and fugitive dust emissions. Emissions of volatile TACs from onsite diesel and gasoline fuel storage would also occur. Staff reviewed the estimated levels of pollutants associated with the concrete batch plant (Galati & Blek 2010i) and has determined that the increased emissions are minimal and would not add significantly to public health impacts during construction. The project owner did not include additional emissions from the concrete batch plant in the HRA. Emissions of TACs from a concrete batch plant usually result in the highest airborne concentrations being close-in. Given the isolated nature of the power plant from residences and commercial operations where the public would congregate for a period of time (as opposed to rapidly moving through the area when traveling on I-10), staff believes that the risks would not be significant to any on-site or off-site receptor.

Construction could disturb a certain percentage of approximately 5,200 acres (Palen 2013c, Section 4.1.1.1) of top soil that could harbor the *Coccidioides* spores possibly exposing humans to the risk of Valley Fever. On-site workers could be exposed from inhaling these fungal spores from wind-blown dust generated from soil excavation construction activities.

To minimize the risk of getting Valley Fever, the Center for Disease Control and Prevention (CDC) recommends the following measures for people who are at risk of severe disease:

- wear an N95 mask if a person must be in or near a dusty environment, such as a construction zone;
- avoid activities that involve close contact to dust including yard work, gardening, and digging;
- use air quality improvement measures indoors such as HEPA filters;
- take prophylactic anti-fungal medication if deemed necessary by a person's healthcare provider; and
- clean skin injuries well with soap and water, especially if they have been exposed to soil or dust.

The California Department of Public Health (CDPH) also recommends that, "those exposed to dust during their jobs or outside activities in these areas should consider respiratory protection, such as a mask, during such activities." (CDPH, 2010)

The recommendations from CDC and CDPH are all preventive actions, not the guarantee of any exposure to Valley Fever. Based on CDC and CDPH's recommendations, staff recommends that project workers in the vicinity of such dust generation areas wet the soil before any excavation activities, wear protective masks and stay indoors during dust storms and close all doors to avoid dust inhalation. Staff also recommend people who live in endemic regions should try to avoid dusty environment. Staff considers the project owner's dust suppression plans adequate to minimize the risk of getting Valley Fever in areas where *Coccidioides* spores are found. Please refer to staff's **WORKER SAFETY AND FIRE PROTECTION** section for more information.

As for the concerns of Valley Fever affecting the general population, in the **AIR QUALITY** section of this PSA staff recommends some mitigation measures, including **AQ-SC3 (Construction Fugitive Dust Control)** and **AQ-SC4 (Dust Plume Response Requirement)** for the purposes of preventing all fugitive dust plumes from leaving the project boundary. As long as the dust plumes are kept within the project boundary, there won't be any significant concern for Valley Fever adversely affecting the general population and public health.

OPERATION IMPACTS AND MITIGATION

<u>Emissions Sources</u>

The emissions sources at the proposed PSEGS site for both power blocks include two natural gas-fired auxiliary boilers, two natural gas-fired night preservation boilers, two wet surface air condensers (WSAC) units, two diesel-fired emergency electrical generators, two diesel-fired emergency fire pumps, mirror washing machines and site support vehicles. Additional emission sources in the common area include one fire pump engine, one emergency electrical generator, and one mirror washing machine. In summary, a total of 18 emitting units were modeled by the project owner for facility operations, including (Palen 2013c):

- 2 auxiliary boilers
- 2 night preservation boilers
- 8 wet surface air condensers (WSAC) units
- 3 emergency electric generator systems
- 3 emergency fire pump systems

In the project owner's modeling of facility operations, emissions of diesel particulate matter (DPM) from mirror washing activities and onsite operations support vehicles were not included, and these sources are listed with zero risk. Responding to staff's question (through email) of including DMP from these sources, the project owner stated that they are in the process of revising the petition to account for a few design changes on the project, and in the revised analysis DPM from the washing equipment will be modeled and included in HARP. The results of revised analysis would be included in staff's Final Staff Assessment (FSA).

The applicant didn't include ammonia emission in their HRA because at the time of submitting their amendment request, they didn't plan on using selective catalytic reduction (SCR) on the boilers. However, to meet the requirement of the air district, the applicant may need to add SCRs on the boilers. If this is the case, the ammonia emission would be included in an updated HRA and the revised analysis would also be updated in staff's FSA.

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 4.1-27 of the Supplement Number Two (Palen 2013c) lists toxic air contaminants that may be emitted by the project. **Public Health Table 3** lists each such TAC, their exposure routes and how they would contribute to the total risk obtained from the risk analysis. Toxicity values include RELs which are used to calculate short-term and long-term noncancer health effects, and cancer unit risks, which are used to calculate the lifetime risk of developing cancer, are listed in **Public Health Table 4** (ARB 2011). Emission factors for most TACs were obtained from the U.S. EPA emission factors database (AP-42) and the California Air Toxics Emission Factors (CATEF II) database.

Public Health Table 3
Types of Health Impacts and Exposure Routes Attributed to Toxic Emissions

Substance	Oral Cancer	Oral Noncancer	Inhalation Cancer	Noncancer (Chronic)	Noncancer (Acute)
Acetaldehyde			✔	✔	✔
Acrolein				✔	✔
Benzene			✔	✔	✔
1,3-Butadiene			✔	✔	
Ethylbenzene			✔	✔	
Formaldehyde			✔	✔	✔
Hexane				✔	
Napthalene			✔	✔	
Polycyclic Aromatic Hydrocarbons (PAHs, as BaP)	✔		✔		
Propylene				✔	
Propylene Oxide			✔	✔	✔
Toluene				✔	✔
Xylene				✔	✔
Diesel Exhaust			✔	✔	
Arsenic	✔	✔	✔	✔	✔
Beryllium		✔	✔	✔	
Biphenyl*					
Chromium (Hexavalent)		✔	✔	✔	
Copper					✔
Nickel		✔	✔	✔	✔
Manganese				✔	
Selenium				✔	
Mercury		✔		✔	✔
Zinc*					

*No cancer risk factors or RELs have been established for biphenyl and zinc. Source: ARB 2011

Public Health Table 4
Toxicity Values Used to Characterize Health Risks

Toxic Air Contaminant	Inhalation Cancer Potency Factor $(mg/kg\text{-}d)^{-1}$	Chronic REL ($\mu g/m^3$)	Acute REL ($\mu g/m^3$)
Acetaldehyde	0.010	140	470 (1-hr) 300 (8-hr)
Acrolein	—	0.35	2.5 (1-hr) 0.7 (8-hr)
Benzene	0.10	60	1,300
1,3-Butadiene	0.60	20	—
Ethylbenzene	0.0087	2,000	—
Formaldehyde	0.021	9	55 (1-hr) 9 (8-hr)
Hexane	—	7,000	—
Napthalene	0.12	9.0	—
Polycyclic Aromatic Hydrocarbons (PAHs, as BaP)	3.9	—	—
Propylene	—	3000	—
Propylene oxide	0.013	3	3100
Toluene	—	300	37,000
Xylene	—	700	22,000
Diesel Particulate Matter	1.1	5	—
Arsenic	12	0.015	0.2
Beryllium	8.4	0.007	—
Biphenyl*	—	—	—
Chromium (Hexavalent)	510	0.2	—
Copper	—	—	100
Nickel	0.91	0.05	6
Manganese	—	0.09	—
Selenium	—	20	—
Mercury	—	0.03	0.6
Zinc*	—	—	—

*No cancer risk factors or RELs have been established for biphenyl and zinc.
Source: ARB 2011

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 project impacts. The project owner’s screening analysis was performed using the ARB/OEHHA Hotspots Analysis and Reporting Program modeling program to model operating period public health impacts, version 1.4f (ARB, 2011). 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. In the following sub-sections, staff reviews and summarizes the work of project owner, and evaluated the adequacy of project owner's analysis by conducting another HRA.

Applicant Analysis

The project owner's screening health risk assessment resulted in a maximum acute hazard index of 0.000108 and a maximum chronic hazard index of 0.00253 at the point of maximum impact (PMI). The worst-case cancer risk was found to be 4.03 in one million at the PMI. As **Public Health Table 5** shows, both acute and chronic hazard indices are under the significance level of 1.0, and cancer risk is below the significance level of 10 in 1 million, indicating that no short- or long-term adverse health effects are expected.

Public Health Table 5
Operation Hazard/Risk at Point of Maximum Impact

Type of Hazard/Risk	Hazard Index/Risk	Significance Level	Significant?
Acute Noncancer	0.000108	1.0	No
Chronic Noncancer	0.00253	1.0	No
Individual Cancer	4.03 in 1 million	10 in 1 million	No

Source: Table4.1-29 of project owner's Supplement Number Two – Complete Air Quality and Public Health Sections (Palen 2013c)

Staff Analysis

To evaluate the project owner's analysis, staff conducted another analysis of cancer risks and acute and chronic hazards due to combustion-related emissions during operation from the proposed PSEGS. The analysis was conducted for the general population, sensitive receptors, nearby residences and the project's work force. The sensitive receptors, as previously noted, are subgroups that may be at greater risk from exposure to emitted pollutants, and include the very young, the elderly, and those with existing respiratory illnesses. Results are shown in **Public Health Table 6**.

Health risks potentially associated with ambient concentrations of carcinogenic pollutants were calculated in terms of excess lifetime cancer risks. The total cancer risk at any specific location is found by summing the contributions from the individual carcinogens. Health risks from noncancer health effects were calculated in terms of hazard index as a ratio of ambient concentration of TACs to RELs for that pollutant.

Cancer Risk at the Point of Maximum Impact (PMI)

The first result of HRA is the numerical cancer risk for the maximally exposed individual (MEI) which is the individual located at the point of maximum impact as well as risks to the MEI at a residence (MEIR). Human health risks associated with emissions from the proposed and similar projects by definition would not be higher at any other location than at the PMI. Therefore, if there is no significant impact associated with concentrations at the PMI location, it can be reasonably assumed that there would not be significant impacts in any other location in the project area. The cancer risk to the MEI at the PMI is referred to as the Maximum Incremental Cancer Risk (MICR). However, the PMI (and thus the MICR) is not necessarily associated with actual exposure because in many cases, the PMI is in an uninhabited area. Therefore, the MICR is generally higher than the maximum residential cancer risk. MICR is based on 24 hours per day, 365 days per year, 70 year lifetime exposure. As shown in **Public Health Table 6**, the total worst-case individual cancer risk calculated by staff is 5.24 in 1 million at the PMI. The PMI is approximately 200 feet west of the project boundary and approximately 250 ft southeast of the project common area. The difference of HRA between the project owners and staff is because the project owner used the Derived (Adjusted) Cancer Risk method to calculate cancer risk while staff used the Derived (OEHHA) Cancer Risk method[5]. As **Public Health Table 6** shows, the cancer risk value at PMI calculated by staff is still below the significance level, 10 in a million, indicating that no significant adverse cancer risk is expected.

Chronic and Acute Hazard Index (HI)

The results of staff's calculations for chronic and acute index reach the same conclusions as the project owner. The screening health risk assessment for the project including emissions from all sources resulted in a maximum chronic Hazard Index (HI) of 2.53×10^{-3} and a maximum acute HI of 1.08×10^{-4}. As **Public Health Table 6** shows, both acute and chronic hazard indices are less than 1.0, indicating that no short- or long-term adverse health effects are expected.

Project-Related Impacts at Area Residences

Several residential and worker receptors were identified by the project owner within the regional area of the project site and were listed in Table 4.1-25 of the Supplement Number Two (Palen 2013c, Section 4.1.12). Staff's specific interest in the risk to the maximally exposed individual in a residential setting (or MEIR) is because this risk most closely represents the maximum project-related lifetime cancer risk. Residential risk is presently assumed by the regulatory agencies to result from exposure lasting 24 hours per day, 365 days per year, over a 70- year lifetime. Residential risks were presented in terms of MEIR and hazard index (HI) at residential receptors in **Public Health Table 6**. The cancer risk for maximally exposed individual (MEI) of residential receptors, or MEIR, is 0.0851 per million, which is below the significance level, indicating that no significant adverse cancer risk is expected. The maximum chronic HI of MEIR is 4.15×10^{-5} and the maximum acute HI is 5.49×10^{-5}. As **Public Health Table 6** shows, both acute and chronic hazard indices are less than 1.0, indicating that no short- or

[5] The Derived (OHHHA) Cancer Risk method applies to multipathway risk assessments and is described in detail in the OEHHA Air Toxic Hot Spots Program Guidance Manual for Preparation of Health Risk Assessment (August 2003). In brief, for a multipathway cancer risk assessment, the two dominant (driving) exposure pathways use the high-end point-estimates of exposure, while the remaining exposure pathways use average point estimates listed in the OEHHA HRA Guidance Manual. The Derived (Adjusted) Cancer Risk method is identical to the method used for the Derived (OEHHA) Cancer Risk with one exception. The Derived (Adjusted) method uses the breathing rate at the 80th percentile of exposure rather than the high-end point-estimate when the inhalation pathway is one of the dominant exposure pathways. Source: http://www.arb.ca.gov/toxics/harp/rmpolicyfaq.htm#10

long-term adverse health effects are expected. This MEIR[6] is approximately 1 mile northwest of the project Unit 1 Tower, and just about 300 ft north of the project boundary.

Risk to Workers

Cancer risk to potentially exposed workers was presented in terms of risk to the maximally exposed individual worker or MEIW at PMI and is also summarized in **Public Health Table 6**. The staff's assessment is for potential workplace risks, due to exposure of shorter duration than for residential risks from 70 years of exposure. Workplace risk is presently assumed by the regulatory agencies to result from exposure lasting 8 hours per day, 245 days per year, over a 40-year period. As shown in **Public Health Table 6**, the cancer risk for workers at MEIW (i.e. 0.795 in 1 million) is below the significance level, indicating that no significant adverse cancer risk is expected.

Risk to Sensitive Receptors

As noted previously, there were no sensitive receptors, such as schools (both public and private), day care facilities, nursing homes, and hospitals, identified within a 6-mile radius of the site (Palen 2013c, Section 4.1.12). Thus, there is no calculation for risk to sensitive receptors.

Public Health Table 6
Results of Staff Analysis: Cancer Risk and Chronic Hazard from PSEGS Operations

Receptor Location	Cancer Risk (per million)	Chronic HI[d]	Acute HI[d]	Significant?
PMI[a]	5.24	2.53×10^{-3}	1.08×10^{-4}	No
Residence MEIR[b]	0.0851	4.15×10^{-5}	5.49×10^{-5}	No
Worker MEIW[c]	0.795	-	-	No
at a Sensitive Receptor	-	-	-	No
Significance level	10	1	1	

[a] PMI = Point of Maximum Impact
[b] MEIR = MEI of residential receptors. Location of the residence of the highest risk with a 70-year residential scenario.
[c] MEIW = MEI for workers. Occupational exposure patterns assuming exposure of 8 hours/day, 245 days/year for 40 years.
[d] HI = Hazard Index

In **Public Health Table 6**, it can also be seen that the cancer and noncancer risks from the PSEGS operation would be significantly below their respective significance levels. It means that no health impacts would occur within all segments of the surrounding population. Therefore, staff concludes there is no need for conditions of certification to protect public health, except for Legionella, discussed next.

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[6]According to Socioeconomics Figure 1 as of April 1, 2010, there were no people counted as part of the Decennial Census, so their residence was either vacant or the occupant did not respond to the census.

Wet Surface Air Condensers (WSAC) and Legionella

To conserve water in the site's desert environment, each plant would use an air-cooled condenser for the main steam-cycle. However, a wet surface air condenser (WSAC) would be used for auxiliary equipment cooling (Palen 2013c). Since the facility would mainly use dry cooling, there would be no emissions of toxic metals or volatile organic compounds from cooling tower mist or drift. In addition to being a source of potential toxic air contaminants, in particular beryllium and copper due to the project's use of groundwater that contains trace amounts of these substances (Palen 2013c, Table 4.1A-8), the possibility exists for bacterial growth to occur in the eight WSACs (four at each power block) that are part of the project. 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 60306, 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 PSEGS project since it intends to use well water (not reclaimed water) for cooling purposes (Palen 2013c, Section 4.1.12.9); however, the potential remains for Legionella growth in cooling water at the PSEGS 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 were 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 3-6 percent. These cooling towers all had implemented aggressive water treatment and biocide application programs similar to that required by existing condition of certification **PUBLIC HEALTH-1**.

To minimize the risk from Legionella, the CTI recommended: (a) minimization of water stagnation; (b) minimization of process leads into the cooling system that provide nutrients for bacteria; (c) maintenance of overall system cleanliness; (d) application of scale and corrosion inhibitors as appropriate; (e) use of high-efficiency mist eliminators on cooling towers; and (5) 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 good 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** in previous PSA/FSA for PSPP. **PUBLIC HEALTH-1** has already been approved and already existed in the license. The condition requires 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 two cooling towers' 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 project owner has stated that an appropriate biocide program and anti-biofilm agent monitoring program would be implemented for the cooling towers (Solar Millennium 2009a, Section 5.10.3.5). Since the condition meets the need of PSEGS, Staff concludes that there is no need to modify **PUBLIC HEALTH-1**.

CLOSURE AND DECOMMISSIONING IMPACTS AND MITIGATION

Closure of the proposed PSEGS (temporary or permanent) would follow a closure plan prepared by the project owner and designed to minimize public health and environmental impacts. 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 PSEGS. 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 PSEGS would be insignificant.

PROJECT-RELATED FUTURE ACTIONS

In order to transmit the power generated at the Palen Solar Electric Generating System to the electricity grid, a new substation is required. Southern California Edison Company (SCE) is constructing the Red Bluff Substation, which will allow the electricity to be carried by the Devers–Palo Verde No. 1 (DPV1) 500 kV transmission line.

The SCE Red Bluff Substation is expected to be operational in December 2013. Staff concludes that there won't be any overlap of construction phase of SCE Red Bluff Substation and the PSEGS. Therefore, there is no need to discuss the potential impacts of the construction of the SCE Red Bluff Substation. As for the potential impacts of the operation of the SCE Red Bluff Substation, the only health impacts in concern are exposure to electromagnetic fields (EMF) from power transmission and safety concerns for workers. EMF is discussed in the **TRANSMISSION LINE SAFETY AND NUISANCE** section of this PSA. Worker safety is discussed in the **WORKER SAFETY AND FIRE PROTECTION** section of this PSA.

CUMULATIVE IMPACT ANALYSIS

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 of Regulations, Title 14, section 15130).

The geographic scope of analysis for cumulative effects to public health is a 6-mile buffer zone around the project site. This is the same six-mile buffer zone for localized significant cumulative air quality impacts described and evaluated in the **AIR QUALITY** section. Cumulative impacts of the proposed project and other projects within a 6-mile buffer zone were not quantitatively evaluated in the Supplement Number Two (Palen 2013c, Section 4.1.12.12). Staff considered the potential impacts due to construction and operation of the proposed PSEGS with new projects or new "reasonably foreseeable probable future projects" in the area since the original project was approved, and none of them fall within the 6-mile buffer zone. Therefore, staff concludes that there would not be any cumulatively significant impacts associated with public health risks.

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 ARB. 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—would 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**. Staff concludes that construction and operation of the PSEGS would be in compliance with all applicable LORS regarding long-term and short-term project impacts in the area of **Public Health**.

NOTEWORTHY PUBLIC BENEFITS

It is noteworthy that a solar electric generating facility such as the proposed PSEGS 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 PSEGS would provide much needed electrical power to California residences and businesses, and would contribute to electricity supply. 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.

Moreover, changing from trough solar collection system to solar tower technology would be more suitable for endemic areas of Valley Fever. This is because the heliostat technology does not require an entirely flat surface and would decrease the disturbance of the top soil.

RESPONSE TO AGENCY AND PUBLIC COMMENTS

INTERVENOR BASIN AND RANCH WATCH'S STATUS REPORT (BRW 2013A)

The Basin and Range Watch group included comments regarding background ambient pollutant concentrations. Each of these comments is responded to separately below.

<u>Fugitive Dust during Construction in regards to Valley Fever</u>

The Intervenor raised concerns in their May 8, 2013 status report regarding air quality and public health during the construction and operational phases of the proposed project to insure air quality impacts don't exceed significant thresholds of PM10/PM2.5 for fugitive and windblown dust.

<u>Response</u>: As for the concerns of Valley Fever on public health, in the **AIR QUALITY** section of this PSA, staff recommends mitigation measures, including **AQ-SC3 (Construction Fugitive Dust Control)** and **AQ-SC4 (Dust Plume Response Requirement)** for the purposes of preventing all fugitive dust plumes from leaving the

project boundary. As long as the dust plumes are kept within the project boundary, there won't be any significant concern for Valley Fever adversely affecting public health.

CONCLUSIONS

Staff has analyzed potential public health risks associated with construction and operation of the amended PSEGS 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 PSEGS 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 PSEGS project would not contribute significantly to morbidity or mortality in any age or ethnic group residing in the project area. With the incorporation of the existing Condition of Certification **PUBLIC HEALTH-1**, the proposed facility would not present a significant health risk to the public.

PROPOSED CONDITIONS OF CERTIFICATION

Staff recommends the following Condition of Certification for PSEGS, which is essentially identical to the single Condition of Certification recommended for the previously approved PPSP (Note: new text is **<u>bold and underlined)</u>**:

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.

<u>Verification:</u> At least 60 days prior to the commencement of cooling tower operations, the Cooling Water Management Plan shall be provided to the **<u>compliance project manager (</u>**CPM**<u>)</u>** for review and approval.

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SOCIOECONOMICS

Lisa Worrall

SUMMARY OF CONCLUSIONS

California Energy Commission (Energy Commission) staff ("staff") has reviewed the Petition to Amend the Commission Decision for the Palen Solar Power Project (PSPP) in accordance with the requirements of the California Environmental Quality Act (CEQA). The petition proposes to eliminate the use of solar parabolic trough technology approved under the Commission Decision and replace it with BrightSource's LPT solar power tower technology. Staff's analysis considers the changes between the approved project (PSPP) and the amended project, now called the Palen Solar Electric Generating System (PSEGS).

At this time staff concludes that the construction and operation of the PSEGS would not cause a significant adverse direct or indirect impact or contribute to a cumulative socioeconomic impact on the area's housing, schools, law enforcement services, or parks. Staff also concludes that the project would not induce a substantial population growth or displacement of population, or induce substantial increases in demand for housing, parks, or law enforcement services.

To fully determine impacts from the construction workforce, staff still needs to identify all of the construction workforce by craft so that each specialty craft can be identified with the labor supply in the Employment Development Department employment projections and labor by skill in the Riverside/San Bernardino/Ontario Metropolitan Statistical Area (MSA).[1] Staff will formally request that the project owner provide this information so staff can determine whether there would be a need to supply the PSEGS with workers by craft from outside the Riverside/San Bernardino/Ontario MSA.

Staff concludes the population in the six-mile project buffer does not constitute an environmental justice population as defined by *Environmental Justice: Guidance under the National Environmental Policy Act*, and would not trigger further scrutiny for purposes of an environmental justice analysis.

INTRODUCTION

Staff's socioeconomics impact analysis evaluates project-caused changes on existing population, housing, employment patterns, and community services. Staff analyzes the potential impacts of the construction and operation of the PSEGS on local communities, community resources, and law enforcement services, and also provides a discussion of the estimated beneficial economic impacts of the construction and operation of the proposed project.

[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.

METHODOLOGY AND THRESHOLDS FOR DETERMINING SIGNIFICANCE

CEQA requires a list of criteria 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 Regs., tit., 14 § 15382).

Thresholds serve as the benchmark for determining if a project will result in a significant adverse impact when evaluated against existing conditions (e.g., "baseline" conditions). CEQA Guideline section 15064(e) specifies that: "[e]conomic and social changes resulting from the project shall not be treated as significant effects on the environment." Section 15064(e) states that when "a physical change is caused by economic or social effects of a project, the physical change may be regarded as a significant effect in the same manner as any other physical change resulting from the project. Alternatively, economic and social effects of a physical change may be used to determine that the physical change is a significant effect on the environment. If the physical change causes adverse economic or social effects on people, those adverse effects may be used as a factor in determining whether the physical change is significant." Staff has used Appendix G of the CEQA Guidelines for this analysis, which specifies that a project may have a significant effect on population, housing, law enforcement services, schools, and parks 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 police protection, schools, and parks and recreation.

Staff’s assessment of impacts on population, housing, police protection, schools, and parks and recreation is based on professional judgments, input from local and state agencies, and the industry-accepted, two-hour commute range for construction workers and one-hour commute range for operational workers.

Criteria for subject areas such as utilities, fire protection, emergency medical services, water supply, and wastewater disposal are analyzed in the **RELIABILITY**, **WORKER SAFETY AND FIRE PROTECTION**, and **SOILS AND WATER RESOURCES** sections of this document. Impacts on population, housing, parks and recreation, schools, medical services, law enforcement, and cumulative impacts are based on professional 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.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

Socioeconomics Table 1 contains socioeconomics laws, ordinances, regulations, and standards (LORS) applicable to projects proposed on non-federal land. The PSEGS is proposed on BLM land, as was the approved PSPP’s administration and warehouse space, therefore the provisions of Education Code section 17620 would not apply, and no school impact fees would be collected for the PSEGS, as was the case for the approved PSPP (CEC 2010g).

Socioeconomics Table 1
Laws, Ordinances, Regulations, and Standards (LORS)

Applicable LORS	Description
State	
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.
California Revenue and Taxation Code, section 73	Allows property tax exclusion for certain types of solar energy systems. Assembly Bill 1451 extended the current property tax exclusion for new construction of solar energy systems to expire on January 1, 2017. If a project has started construction prior to the expiration date it would be eligible for the exclusion. After the exclusion sunsets, any solar energy system constructed remains exempt from property tax for so long as the property does not change ownership.

PROPOSED MODIFIED PROJECT

The changes from the approved PSPP to the PSEGS relevant to Socioeconomics involve the construction and operations workforce numbers (including the peak and average number of workers), duration of construction, and estimated fiscal benefits. The construction schedule for PSEGS would be 33 months rather than the approved PSPP's 39-month schedule. The construction workforce for the PSEGS would increase over the approved PSPP by 1,166 workers during peak construction, for a peak of 2,311 workers. The average number of construction workers for the PSEGS would increase by 432 workers, for an average of 998 construction workers. The changes to the fiscal benefits are presented in **Socioeconomics Table 14**. The PSEGS is in the same location as the approved PSPP, but reduced in size. Therefore, the regional and local study areas are not changed from the approved PSPP.

SETTING

Staff defines the study area related to project impacts on population, housing, and parks as the local study area. The study area for law enforcement is the local jurisdictional boundaries for the Riverside Sheriff's Department. The study area for impacts to schools is the Palo Verde and Desert Center School districts. The study area for indirect and induced economic impacts is defined as Riverside County. The study area for environmental justice impacts is within a six-mile buffer of the project site.

Regional Study Area

For the purposes of assessing project impacts during construction, staff defines the regional study area as within a two-hour commute of the project. The regional study area is roughly defined by the distance construction workers are typically willing to commute daily to a project site, and includes Riverside County, California, San Bernardino County, California, and La Paz County, Arizona.

The proposed PSEGS includes the construction and operation of a solar generating facility located in the Southern California inland desert, approximately 10 miles east of the small community of Desert Center, in eastern Riverside County, California.

To characterize the population and housing profile of the regional study area, current and forecasted population trends as well as current housing trends for the study area are summarized in **Socioeconomics Table 2**. The regional study contains a high number of housing units, with San Bernardino and Riverside Counties contributing the largest number of vacant units in the PSEGS study area. Among all counties within the study area, La Paz County has the highest vacancy rate (43 percent).

Socioeconomics Table 2
Population and Housing Profile of the Regional Study Area

Population							
Area	**2000**	**2010**	**2020 Projected**	**2030 Projected**	**2040 Projected**	**2050 Projected**	**2060 Projected**
Riverside County, California	1,545,387	2,189,641	2,593,211	3,046,064	3,462,256	3,828,798	4,216,816
San Bernardino County, California	1,709,434	2,035,210	2,273,017	2,626,945	2,988,648	3,248,440	3,433,047
La Paz County, Arizona	19,579	22,632	21,988	23,615	25,351	27,710	—

Housing				
Area	**2010Total Housing Units**	**2010 Occupied Housing Units**	**2010 Vacant Housing Units**	**2010 Vacancy Rate**
Riverside County, California	800,707	686,260	114,447	14%
San Bernardino County, California	699,637	611,618	88,019	13%
La Paz County, Arizona	16,049	9,198	6,851	43%

Notes: — Data not available
Source: US Census 2000; US Census 2010a; US Census 2010b; CA DOF 2013; AZ Dept. of Admin 2012.

Local Study Area

Staff defines the local study area during project operation as within a one-hour commute of the project. An analysis at a local level presents a challenge because the proposed PSEGS is in a sparsely populated area, with the largest urban center being the city of Riverside, located approximately 100 miles west of the site. A reasonable study area for localized socioeconomic impacts would include the two nearest communities: the City of Blythe, California (approximately 25 miles east of the PSEGS site), and the City of Ehrenburg, Arizona (approximately 30 miles east of the PSEGS site). The most recently published population and housing data for these communities are presented below in **Socioeconomics Table 3.** As Desert Center is the closest community to the project site, population and housing data for Desert Center have been included in the table even though this community is sparsely populated.

Socioeconomics Table 3
Population and Housing Profile of the Local Study Area

Population				
Area	**2000**		**2010**	
Blythe, California	12,155		20,817	
Desert Center, California	—		204	
Ehrenburg, Arizona	1,357		1,470	
Quartzite, Arizona	3,354		3,677	
Housing				
Area	**2010Total Housing Units**	**2010 Occupied Housing Units**	**2010 Vacant Housing Units**	**2010 Vacancy Rate**
Blythe, California	5,473	4,513	960	18%
Desert Center, California	140	85	55	39%
Ehrenburg, Arizona	948	645	303	32%
Quartzite, Arizona	3,378	2,027	1,351	40%
Notes: — Data not available Source: US Census 2000; US Census 2010a; US Census 2010b; CA DOF 2013; AZ Dept. of Admin 2012.				

Using the 2010 US Census and US Census Bureau's American Community Survey in Staff Assessments

The detailed social, economic, and housing information previously collected only in the decennial census was not collected for the 2010 Census (US Census 2011a). This information is now collected through the U.S. Census Bureau's American Community Survey (ACS). Decennial census data are from a 100 percent count collected once every ten years and represent information from a single reference point (April 1). The main function of the decennial census is to provide *counts* of people for the purpose of congressional apportionment and legislative redistricting. ACS estimates are collected from a sample of the population based on information compiled continually and aggregated into one, three, and five-year estimates ("period estimates") released every year. The primary purpose of the ACS is to measure the changing social and economic characteristics of the U.S. population. As a result, the ACS does not provide official counts of the population in between censuses. Instead, the Census Bureau's Population Estimates Program will continue to be the official source for annual population totals, by age, race, Hispanic origin, and sex.

ACS collects data at every geographic level from the largest level (nation) to the smallest level available (block group (BG)).[2] Census Bureau staff recommends the use of data from units no smaller than the census tract level.[3,4] Data from the five-year

[2] Census Block Group - A statistical subdivision of a census tract. A BG consists of all tabulation blocks whose numbers begin with the same digit in a census tract; for example, for Census 2000, BG 3 within a census tract includes all blocks numbered between 3000 and 3999. The block group is the lowest-level geographic entity for which the Census Bureau tabulates sample data from the decennial census. http://www.census.gov/dmd/www/glossary.html.

[3] Census Tract - A small, relatively permanent statistical subdivision of a county or statistically equivalent entity, delineated for data presentation purposes by a local group of census data users or the

estimates are used for staff's analysis as it provides the greatest detail at the smallest geographic level. Because ACS estimates come from a sample population, a certain level of variability is associated with these estimates. This variability is expressed as a margin of error (MOE). The MOE is used to calculate the coefficient of variation (CV). CVs are a standardized indicator of the reliability of an estimate. While not a set rule, the U.S. Census Bureau considers the use of estimates with a CV of more than 15 percent a cause for caution when interpreting patterns in the data (US Census 2009). In situations where CVs for estimates are high, the reliability of an estimate improves by using estimates for a larger geographic area (e.g., city or community versus census tract), or by aggregating estimates of adjacent geographic areas, such as cities.

Project-Specific Demographic Screening

Staff's demographic screening is based on information contained in two documents: *Environmental Justice: Guidance Under the National Environmental Policy* Act (CEQ 1997) and *Final Guidance for Incorporating Environmental Justice Concerns in EPA's Compliance Analyses* (US EPA 1998). The intention is to identify potentially sensitive populations, which could be disproportionately impacted by the proposed action. Due to the changes in the data collection methods used by the U.S. Census Bureau, the screening process relies on 2010 U.S. Census data to determine the number of minority populations and data from the 2007–2011 ACS to evaluate the presence of individuals and households living below the federal poverty level.

Staff's demographic screening is designed to identify the presence of minority and below-poverty-level populations within a six-mile area of the proposed project site. The six-mile buffer is based on air quality modeling, which shows that project-related impacts from pollutants decrease to less than significant within six miles of the emission site. Staff uses the six-mile buffer to determine the area of potential project impacts and to obtain data to gain a better understanding of the demographic makeup of the communities potentially impacted by the project. Once Socioeconomics staff identifies the presence of an environmental justice population, staff from the thirteen affected technical areas evaluates the project for potential disproportionate impacts on the environmental justice population.[5] When staff's screening analysis does not identify the population in the six-mile buffer as an environmental justice population, as defined by *Environmental Justice: Guidance Under the National Environmental Policy Act*, no further scrutiny of this population is required for purposes of an environmental justice analysis.

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geographic staff of a regional census center in accordance with Census Bureau guidelines. Census tracts are designed to be relatively homogeneous units with respect to population characteristics, economic status, and living conditions at the time they are established. Census tracts generally contain between 1,000 and 8,000 people, with an optimum size of 4,000 people. Census tract boundaries are delineated with the intention of being stable over many decades, so they generally follow relatively permanent visible features. http://www.census.gov/dmd/www/glossary.html.

[4] Using the American Community Survey (ACS) and The New American Factfinder (AFF). Census Workshop presented by Barbara Ferry, U.S. Census Partnership Data Services Specialist, hosted by Sacramento Area Council of Governments, May 11–12, 2011.

[5] The thirteen technical staff/areas are Air Quality, Hazardous Materials Management, Land Use, Noise and Vibration, Public Health, Socioeconomics, Soils and Surface Water Resources, Water Supply, Traffic and Transportation, Transmission Line Safety and Nuisance, Visual Resources, Cultural Resources, and Waste Management.

Minority Populations

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. An environmental justice population is identified when the minority population of the potentially affected area is greater than 50 percent or meaningfully greater than the minority population in the general population or other appropriate unit of geographical analysis. **Socioeconomics Figure 1** shows that, based on census data, there are no people within a six-mile buffer of the project site. **Socioeconomics Table 4** presents the minority population data for the community of Desert Center, plus Riverside County, and the Chuckwalla Census County Division (CCD) for reference. The 2010 decennial census data show there is no population (minority or otherwise) in the six-mile project buffer. Therefore, there is no environmental justice population as defined by *Environmental Justice: Guidance Under the National Environmental Policy Act* that would trigger further scrutiny for purposes of an environmental justice analysis.

Socioeconomics Table 4
Minority Population in the Project Area

	Six-Mile Buffer Around Project Site	Desert Center CDP	Chuckwalla Valley CCD	Riverside County
Total	0	204	9,843	2,189,641
Not Hispanic or Latino: White alone	0	156	4,349	869,068
Minority	0	48	5,494	1,320,573
Percent Minority	0	24	56	60
Notes: CDP – Census Designated Place, CCD – Census County Division. Source: US Census Bureau 2010c.				

Below-Poverty-Level Populations

The poverty status of households and individuals is determined based on a set of income thresholds, set by the U.S. Census Bureau, that vary by family size and composition. If the total income of the family is less than the family's threshold, that family and every individual in it is considered in poverty. The official poverty thresholds do not vary by geography (e.g., state, county, etc.), but are updated annually to allow for changes in the cost of living. The population for whom poverty status is determined does not include institutionalized people, people in military quarters, people in college dormitories, and unrelated individuals under 15 years old.

Staff identified the below-poverty-level population in the project area using county level data from the 2007-2011 ACS Five-Year Estimates from the U.S. Census (US Census 2011b).[6] Approximately 14 percent, or 8,482 people, in Riverside County lives below the federal poverty threshold. **Socioeconomics Table 5** presents poverty data for Riverside County, plus California for reference purposes. Poverty data for the Chuckwalla Valley CCD and Desert Center CDP were not included because the CV

[6] Staff determined that the data at the county level are the lowest level available that retain reasonable accuracy. The data represent a period estimate, meaning the numbers represent an area's characteristics for the specified time period.

values were greater than 20, indicating that the data were unreliable and may not accurately reflect local characteristics.

Socioeconomics Table 5
Poverty Data in the Project Area

Area	Total			Income in the past 12 months below poverty level			Percent below poverty level		
	Estimate*	MOE	CV	Estimate	MOE	CV	Estimate	MOE	CV
Riverside County	2,119,466	±1,760	0.05	301,763	±8,482	1.71	14.20	±0.4	1.71
California	36,211,794	±3,530	0.01	5,211,481	±39,013	0.46	14.40	±0.1	0.42
Note: *Population for whom poverty status is determined. Source: U.S. Census 2011b.									

Additional Environmental Justice Population Considerations

Final Guidance for Incorporating Environmental Justice Concerns in EPA's Compliance Analyses (US EPA 1998) also encourages outreach to community-based organizations and tribal governments early in the screening process to identify the presence of distinct minority communities residing within, or in close proximity to, the proposed project site. It also encourages identification of minority groups that utilize or hold sacred certain natural and cultural resources that may be affected by the proposed action. For information regarding the Energy Commission's outreach program and consultations with local Native American communities, see the **EXECUTIVE SUMMARY, INTRODUCTION,** and **CULTURAL RESOURCES** sections of this document.

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 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 PSEGS project to be the Riverside/San Bernardino/Ontario MSA, which includes both Riverside and San Bernardino counties. While the City of Ehrenberg, within La Paz County, Arizona, is located within the proposed PSEGS regional study area and could contribute to the local workforce, detailed labor skill data are unavailable for this limited portion of the regional and local study area. As shown above in **Socioeconomics 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. Staff has focused this analysis on the cities and communities along the Interstate-10 corridor, as this route provides the most reasonable access to the PSEGS site. Access to the site from other parts of Riverside, San Bernardino, and La Paz Counties is not as convenient.

Construction

The project owner expects that construction of the proposed PSEGS would be similar to the approved PSPP. Construction of the PSEGS would last for 33 months, while construction of the approved PSPP was 39 months. The construction workforce would increase from an average of approximately 566 daily construction workers, peaking with a daily workforce of 1,145, to an average of approximately 998 workers, with a peak workforce of 2,311 workers (Palen 2012a). This peak employment number is used to analyze worst-case construction population and employment impacts. **Socioeconomics Table 6** shows Year 2010–2020 occupational employment projections for the Riverside/San Bernardino/Ontario MSA by construction labor skill. The number of construction workers by trade for the PSEGS peak month (month 22) is presented in **Socioeconomics Table 6** and compared with the construction workforce needed for the approved PSPP (Solar Millennium 2009a, p. 5.11-26; Palen 2012a). The peak number of construction workers by trade is reported in parenthesis where different from the PSEGS peak construction month.

A total of 608 construction workers (non-craft and off-site linear) needed during the PSEGS peak month have not been included in **Socioeconomics Table 6** because staff cannot determine from the generic list supplied by the project owner the number and type of specific craft workers needed for the project. Staff needs to identify the workers by craft to make sure the construction workforce can accurately be identified with the labor supply as shown in the Employment Development Department employment projections and labor by skill in the Riverside/San Bernardino/Ontario MSA. Staff will formally request that the project owner provide this information so staff can determine whether there would be a need to supply the PSEGS with workers by craft from outside the Riverside/San Bernardino/Ontario MSA.

Socioeconomics Table 6
Total Labor by Skill in Riverside/San Bernardino/Ontario MSA and Construction Worker by Craft, Peak Month

Trade	Total Workers for Construction by Craft (peak month)		Riverside/ San Bernardino/ Ontario MSA	
	Approved PSPP Project	PSEGS	2010	2020
Surveyor	12		1,420440	1,670520
Operator[1]	90	102	4,7902,510	5,4603,030
Laborer[2]	185	82 (122*)	27,93011,870	32,08013,380
Truck Driver[7]	35		27,93011,870	32,08013,380
Oiler[3]	4		27,93011,870	32,08013,380
Carpenter	100	75 (123*)	28,85010,140	32,39010,450
Boilermaker[3]	11	264	4,6303,160	5,3303,570
Paving Crew	0		630400	720490
Pipe Fitter	326	508	4,6303,160	5,3303,570
Electrician	150	359	6,7404,000	7,6004,520
Cement Finisher	100	9 (18*)	4,1102,420	4,6902,570
Ironworker[4]	59	126 (132*)	19,4601,000	20,800980
Millwright	25	141 (149*)	2,630140	2,960140
Tradesman[2]	10		27,93011,870	32,08013,380
Project Manager[5]	3		10,9904,540	32,0805,240
Construction Manager	3		4,3805,000	5,1105,490
PM Assistant[5]	4		10,9904,540	12,3805,240
Support[6]	4		120150	130170
Support Assistant[6]	4		120150	130170
Engineer	10		1,3707,270	1,6008,120
Timekeeper[5]	3		10,9904,540	12,3805,240
Administrator[5]	6		10,9904,540	12,3805,240
Welder	1		3,9602,650	4,6403,090
Teamster[7]		25 (28*)	7,810	9,660
Instrument Tech[8]		12	260	300

Notes:
1 - The "Operating Engineers and Other Construction Equipment Operators" category was used.
2 - The "Construction Laborers" category was used.
3 - The "Plumbers, Pipefitters, and Steamfitters" category was used.
4 - The "Reinforcing Iron and Rebar Workers" and "Structural Iron and Steel Workers" categories were used.
5 - The "Supervisors, Construction and Extraction Workers" category was used.
6 - The "Helpers: Construction Trades, all other" category was used.
7 - The "Industrial Truck and Tractor Operators" category was used.
8 - The "Electro-Mechanical Technicians" category was used.
*Largest number of workers by trade. Where no number is included in parenthesis, number reported is the largest number of workers for the trade and during the peak project month, month 22.
Sources: Solar Millennium 2009a, Tables 5.11-8 and 5.11-17; EDD 2012.

As shown in **Socioeconomics Table 6**, there is more than adequate local availability of construction workforce within the Riverside/San Bernardino/Ontario MSA for the approved PSPP and, given the relatively small increase in total number of workers for the PSEGS, it is reasonable to assume there would be adequate local availability of workforce for the PSEGS.

The amendment did not include the project owner's estimations of the proportion of construction workers who would temporarily relocate closer to the project site versus those who would commute daily. Staff for the approved PSPP assumed that up to 15 percent of construction workers would seek local lodging during the workweek, and up to 85 percent would commute daily. Staff is using the same assumptions for the PSEGS and agrees that 15 and 85 percent are reasonable. Therefore, for the PSEGS peak construction, up to 347 workers would seek local lodging, which represents an increase of 175 workers over the approved PSPP project.

Hotel/Motel. **Socioeconomics Table 7** identifies over 12,500 motel/hotel rooms within a two-hour commute of the project site in selected cities in Riverside County and the nearby communities of Ehrenberg and Quartzite in Arizona.

Socioeconomics Table 7
Hotel/Motel Supply Within the PSEGS Regional Study Area

Geographic Area	Hotels/Motels	Total Number of Rooms
Blythe, California	21	1,032
Indio, California	13	808
Indian Wells, California	5	1,508
Palm Desert, California	14	2,300
Palm Springs, California	55	5,232
Rancho Mirage, California	6	1,598
Ehrenberg, Arizona	1	84
Quartzite Arizona	1	50
Totals	116	12,612
Sources: BS 2011a, adapted from Table 5.10-6, pg. 5.10-16.		

Housing Vacancy. As shown in **Socioeconomics Table 3**, the closest community to the PSEGS site, Desert Center, had a 39 percent vacancy rate with 55 vacant housing units available in 2010. The city of Blythe had a larger vacant housing supply with 960 units, for an 18 percent vacancy rate. A five percent vacancy is largely accepted as a minimum benchmark for a sufficient amount of housing available for occupancy (Virginia Tech 2006). **Socioeconomics Table 8** presents a more detailed look at housing supply within a two-hour commute of the PSEGS. In 2010, a total of 40,733 vacancies, representing a 30 percent vacancy rate, were available in the cities and communities within the regional study area. The housing counts in the study area indicate a greater supply of available housing units than demand.

Socioeconomics Table 8
Housing Unit Supply Within the PSEGS Regional Study Area

Geographic Area	Total	Occupied	Vacant	Percent Vacant
City of Blythe, California	5,473	4,513	960	18
Desert Center CDP, California	140	85	55	39
Palo Verde CDP, California	211	84	127	60
Indio, California	28,971	23,378	5,593	19
Indian Wells, California	5,137	2,745	2,392	46
Palm Desert, California	37,073	23,117	13,956	38
Palm Springs, California	34,794	2,274	12,048	35
Cathedral City, California	20,995	17,047	3,948	19
Quartzite, Arizona	3,378	2,027	1,351	40
Ehrenberg, CDP, Arizona	948	645	303	32
Total	137,120	75,915	40,733	30
Counties				
Riverside County, California	800,707	686,260	114,447	14
La Paz County, Arizona	16,049	9,198	6,851	43
*CDP – Census Designated Place Source: US Census Bureau 2010b.				

Campground/RV Parks. **Socioeconomic Table 9** shows abundant RV park spaces in the Blythe and Quartzite areas. However, RV parks in Blythe tend to be located along the Colorado River and receive higher levels of use during the summer, thereby possibly reducing availability for construction workers.

Socioeconomics Table 9
RV Parks Near the PSEGS Site

Geographic Area	RV Spaces
Blythe, California	795
Quartzite, Arizona	1,876
Sources: BS 2011a, adapted from Table 5.10-7, pg. 5.10-17; URS 2012a.	

For the approved PSPP, staff contacted a small sample of these RV parks and learned that while they have a large number of spaces, many are occupied by year-round residents or are privately owned, and would not be available for use by construction workers (GSEP2009a, p. 5.8-6). Additional RV parks are located in Ehrenberg, Arizona, and Quartzsite, Arizona, approximately 4 miles and 20 miles east of Blythe, respectively. The town of Quartzsite web site states there are more than 70 RV parks in the vicinity of the community that are typically occupied between October and March, with visitors attracted to the gem, mineral, and swap meet shows which are popular tourist attractions in the area (GSEP2009a, p. 5.8-6).

Conclusion. Based on this available local study area data, staff concludes that any construction workers seeking RV and campground lodging could find limited availability during the winter months. However, staff anticipates ample local housing (hotel/motel and housing units) would be available to any construction worker seeking local housing. Because of the availability of short-term housing in the local study area, staff concludes that construction of the PSEGS would not temporarily induce substantial growth or a concentration of population in the local study area.

Operation

The proposed PSEGS is expected to require 100 operational employees, compared with the 134 permanent operational employees that were required for the approved PSPP (Solar Millennium 2009a, p. 5.11-29; Palen 2012a). **Socioeconomics Table 10** shows Year 2010-2020 occupational employment projections for the Riverside/San Bernardino/Ontario MSA by operational labor skill, and the estimated total number of operational workers needed for the PSEGS, along with the number needed for the approved PSPP. Staff will formally request that the project owner provide a list of the trades and numbers of employees by trade required for PSEGS operations. For this PSA, staff has used the same trades used by PSPP staff in the Revised Staff Assessment for the approved PSPP project.

Socioeconomics Table 10
Total Labor by Skill in Riverside/San Bernardino/Ontario MSA and Required Operations Workers

Trade	Total Workers for Project Operation		Riverside/ San Bernardino/ Ontario MSA	
	Approved PSPP Project	PSEGS	2010	2020
Plant and System Operators	—	—	1,770	1,910
Power Plant Operators	—	—	130	150
Total	*134*	*100*	*1,900*	*2,060*

Sources: Solar Millennium 2009a, Table 5.11-8; Palen 2012a; EDD 2012.

Data for the Riverside/San Bernardino/Ontario MSA indicate that in the Year 2010, the "Plant and System Operators" and "Power Plant Operators" employment sector contained 1,900 workers, with Year 2020 forecasts for these employment sectors estimated at 2,060 employees. The applicant for the approved PSPP estimated that 75 percent of operational workers would come from within the regional study area workforce, resulting in a potential influx of approximately 34 workers in the communities in the local study areas (Solar Millennium 2009a). With the reduction of operational workers for the PSEGS, staff estimates 25 permanent workers could choose to live closer to the PSEGS site. Housing data show that the vacancy rates for the cities of Blythe, California, Ehrenberg, Arizona, and Quartzsite, Arizona, are 18, 32, and 40 percent, respectively. These vacancy rates indicate ample local housing is available should these operational employees choose to relocate to the local study area. Additionally, as shown in **Socioeconomics Table 2**, the regional study area provides a high number of available housing opportunities. The addition of up to 25 workers for the PSEGS operations to either the local or regional study area would not induce substantial growth or concentration of population in excess of available housing or forecasted growth.

Staff concludes that inducement of substantial population growth would be a less than significant impact, under CEQA, which is consistent with the conclusion for the approved PSPP.

Displace Existing Housing and Substantial Numbers of People

The proposed PSEGS site is vegetated with desert scrub throughout and includes some sand dunes in the northeast, with no housing structures existing on the property (Solar Millennium 2009a, p. 5.7-12). Two residences exist west of the PSEGS site, but would not be impacted by the project (Solar Millennium 2009a, p. 5.7-14). As such, no housing or persons would be displaced by the PSEGS.

Staff concludes that the required construction workforce for the PSEGS would be found in the regional study area, consistent with the approved PSPP. While 15 percent of workers could seek immigration local lodging during the workweek, they would not trigger the need for new housing based on available hotel/motel rooms and vacant housing units within the local study area. Vacancy rates within the local study area offer the 25 operational employees wishing to relocate ample available housing. 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 PSEGS 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 can increase the demand for a particular service, leading to the need for expanded or new facilities. Public service providers serving the PSEGS site are located within Riverside County. Therefore, the study area for the public services analysis is limited to Riverside County.

As discussed under the subject headings below, the PSEGS would not cause significant impacts to service ratios, response times, or other performance objectives relating to law enforcement, schools, or parks.

Please refer to the **WORKER SAFETY AND FIRE PROTECTION** section of this document for a detailed discussion of fire protection and emergency medical services.

Police Protection

The PSEGS, like the approved PSPP, would be served by the Riverside County Sheriff’s Department Colorado River Station at 260 North Spring Street in Blythe, California. The Colorado River Station provides service to the unincorporated area from Red Cloud Road on the west, to the Arizona state line on the east, and from county line to county line on the north and south (Solar Millennium 2009a, p. 5.11-20). Communities included in this service area are Desert Center, Eagle Mountain, East Blythe, Hayfield, Midland, Nicholls Warm Springs, Ripley, and the Colorado River. The project owner for the PSEGS has not provided any information related to police protection, such as updated response times to the project site and proposed security measures for either construction or operations of the PSEGS. Staff will contact the local sheriff’s department to obtain necessary information and update any changes to response times in the FSA.

At the time the approved PSPP was under Energy Commission review, the Riverside County Sheriff's Department was estimated to have an average response time to the site that depended on the severity of the incident and the location of the deputies on call. The response time was estimated at 45–60 minutes for the approved PSPP project (Solar Millennium 2009a, p. 5.11-20).

Recent communication with the Riverside County Sheriff's Department on another proposed solar project in eastern Riverside County (Rio Mesa Solar Energy Generation Facility) revealed sheriff's concerns for increased property theft at the project site. Specific measures such as fencing material, location of lighting, gates, signage, and a project site address would reduce the potential for crime (CEC 2013p). In addition, the Riverside County Sheriff's Department advised staff for the Rio Mesa Solar Energy Generation Facility that a "No Trespassing" letter should be on file at the sheriff station during construction and operation of the project. This letter would state the following: no one, other than employees, are permitted on the property; the owner or designee is requesting enforcement of trespass laws by the Riverside County Sheriff's Department; the owner or designee will testify in court; the property has been posted with "No Trespassing" signs; and contact information of the owner/designee. Staff will work with the Riverside County Sheriff's Department to determine if the department would request the same for PSEGS and if a condition of certification would be required.

Construction. The project owner for the PSEGS project did not provide security details for construction; however, the **HAZARDOUS MATERIALS MANAGEMENT** section of this document proposes Conditions of Certification **HAZ-4** and **HAZ-5,** which require the preparation of a Construction Site Security Plan and an Operation Security Plan to ensure site security. The plans also include a protocol for contacting law enforcement and the Energy Commission Compliance Project Manager (CPM) in the event of suspicious activity or emergency. Site security would minimize the potential need for the Riverside County Sheriff's Department assistance.

During the peak construction month, up to 347 workers for the PSEGS could seek local lodging. This number is considered less than significant as these workers would most likely already live within the regional study area and would be part of the Riverside County Sheriff's Department population served. While the PSEGS would increase the number of individuals within the local study area during construction, the increase would not be substantial and would not necessitate new or expanded law enforcement facilities or staff levels within the PSEGS regional or local study areas.

Operation. The project owner for the PSEGS project did not provide security details for operation of the site, but as was discussed for construction, an operations security plan would be required for the PSEGS. As discussed above, the operational workforce for the PSEGS is expected to be hired from within the regional workforce. It is possible that up to 25 operational employees for the PSEGS could choose to relocate to the PSEGS local area from more distant regional study area locations. If any operational employees were to permanently relocate to the local study area, it is assumed that some percentage of this population would purchase homes and contribute to the local community through the payment of property taxes. As it is likely a number of these employees already reside in Riverside County, relocation to the local area would not result in an increase over the total population policed by the Riverside County Sheriff's

Department. Therefore, staff concludes that operation of the proposed PSEGS would not require the need for new or expanded law enforcement facilities or staff levels within the PSEGS regional or local study areas.

Schools

The proposed PSEGS 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 (Solar Millennium 2009a, pp. 5.11-22–5.11-23). **Socioeconomics Table 11** identifies the schools plus the current and previous year's student enrollment data in each of the respective school districts. As shown, Palo Verde Unified School District (PVUSD), approximately 40 miles east of the PSEGS site, offers a full range of educational opportunities with three elementary schools, one middle school, one high school, and a continuation high school. Desert Center Unified School District, approximately 10 miles west of the PSEGS site, offers one elementary school.

Socioeconomics Table 11
Summary of Schools and Enrollment in Palo Verde and Desert Center School Districts

Palo Verde Unified School District					
School Name	**Community**	**Grades**	**Students**	**Pupil-to-Teacher Ratio**	**Average Class Size**
Felix J. Appleby Elementary School	Blythe	K-5			
2012–2013			571	—	—
2011–2012			531	19.7	19.7
Margaret White Elementary School	Blythe	K-5			
2012–2013			668	—	—
2011–2012			683	27.3	28.5
Ruth Brown Elementary School	Blythe	K-5			
2012–2013			633	—	—
2011–2012			713	27.4	28.5
Blythe Middle School	Blythe	6-8			
2012–2013			502	—	—
2011–2012			502	15.9	18.0
Palo Verde High School	Blythe	9-12			
2012–2013			955	—	—
2011–012			955	22.1	25.3

Twin Palms Continuation School	Blythe	9-12			
2012–2013			102	—	—
2011–2012			92	18.4	17.4
District Total	Blythe	K-12			
2012–2013			3,448	—	—
2011–2012			3,486	22.0	22.4
Desert Center Unified School District					
School Name	**Community**	**Grades**	**Students**	**Pupil-to-Teacher Ratio**	**Average Class Size**
Eagle Mountain Elementary School	Desert Center	K-8			
2012–2013			15	—	—
2011–2012			20	0	0
Riverside County					
Riverside County	County	K-12			
2012–2013			425,564	—	—
2011–2012			425,651	24.2	27.3
Source: CDE 2013.					

Construction. Staff assumes the construction workforce for the PSEGS would be hired from within the available regional workforce, with up to 15 percent of workers potentially seeking temporary local housing during the workweek. This temporary local housing need would not result in substantial population in-migration occurring from PSEGS construction into the PVUSD. Staff does not expect that any construction workers seeking local temporary housing would bring school-aged children seeking enrollment within the PVUSD, as staff assumes workers would only seek local lodging during the workweek and return to their permanent homes on the weekend. Therefore, staff concludes that construction of the PSEGS would not require the need for new or expanded PVUSD school facilities or staff levels.

Operation. The PSEGS is proposed on BLM land, as was the approved PSPP's administration and warehouse space, therefore the provisions of Education Code section 17620 would not apply, and no school impact fees would be collected for the PSEGS, as was the case for the approved PSPP (CEC 2010g).

The operational workforce for the PSEGS is expected to be hired from the available regional workforce. Up to 25 operational employees for the PSEGS, a decrease from the estimated 34 employees for the approved PSPP could choose to relocate to the PSEGS local area from more distant regional study area locations. At the time the approved PSPP was under Energy Commission review, the PVUSD school district expected to have the necessary capacity to accommodate new students resulting from project operation (Solar Millennium2009a, p. 5.11-23). Based on the school data in **Socioeconomics Table 11**, staff concludes that any contribution of school-aged children from workers relocating for the PSEGS would account for a small increase in the overall PVUSD student body. With the decrease in the required operational PSEGS workforce from 34 to 25, staff does not anticipate the impacts to school capacity to worsen. Staff concludes that operation of the proposed PSEGS would not necessitate new or expanded school facilities or staff levels within the PSEGS regional or local study areas, which was also the conclusion for the approved PSPP project.

Parks and Recreation

The PSEGS site is currently undeveloped, is not designated for active recreational use, and does not appear to be frequented as a recreational area (Solar Millennium 2009a, p. 5.7-13). The nearest park facilities to the PSEGS site are located within the City of Blythe, approximately 40 miles east of the PSEGS 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. Staff assumes the construction workforce for the PSEGS would be hired from within the available regional workforce, with up to 15 percent of workers potentially seeking temporary local area housing during the workweek to avoid commuting. This temporary local housing need would not result in substantial population in-migration occurring from PSEGS construction into either the local or regional study areas. As discussed above, staff concludes that camping and RV facilities would experience peak attendance from tourists during the summer and higher occupancy during the winter, thereby possibly reducing availability for construction workers seeking local area housing. Therefore, staff concludes that as a result of the PSEGS, construction employment, like the approved PSPP construction employment, would not require new or expanded recreational facilities or staff levels within the PSEGS regional or local study areas.

Operation. The operational workforce for the PSEGS is expected to come from within the available regional workforce. It is possible that up to 25 operational employees for the PSEGS could choose to relocate to the PSEGS local area from more distant regional study area locations. If any operational employees were to permanently relocate to the local study area, it is assumed that some percentage of this population would purchase homes and contribute to the local community through the payment of property taxes. Staff concludes that permanent employment associated with the PSEGS, like the approved PSPP, would not necessitate new or expanded parks and recreational facilities or staff levels within the PSEGS regional or local study areas.

PROJECT CLOSURE AND DECOMMISSIONING

As described in the **PROJECT DESCRIPTION** section of the **EXECUTIVE SUMMARY**, it is assumed the planned operational life of the PSEGS is at least 30 years from project start-up, but the facility conceivably could operate for a longer or shorter period depending on economic or other circumstances (Solar Millennium 2009a, p. 3-2). If the PSEGS remains economically viable, it could operate for more than 30 years, which would defer environmental impacts associated with closure and with the development of replacement power generating facilities. However, if the facility were to become economically non-viable before 30 years of operation, permanent closure could occur sooner. In any case, a Decommissioning Plan would be prepared at PSEGS closure and put into effect when permanent closure occurs (Solar Millennium 2009a, p. 3-2). In the case of a temporary closure, security for the PSEGS would be maintained on a 24-

hour basis during permanent closure (Solar Millennium 2009a, p. 3-2). In general, the Project Decommissioning Plan would address decommissioning measures for the PSEGS and all associated facilities, including activities necessary for site restoration/revegetation. If removal of all equipment and facilities is needed, recycling of facility components, collection and disposal of hazardous wastes and resale of unused chemicals to other parties would be addressed in the decommissioning plan. Decommissioning alternatives other than full site restoration, costs associated with the planned decommissioning activities, funding sources for these activities; and conformance with applicable LORS would also be included in the decommissioning plan (Solar Millennium 2009a, p. 3-2).

It is assumed that the number and type of workers required for closure and decommissioning activities would be similar to those described above for construction of the PSEGS. Also, staff assumes that, as for the construction of the PSEGS, 15 percent of the closure and decommissioning workforce would temporarily relocate closer to the project site for decommissioning and closure activities. The remaining 85 percent would be drawn from the regional and local study areas. As most workers are expected to reside within the study area, no impacts to existing population levels are expected to occur. Staff expects that, like the PSEGS construction workforce, the workforce for decommissioning and closure would have no impacts on housing, population, and police services. No significant impacts to the study area population would result from proposed PSEGS closure and decommissioning activities.

CUMULATIVE IMPACTS

A project may result in significant adverse cumulative impacts when 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, or the effects of probable future projects (Cal. Code Regs., tit. 14, §15130). Cumulative socioeconomics impacts could occur when more than one project has an overlapping construction schedule that creates a demand for workers that cannot be met by the local labor force, resulting in an influx of non-local workers and their dependents. Operational cumulative socioeconomic impacts could occur when the development of multiple projects significantly impacts the population of an area, resulting in a housing shortage, change in local employment conditions, and an increased demand on public services.

Projects considered for the socioeconomic cumulative analysis are shown in **Executive Summary Table 1** (existing projects), **Executive Summary Table 2** (foreseeable projects in the project area), **Executive Summary Table 3** (foreseeable projects in the California desert), and **Socioeconomics Table 12**. Although not all of those projects are expected to complete the environmental review process, or to be funded and constructed, the list is indicative of the large number of large residential, commercial, and energy projects currently proposed in California.

The projects are defined within a geographic area that has been identified by staff as covering an area large enough to provide a reasonable basis for evaluating cumulative impacts for all resource elements. Most of these projects have, are, or would be required to undergo their own independent environmental review under CEQA and/or the National Environmental Protection Act (NEPA).

GEOGRAPHIC EXTENT OF CUMULATIVE IMPACT ANALYSIS

The area of cumulative effect for socioeconomic resources is Riverside and San Bernardino Counties, California, and La Paz County, Arizona. 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.

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 **Socioeconomics Table 2**, from 2000 to 2010 the populations of Riverside and San Bernardino Counties increased by 41.7 and 19.1 percent, respectively, while the population within La Paz County increased by 15.6 percent during the same time. This is an example of the steady growth rate that has occurred throughout the regional study area. As a result, past and present residential, commercial, and industrial development has contributed to the overall socioeconomic growth within the study area.

EFFECTS OF FUTURE FORESEEABLE PROJECTS

Socioeconomics would be affected by reasonably foreseeable future projects such as large electrical generation and distribution infrastructure development projects proposed along the I-10 corridor (**Executive Summary Figure 1**) and solar and wind applications proposed on approximately 1,000,000 acres of BLM land in the California Desert District Planning Area. Also, a large number of solar generation and distribution infrastructure development projects proposed on non-federal land in the I-10 corridor would affect socioeconomics (**Executive Summary Tables 2** and **3, Socioeconomics Table 12,** and **Executive Summary Figure 1**).

Contribution of the Palen Solar Electric Generating System to Cumulative Impacts

Construction. Foreseeable development in the project area includes primarily renewable energy electrical generation and transmission infrastructure projects, with some residential and commercial development. Given the large number of renewable energy projects occurring within the PSEGS regional study area, it is possible that some overlap of construction phasing could occur between the PSEGS and the cumulative development projects. **Socioeconomics Table 12** presents the most recently published data (Year 2010–2020 projections) on labor force characteristics for the cumulative regional study area pertaining to solar energy project construction labor skill sets and compares those to major cumulative projects located near the PSEGS along the I-10 corridor, including the Blythe Solar Energy Project (BSPP), Genesis Solar Power Project (GSEP), Rice Solar Energy Project (RSEP), and the Desert Sunlight PV Project (DSPV)

Socioeconomics Table 12
Cumulative Project Construction Employment Needs and Labor Supply

Trade	Total # of Workers for Project Construction by Craft – Peak Month						*TOTAL*	Riverside/San Bernardino/ Ontario MSA	
	Approved PSPP Project (Month 17)	PSEGS (Month 22)	BSPP (Month 16)	GSEP (Month 16)	RSEP (Month 12)	DSPV (Months 6-8)		2010	2020
Surveyor	12		16	0	0	—	*28*	440	520
Operator	90	102	94	0	0	—	*184*	2,510[1]	3,030[1]
Laborer	185	82 (122*)	229	198	52	—	*637*	11,870[2]	13,380[2]
Truck Driver	35		28	0	0	—	*63*	11,870[2]	13,380[2]
Oiler	4		4	0	0	—	*8*	11,870[2]	13,380[2]
Carpenter	100	75 (123*)	77	44	50	—	*300*	10,140	10,450
Boilermaker	11	264	9	0	0	—	*20*	3,160[3]	3,570[3]
Paving Crew	0		0	0	0	—	*0*	400	490
Pipe Fitter	326	508	290	200	80	—	*968*	3,160	3,570
Electrician	150	359	81	105	56	—	*449*	4,000	4,520
Cement Finisher	100	9 (18*)	80	4	6	—	*197*	2,420	2,570
Ironworker	59	126 (132*)	42	70	32	—	*246*	1,000[4]	980[4]
Millwright	25	141 (149*)	18	22	16	—	*153*	140	140
Tradesman	10		8	382[7]	105[8]	—	*544*	11,870[2]	13,380[2]
Project Manager	3		2	0	0	—	*5*	4,540[5]	5,240[5]
Construction Manager	3		2	0	5	—	*10*	5,000	5,490
PM Assistant	4		2	0	0	—	*6*	4,540[5]	5,240[5]
Support	4		2	0	0	—	*6*	150[6]	170[6]
Support Assistant	4		2	0	0	—	*6*	150	170
Engineer	10		7	60	36	—	*127*	7,270	8,120
Timekeeper	3		2	0	0	—	*5*	4,540[5]	5,240[5]
Administrator	6		5	0	0	—	*11*	4,540[5]	5,240[5]
Welder	1		1	0	0	—	*2*	2,650	3,090
Teamster		25 (28*)						7,810[9]	9,660[9]
Instrument Tech		12						260[10]	300[10]
Total Peak Month	*1,145*	*2,311*	*1,001*	*1,085*	*438*	*622*	*5,457*	N/A	N/A
Local Housing Need[11]	*172*	*347*	*150*	*163*	*0*[12]	*93*	*753*	N/A	N/A

Notes: — Data not available, N/A Not applicable. *Largest number of workers by trade. Where no number is included in parenthesis, number reported is the largest number of workers for the trade and during the peak project month, month 22.
1 The Operating Engineers and Other Construction Equipment Operators" category was used. 2 "Construction Laborers" category was used. 3 The "Plumbers, Pipefitters, and Steamfitters" category was used. 4 The "Reinforcing Iron and Rebar Workers" and "Structural Iron and Steel Workers" categories were used. 5 The "Supervisors, Construction and Extraction Workers" category was used. 6 The "Helpers- Construction Trades" category was used. 7 Includes: insulators, painters, teamsters, and 'Solar Field Craft". The solar field craft workers include an estimated five solar field installation crews, with each crew including a Foreman, Equipment Operators, Laborers, Electricians, Ironworkers, Carpenters, Masons, and Pipefitter/Welders. 8 Includes Teamsters, Heliostat Assembly Craft, Construction Staff, Subcontractors, and Technical Advisors. 9 The "Industrial Truck and Tractor Operators" category was used. 10 The "Electro-Mechanical Technicians" category was used. 11 Assumes 15% of peak month workforce may seek temporary local housing during workweek.12 On-site worker camp is provided for RSEP, providing housing for up to 300 trailers, eliminating local housing need.
Source: Solar Millennium 2009a and b; GSEP 2009a; SR 2009a; BLM 2010c; and Palen 2012a.

All cumulative projects identified in **Socioeconomics Table 12** would be expected to draw on the large regional construction workforce in and around Riverside/San Bernardino/Ontario MSA. **Socioeconomics Table 12** also identifies the labor force by skill for the MSA and the number of workers by skill to construct each project. Even in a worst-case scenario, should construction of these projects occur during overlapping peak work months, construction labor requirements would not exhaust the supply of construction labor by craft in the Riverside/San Bernardino/Ontario MSA. While this number could impact the amount of local hotel/motel rooms in the local and regional study area, as discussed above for the proposed PSEGS, a high number of short-term housing units are available within increasing distance from the local study area. Furthermore, local housing is available within the cities of Ehrenburg and Quartzsite, Arizona. While staff acknowledges that, cumulatively, workers seeking short-term temporary housing during the workweek to avoid commuting from their homes in the regional study area could increase housing demand and population in the local area, the extent and quantification of these impacts is unknown and speculative. Staff also concludes that like the PSEGS, as was the conclusion for the approved PSPP, workers seeking RV and campsite lodging from cumulative projects would likely not find availability within the winter months. Based on the availability of local temporary housing within a two-hour commute range (as discussed above for the PSEGS), it is assumed, from a cumulative perspective, that ample temporary short-term housing is available for any workers seeking short-term local lodging. Therefore, staff concludes that cumulative project construction within the PSEGS local study area would not significantly impact the population projections or necessitate new or expanded housing within the local study area, consistent with the conclusions for the approved PSPP.

Furthermore, staff concludes that all workers associated with the cumulative projects identified in **Socioeconomics Table 12** would come from the regional study area, with up to 15 percent of these workers seeking short-term temporary housing during the workweek. Cumulative construction activities would not necessitate new or expanded public services (police, schools, parks and recreation) serving the local study area because no significant population increase would occur. **Socioeconomics Table 12** indicates that cumulative development could result in up to 753 workers relocating closer to the project site during construction. Staff concludes construction of the PSEGS would not contribute to adverse cumulative socioeconomic impacts because of the availability of over 40,000 housing vacancies within a two-hour commute of the project.

In addition, short-term, construction-related spending activities of the PSEGS, as for the approved PSPP, are expected to have cumulative economic benefits for the study area (refer below to **Socioeconomics Table 14**). The cumulative benefits would increase when revenues accrued as a result of the proposed PSEGS are combined with spending and any local revenues accrued as a result of current and future reasonably foreseeable cumulative development projects.

Operation. Operation of the PSEGS is expected to result in the potential permanent relocation of up to 25 workers into the local study area, versus 34 workers estimated for the approved PSPP. **Socioeconomics Table 13** presents the most recently published data (Year 2010–2020 projections) on labor force characteristics for the cumulative regional study area pertaining to solar energy project operational labor skill sets and compares those to major cumulative projects located near the PSEGS along the I-10 corridor, including the GSEP, BSPP, RSEP, and the DSPV.

Socioeconomics Table 13
Cumulative Project Operational Employment Needs and Labor Supply

Trade	Total # of Workers for Project Operation						TOTAL	Riverside/San Bernardino/ Ontario MSA	
	Approved PSPP Project	PSEGS	BSPP	GSEP	RSEP	DSPV		2010	2020
Plant and System Operators	—	—	—	—	—	—	—	1,770	1,910
Power Plant Operators	—	—	—	—	—	—	—	130	150
Total	*134*	*100*	*221*	*50*	*47*	*15*	*433*	*1,900*	*2,060*
Local Housing Need[1]	*34*	*25*	*55*	*33*	*12*	*4*	*129*	*N/A*	*N/A*

Notes: — Data not available.
N/A Not applicable.
1 BSPP and PSEGS use a 25% relocation assumption in their respective AFCs. As no assumed percentage was included in the RSEP AFC or in the DSPV information provided by BLM, this table assumes 25% of operational employees would permanently relocate to the cumulative project area. The GSEP AFC specifically indicates that up to 33 workers would relocate.
Source: Solar Millennium 2009a and b; GSEP 2009a; SR 2009a; BLM 2010c; and Palen 2012a.

Decommissioning. The decommissioning of the PSEGS is expected to result in similar cumulative impacts related to socioeconomics as PSEGS construction impacts, as described above. It is unknown if 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 until at least 30 years from project start-up. Based on the cumulative impact analysis for PSEGS construction activities, the impacts of the decommissioning of the PSEGS would not be expected to contribute to cumulative impacts related to socioeconomics. Staff assumes that like the PSEGS, the closure and decommissioning workforce would be drawn from the regional and local study areas, and at most, 15 percent of the workforce would temporarily relocate closer to the site for decommissioning activities.

COMPLIANCE WITH LORS

CALIFORNIA REVENUE & TAXATION CODE, SECTION 73

Solar thermal projects are subject to property taxes and current law would qualify the PSEGS for the exclusion of certain parts from valuation per the Revenue and Taxation Code, section 73, if the project were under construction by January 1, 2017. However, because the PSEGS is located entirely on BLM lands and under Title 43, United States Code, section 1701, and the federal government is immune from state and local taxes, property taxes would not be collected. The federal government can provide payments to compensate states and local governments for burdens created as a result of immunity (payment in lieu of taxes, or PILT) (43 U.S.C., § 1701, subd. (a)(13)).

NOTEWORTHY PUBLIC BENEFITS

For the purpose of this analysis, staff defines noteworthy public benefits to include changes in local economic activity and local tax revenue that would result from project construction and operation. Impact estimates reflect two different scenarios representing the construction and operation phases of the project. Economic impacts associated with the construction phase include substantial expenditures on materials and labor that would occur during the 33-month construction phase.

The economic model most commonly used is the IMPLAN input-output model, developed by the Minnesota IMPLAN Group (MIG). The model relies on complex input-output tables and social accounting matrices. These are quantitative representations of the purchaser-supplier relationships between producers and intermediate and final consumers. Based on these tables, the analyst can estimate the economic activity that would result from a given expenditure, or other economic event. The resulting economic impact estimates are divided into three categories. These are the direct, indirect, and induced economic impacts. Within each of these categories, the model estimates associated changes in employment, labor income, and economic output.[7] Direct economic effects represent the employment, labor income, and spending associated with construction or operation of the project itself. Indirect economic effects represent the expenditures on intermediate goods made by suppliers who provide goods and services to the project. Induced economic effects represent household spending that occurs due to the increased wages, salaries, and proprietor's income generated in the direct and indirect rounds.

Socioeconomics Table 14 provides a summary of economic and employment benefits of the PSEGS compared with the approved PSPP. As the PSEGS is completely on BLM land and the federal government is immune from state and local taxes, property taxes would not be collected. However, through payment in lieu of taxes the federal government can provide payments to compensate state and local governments for burdens created as a result of immunity (43 U.S.C., § 1701, subd. (a)(13)). The petition to amend has identified that an estimated $4.3 million in annual property tax would be assessed on the project if it were sited on non-BLM land. Payment in lieu of taxes would be at the discretion of the BLM.

[7] The Minnesota IMPLAN Group (2012) defines Economic Output as "the value of industry production." In the manufacturing sector, output is equal to total sales, minus inventory changes. For the service sectors, output is equal to total sales. In the retail and wholesale trade sectors, output is equal to the gross margin (i.e., total sales, minus the cost of goods sold).

Socioeconomics Table 14
PSEGS Economic Benefits

Fiscal Benefits	**Approved PSPP Project** (2009 dollars)	**PSEGS**
Estimated annual property taxes	$200,000[1]	$0 to 4.3 million[2]
State and local sales taxes: Construction	$805,000	$7 million
State and local sales taxes: Operation	$437,500	$70 million
School Impact Fee	$0	Not applicable
Non-Fiscal Benefits		
Capital Cost	$248,700,000	$533.8 million[3]
Construction materials and supplies	$30.0 million	$71,400,000
Operations and maintenance supplies	$5.0 million	$589,600
Direct, Indirect, and Induced Benefits		
Estimated Direct Employment		
Construction	566 jobs (annual full-time equivalent over full 39-month construction phase)	840 jobs
Income	$218.7 million (total over full 39-month construction phase)	$462.4 million
Operation	134 jobs	100 jobs
Income	$5.8 million (annual)	12.3 million (annual)
Estimated Indirect Employment		
Construction	291 jobs	172 jobs
Income	$14.0 million	$11 million
Operation	40 jobs	8 jobs
Income	$3.0 million	$36,605
Estimated Induced Employment		
Construction	196 jobs	3,274 jobs
Income	$13.0 million	$159.1 million
Operation	37 jobs	69 jobs
Income	$2.0 million	$2,778,257

Notes:

1 At present, there is no property tax assessed on solar components (mirrors, solar boiler, heat exchangers) by law (section 73 of the California Taxation and Revenue Code). Components included under the exemption include storage devices, power conditioning equipment, transfer equipment, and parts. The first operational year and subsequently thereafter would generate an estimated $200,000 in annual property taxes.

2 As the PSEGS is completely on BLM land and the federal government is immune from state and local taxes, property taxes would not be collected. However, the federal government can provide payments to compensate states and local governments for burdens created as a result of immunity (43 U.S.C., § 1701, subd. (a)(13)). An estimated $4.3 million would ordinarily be assessed which the federal government could pay to Riverside County, either in full, in part, or not at all.

3 The applicant estimated the capital cost for construction as $2 billion. Staff questions the applicant's estimate as the combined estimate for local materials and supply purchases and the total construction payroll (capital costs) add up to $533.8 million.

Source: Solar Millennium, 2009a; Palen 2012a.

RESPONSE TO AGENCY AND PUBLIC COMMENTS

Staff has not received any agency or public comments related to socioeconomics for the PSEGS.

CONCLUSIONS

At this time, no significant adverse socioeconomics impacts would occur as a result of the construction or operation of the proposed PSEGS, and, like the approved PSPP, the PSEGS would not cause a significant adverse direct, indirect, or cumulative impact on population, housing, or public services. Staff will contact the Riverside County Sheriff's Department, as discussed earlier in the subsection, "Police Protection," and incorporate any comments they might have on the PSEGS into the Final Staff Assessment (FSA). Staff will formally request the project owner to identify workers by craft so the construction workforce can accurately be identified with the labor supply as shown in the Employment Development Department employment projections and labor by skill in the Riverside/San Bernardino/Ontario MSA. Staff will formally request that the project owner provide a list of the trades and numbers of employees by trade required for PSEGS operations.

The proposed PSEGS, like the approved PSPP, 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 possible benefit to public finance and local economies through taxation. These activities would have a positive effect on the local and regional economy.

PROPOSED CONDITIONS OF CERTIFICATION

As was the case for the approved PSPP, no conditions of certification are required, as all potential socioeconomic impacts associated with the proposed PSEGS would be less than significant.

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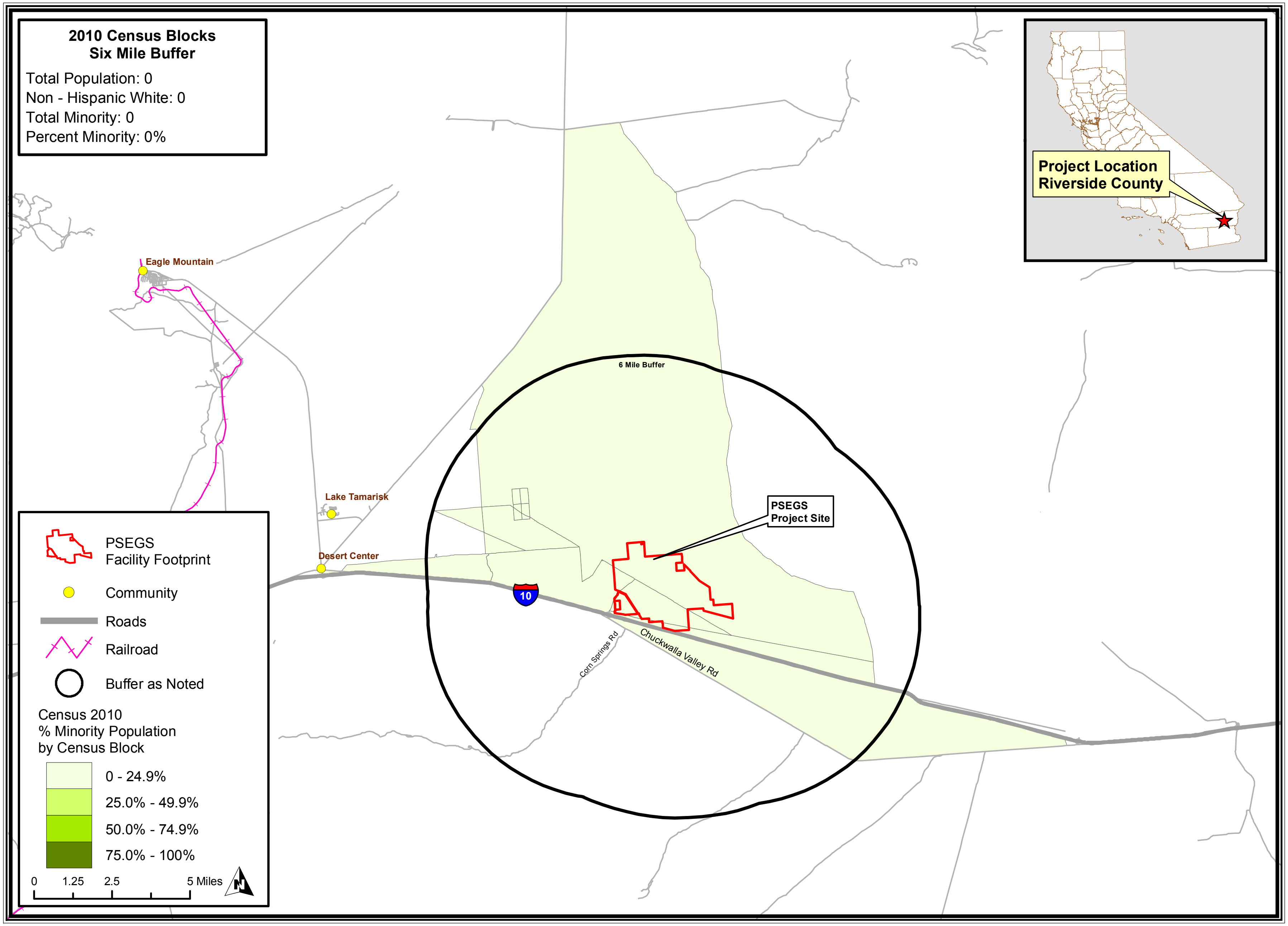
SOCIOECONOMICS - FIGURE 1

Palen Solar Electric Generating System - Census 2010 Minority Population by Census Block - Six Mile Buffer



SOCIOECONOMICS

CALIFORNIA ENERGY COMMISSION, SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: AECOM, Census 2010 PL 94-171 Data

SOIL AND WATER RESOURCES

Marylou Taylor, P.E.

SUMMARY OF CONCLUSIONS

With the information provided to date, California Energy Commission (Energy Commission) staff (staff) determined that construction, operation, and decommissioning of the proposed modified Palen Solar Electric Generating System (PSEGS) 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, are included herein as conditions of certification. The Soil and Water Conditions of Certification address the California Environmental Quality Act (CEQA) requirements for the Energy Commission's analysis, and if the conditions of certification are implemented, the project would conform to all applicable LORS and state policies.

A summary of proposed modifications to the **Soil and Water Resources** Conditions of Certification is shown in **Soil & Water Resources Table 1**.

Soil & Water Resources Table 1
Summary of Proposed Modifications to Conditions of Certification

Condition of Certification	Proposed Modification(s) to Condition
SOIL&WATER-1	DRAINAGE EROSION AND SEDIMENTATION CONTROL PLAN (DESCP): Edit to item N which references SOIL&WATER-12.
SOIL&WATER-2	PROJECT GROUNDWATER WELLS, PRE-WELL INSTALLATION: No change.
SOIL&WATER-3	CONSTRUCTION AND OPERATION WATER USE: Reduce maximum limit of water usage and construction duration to match the project description.
SOIL&WATER-4	GROUNDWATER LEVEL MONITORING, MITIGATION AND REPORTING: No change.
SOIL&WATER-5	COMPENSATION FOR WELL IMPACTS: No change.
SOIL&WATER-6	WASTE DISCHARGE REQUIREMENTS: Revise requirements specified in Appendix B, C, and D to match the modified project.
SOIL&WATER-7	SEPTIC SYSTEM AND LEACH FIELD REQUIREMENTS: No change.
SOIL&WATER-8	REVISED PROJECT DRAINAGE REPORT AND PLANS: Delete.
SOIL&WATER-9	DETAILED FLO-2D ANALYSIS: Delete.
SOIL&WATER-10	DRAINAGE CHANNEL DESIGN: Delete.
SOIL&WATER-11	CHANNEL EROSION PROTECTION: Delete.
SOIL&WATER-12	CHANNEL MAINTENANCE PROGRAM: Delete.
SOIL&WATER-13	CLOSURE AND DECOMMISSIONING PLAN: No change.
SOIL&WATER-14	MITIGATION OF IMPACTS TO THE PALO VERDE MESA GROUNDWATER BASIN: No change.
SOIL&WATER-15	GROUNDWATER PRODUCTION REPORTING: No change.
SOIL&WATER-16	GROUND SUBSIDENCE MONITORING AND ACTION PLAN: No change.
SOIL&WATER-17	ESTIMATION OF SURFACE WATER IMPACTS: No change
SOIL&WATER-18	GROUNDWATER QUALITY MONITORING AND REPORTING PLAN: No change.
SOIL&WATER-19	NON-TRANSIENT, NON-COMMUNITY WATER SYSTEM: No change.
SOIL&WATER-20	STORM WATER DAMAGE MONITORING AND RESPONSE PLAN: New.

Socioeconomics staff has determined that the population in the six mile buffer does not constitute an environmental justice population as defined by “Environmental Justice: Guidance under the National Environmental Policy Act” and would not trigger further scrutiny for purposes of an environmental justice analysis.

INTRODUCTION

This analysis addresses potential impacts to soil and water resources through the construction and operation of the modified PSEGS project. Where impacts are found to be the same or less than impacts of the approved PSPP project, staff applied the existing Conditions of Certification, as contained in the Commission Decision dated December 15, 2010 (CEC 2012f), to reduce those impacts to less than significant.[1] Aspects of the modified project that are new or substantially different from the approved project have been identified and examined for potential impacts. To reduce these impacts to less than significant, staff recommends new conditions of certification. In this analysis, the term “approved project” refers to the PSPP and the term “modified project” refers to the proposed modified PSEGS.

METHODOLOGY AND THRESHOLDS FOR DETERMINING ENVIRONMENTAL CONSEQUENCES

Significance criteria are based on those listed in CEQA Appendix G. Soil 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 or 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 or offsite;
- create or contribute runoff water that 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;

[1] The analysis presented in the PSPP Revised Staff Assessment (CEC 2010c) has been included in the text of this PSA, where applicable, for the reader's reference.

- place structures within a 100-year flood hazard area that would impede or redirect flood flows;
- expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam;
- result in substantial soil erosion or the loss of topsoil;
- have impacts that are individually limited, but cumulatively considerable ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects); or
- have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly.

Although the CEQA Guidelines provide a checklist of suggested issues that should be addressed in an environmental document, neither the CEQA statute nor the CEQA guidelines prescribe thresholds of significance or particular methodologies for performing an impact analysis. This is left to lead agency judgment and discretion, based on factual data and guidance from regulatory agencies and other sources where available and applicable. Staff assessed whether the PSEGS project would comply with the LORS and policies described in **Soil & Water Resources Table 2** and whether there would be a significant impact under the CEQA. Where a potentially significant impact was identified, staff proposed mitigation to ensure the impacts would be less than significant.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS (LORS)

Soil & Water Resources Table 2
Laws, Ordinances, Regulations, and Standards (LORS) and Policies

Federal LORS	
Clean Water Act of 1977 (Including 1987 Amendments) Sections 401, 402 and 404	The primary objective of the Clean Water Act (CWA) is to restore and maintain the chemical, physical, and biological integrity of the Nation's surface waters. Section 401: Requires certification that the proposed project is in compliance with established water quality standards. Section 402: Direct and indirect discharges and storm water discharges into waters of the United States must be made pursuant to a National Pollutant Discharge Elimination System (NPDES) permit. 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 U.S. Army Corp of Engineers (USACE).
State LORS	
State of California Constitution 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.
SWRCB Order 2009-0009-DWQ	The State Water Resources Control Board (SWRCB) regulates storm water discharges associated with construction affecting areas greater than or equal to 1 acre to protect state waters. Under Order 2009-0009-DWQ, the SWRCB has issued a NPDES General Permit for storm water discharges associated with construction activity.
SWRCB Order 97-03-DWQ	The SWRCB regulates storm water discharges associated with several types of facilities, including steam electric generating facilities. Under Order 97-03-DWQ, the SWRCB has issued a NPDES General Permit for storm water discharges associated with industrial activity.
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.
California Water Code Section 1200 "Water Rights"	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.
The Porter-Cologne Water Quality Control Act of 1967, California Water Code Section 13000 et seq.	Requires the SWRCB and the nine Regional Water Quality Control Boards (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.
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). Regulated wells must be sampled for bacteriological quality once a month and the results submitted to the California Department of Public Health (CDPH).
California Code of Regulations Title 23, Division 3, Chapter 9	This chapter requires the Colorado River Basin RWQCB (CRBRWQCB) to issue a report of waste discharge for discharges of waste to land pursuant to the Water Code.

California Code of Regulations Title 23, Division 3, Chapter 15	Regulates all discharges of hazardous waste to land that may affect water quality.
State Policies and Guidance	
SWRCB Res. 68-16	Anti-Degradation Policy: This policy restricts degradation of surface and ground waters. In particular, this policy protects water bodies where existing quality is higher than necessary for the protection of beneficial uses.
SWRCB Res. 75-58	Power Plant Cooling Water Policy: 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.
SWRCB Res. 77-01	Water Reclamation Policy: Under this policy, the SWRCB and CRBRWQCBs shall encourage reclamation and reuse of water in water-short areas.
SWRCB Res. 92-49	Policies and Procedures for Investigations and Clean-up and Abatement of Discharges Under CWC Section 13304: Under this policy, clean-up and abatement actions are to implement applicable provisions of Title 23 CCR Chapter 15, to the extent feasible.
SWRCB Res. 209-0011	Water Quality Control Policy for Recycled Water: 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.
Public Resources Code Section 25300 et. seq.	The Energy Commission adopted a policy stating they would approve the use of “fresh inland” water for cooling purposes by power plants only where alternative water supply sources and alternative cooling technologies are shown to be “environmentally undesirable” or “economically unsound.”
State Water Policy	The Energy Commission has five authoritative 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 resolutions (in particular Resolutions 75-58 and 88-63), and a letter from the Board to the Energy Commission interpreting Resolutions 75-58 and 88-63 [collectively referred to as the state’s water policies - see Genesis Solar Project (09-AFC-08)].
Local LORS	
Riverside County Ordinance Code, Title 13, Chapter 13.20	Establishes requirements to construct and operate groundwater wells.
Riverside County Ordinance Code, Title 8, Chapter 8.124	Establishes requirements to construct and operate sanitary wastewater disposal systems.
Riverside County Title 15 Chapter 15.24 Uniform Plumbing Code	Adopts by reference the California Plumbing Code, including the appendix and standards, for the installation and inspection of plumbing systems as a means of promoting the public's health, safety and welfare.
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.

PROPOSED MODIFIED PROJECT

Characteristics of the modified project that have the potential to impact soil and water resources differently than the approved project are shown in **Soil & Water Resources Table 3**.

Soil & Water Resources Table 3
PSPP vs. PSEGS Features Impacting Soil and Water Resources

Feature	PSEGS – Modified Project	PSPP – Approved Project
Solar technology	solar tower - two adjacent solar fields, each consisting of a power block and approximately 85,000 heliostats for heating a receiver on top of a 750 foot tall solar power tower	parabolic trough – two adjacent solar fields, each consisting of a power block and rows of parabolic mirrors for heating heat transfer fluid (HTF)
Project footprint	approximately 3,794 acres	approximately 4,365 acres
Water use during construction	400 acre-feet per year (total of 1,130 acre feet)	1,917 acre-feet per year (total of 5,750 acre feet)
Water use during operations	up to 201 acre-feet per year	up to 300 acre-feet per year
Evaporation ponds	two 2-acre ponds	four 4-acre ponds
Land Treatment Units (LTUs)	not required	required to treat HTF-contaminated soils
Solar field grading	maintaining existing vegetation to the extent possible; limited grading for roads, power blocks, and common facilities area (total earthwork approximately 213,000 cubic yards)	grading of entire solar fields to create flat, uniform topography and elimination of all vegetation (total earthwork approximately 4,500,000 cubic yards)
Storm water drainage control	maintain natural drainage patterns for the majority of the site; diversion channels bypass storm water runoff around power blocks and common facilities area	eliminate all onsite natural drainage and construct three large drainage control channels to bypass all offsite storm water runoff around the solar fields
Common facilities area	a common facilities area of approximately 15 acres located in the southwestern corner of the site containing: main office building, warehouse and maintenance buildings, and evaporation ponds	a common facilities area of approximately 50 acres located in a southwestern edge of the site containing: main office building, warehouse and maintenance buildings, and laydown area
Temporary construction laydown area	203 acres located in the southwestern portion of the site immediately north of the common facilities area	
Length of construction	33 months	39 months
Offsite linear facilities	The modified project includes a slight re-routing of the generation tie-line and the redundant telecommunication line near the western end of the approved route, around the newly constructed Red Bluff Substation. The modified project also includes a natural gas pipeline from a new extension of the existing Southern California Gas (SoCal Gas) distribution system.	

Source: Palen 2012a §5.2, CEC 2010f

Refer to the **PROJECT DESCRIPTION** section of this PSA for more information on PSEGS major features. **Project Description Figure 5** shows the location of the proposed modified project with respect to the approved project, as well as the offsite linear facilities. Additional information relevant to the soil and water resources analysis is summarized below. For a complete detailed description of the proposed modified project, refer to the Petition for Amendment (Palen 2012a) and the project owner's related supplemental material.

PROJECT CONSTRUCTION

Construction of the approved project was to be accomplished in two, overlapping phases, requiring 39 months for completion, with completion of the west solar field within six months after the east solar field. For the modified project, the two phases would be constructed over a similar time frame, with construction of Solar Plant 1 beginning only a few months prior to that for Solar Plant 2. Commercial operation for both plants is expected to begin on the same date[2]. The entire construction period would be 33 months versus the 39 for the approved project (Palen 2013h §5).

Soil Erosion and Storm Water Control

During construction, portions of the PSEGS site would be graded, including portions along the ephemeral washes. Grading is not intended to level the site, but rather to prepare the site for installation of the heliostats and ease future maintenance activities. As such, the drainages would remain, to the extent feasible, and natural drainage waters are expected to continue to flow in and through these ephemeral washes. Any grading required would be designed to maintain existing drainage pathways, where possible (Palen 2013e §3.4).

Power Plant Sites

Major items at each PSEGS solar plant would include a steam turbine system, an air-cooled steam condenser system, and a 750-foot-tall solar power tower topped with a solar receiver steam generator (SRSG). Other associated items include various raw water/wastewater treatment facilities with water storage tanks, auxiliary boilers, mirror washing related equipment, a wet surface air cooler (WSAC), a gas metering set, and a plant services building with parking. Heavy to medium grading would be performed within each plant’s solar power tower and power block areas. The earthwork within the power blocks would be excavated and compacted to the recommendations of the final geotechnical report. The deepest excavations would occur for foundations and sumps. Within each of these individual areas, earthwork cuts and fills would be balanced to the greatest degree possible (Palen 2012a §§2.2, 2.13).

Prior to construction, the project owner would prepare a Storm Water Pollution Prevention Plan (SWPPP) to control storm water and soil erosion during the facility’s construction using best management practices (BMPs).[3] To redirect storm water flow

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[2] The first construction phase would include construction of the generation tie-line, access road, common facilities area, common facilities, temporary construction laydown area, both power blocks including laydown area, and a portion of Solar Field 2. The second construction phase would include the construction of Solar Field 1 and the remainder of Solar Field 2 (Palen 2013a).

[3] Storm water and soil erosion BMPs are methods that have been determined to be the most effective, practical means of preventing or reducing pollution from nonpoint sources. BMPs can be classified as "structural" (i.e., devices installed or constructed on a site) or "non-structural" (procedures, such as modified landscaping practices). There are a variety of BMPs available, depending on pollutant removal capabilities. (See California Stormwater BMP Handbook at www.casqa.org.)

around these facilities, diversion channels, bypass channels, or drainage swales would be used. Stone filters and check dams would be placed strategically, as needed, throughout the project site to provide areas for sediment deposition and to promote the sheet flow of storm water prior to leaving the project site boundary. Native materials (rock and gravel) would be used where available for the construction of the stone filter and check dams. Stone filters and check dams are not intended to alter drainage patterns, but to minimize soil erosion and promote sheet flow (Palen 2012a §2.13).

Permanent diversion channels would be built around both Solar Plant 1 and Solar Plant 2 power blocks during the early stages of power plant construction to provide storm water management of the power block area during construction activities. These channels would be designed with a minimum ground surface slope of 0.5 percent to allow positive, puddle-free drainage. To reduce erosion, storm drainage channels may be lined with a nonerodible material such as compacted riprap, geosynthetic matting, or engineered vegetation (Palen 2013e §3.4.3).

Solar Fields – Heliostats

The approved project would have required extensive grading to maintain a consistent grade for interconnecting piping and three major drainage channels to route the water through and around the entire solar field. The modified project would instead require much less grading because the heliostat technology does not require an entirely flat surface (Palen 2012a §2.13).

The modified project would be designed to provide the minimum requirements for access of installation equipment and materials during site construction and operations. Most of the natural drainage features would be maintained and any grading required would be designed to promote sheet flow where possible. Areas disturbed by grading and other ground disturbance would be protected from erosion by implementation of appropriate BMPs (Palen 2012a §2.13).

Solar field development would maintain unobstructed sheet flow, with storm water mostly traveling in existing natural contours and flowpaths. Relatively small rock filters and local diversion berms through the heliostat fields may be installed as required to discourage water from concentrating and to maintain sheet flow. Mowing vegetation, rather than removal, would allow for clearance for heliostat function while leaving soil surface and root structures intact (Palen 2013e §4.4).

Each solar field would consist of approximately 85,000 heliostats - elevated mirrors with a total reflecting surface of 204.7 square feet. Each heliostat assembly would be mounted on a single support pylon and guided by a computer-programmed aiming control system to track the movement of the sun. Communication between the heliostats and the operations center will be done via surface-mounted anchored cable or wireless remote system (Palen 2012a § 2.2).

The siting of pylons will be guided by global positioning system (GPS) technology. Installation of the heliostat assemblies would use vibratory technology to insert the pylons into the ground and a rough terrain crane able to mount heliostat assemblies on several pylons before moving to the next location. Depths are not expected to be greater than 12 feet. Vegetation clearing, grubbing,[4] and contour smoothing in the heliostat fields would occur where necessary to allow for equipment access and storm water management. In areas where these activities are not required for access or construction, the vegetation would not be removed, but would be mowed (if needed) to a height of approximately 12 to 18 inches (Palen 2012a §2.13).

Solar Fields – Roads

PSEGS would contain six types of roads (Palen 2012a Appendix 2-D, Palen 2013a Appendix A, Palen 2013e) as shown on **Soil & Water Resources Figure 1**:

- 24-ft wide asphaltic paved road provides access to the site from Interstate 10
- 20-ft wide asphaltic paved roads located within the solar field connect the power blocks/towers to each other
- 20-ft wide dirt (aggregate base) road located at the boundary of the two solar fields from where the 20-ft paved road ends to the northeast boundary of the site.
- 12-ft wide asphaltic paved roads located around the perimeter of the common area facilities
- 12-ft wide dirt (aggregate base) roads located around the perimeter of the site, around the perimeter of the power blocks, and spike access from power blocks to the site perimeter
- 10-ft wide circular dirt (cleared and smoothed) roads placed approximately 152 feet apart located concentrically around the power blocks areas provide maintenance access to the heliostats

Most of the natural drainage features would be maintained and any grading required would be designed to promote sheet flow where possible (Palen 2013e §3.4).

Common Area

A 15-acre common facilities area will be established in the southwestern corner of the site to accommodate an administration building, warehouse, and maintenance complex; evaporation ponds; asphalt-paved visitor and employee parking area; and landscape areas. Construction of these common area facilities would require heavy to medium grading and would occur concurrently with the construction of Solar Plants 1 and 2 (Palen 2012a §2). The common facilities area would also be used for a temporary construction area, as described in "Laydown Areas" below.

The administration complex will occupy approximately 4.8 acres and will be served by power from the local 33-kV distribution system and water from water supply wells located in the common area. Similar to the power plant sites, storm water management for the administration complex would include a permanent diversion channel comprising an engineered earthen berm and adjacent swale with rock slope protection. The surface areas within the common area that are used for construction activities would be

[4] Grubbing of vegetation includes the removal of any remaining roots or stumps after cutting vegetation to clear land.

stabilized and dust suppression maximized with a layer of crushed stone in areas subject to heavy daily traffic (Palen 2012a §2).

Laydown Areas

The 203-acre temporary construction laydown area on the west side of the site would be used for equipment laydown, construction parking, construction trailers, a tire cleaning station, heliostat assembly facility, a temporary concrete batch plant, and other construction support facilities. The surface areas within the temporary construction area that are used frequently would be stabilized and dust suppression maximized with a layer of crushed stone in areas subject to heavy daily traffic. The temporary construction laydown area has been sized large enough to allow the staging of deliveries and truck and worker ingress and egress to the site to avoid stacking on the I-10/Corn Springs interchange (Palen 2012a §2.6).

Additionally, 11.2 acres of temporary construction laydown areas would be located at each solar plant site for construction parking and equipment laydown. To redirect storm water flow around these construction laydown areas, diversion berms or drainage swales would be used. Stone filters and check dams would be placed, as needed, to provide areas for sediment deposition (Palen 2013g). Areas compacted during construction activities will be restored, as appropriate, to approximate preconstruction compaction levels to minimize the opportunity for any increase in surface runoff (Palen 2013e §3.4).

Linear Facilities

Offsite

The approved project did not include a natural gas supply pipeline, but rather was approved to use liquefied petroleum gas contained within a tank for its auxiliary fuel. The modified project would use natural gas to fire its auxiliary and nighttime preservation boilers. The natural gas supply for PSEGS would be provided by Southern California Gas (SoCal Gas), which would upgrade and extend an existing distribution line from its main transmission gas pipeline located approximately 1.8 miles west and south of the site. The modified project also includes a slight re-routing of the generation tie-line and the redundant telecommunication line near the western end of the approved route, around the newly constructed Red Bluff Substation (Palen 2012a §2).

Onsite

During construction, trenches would be excavated for the installation of underground systems, equipment and materials including onsite electrical transmission system conductors and onsite natural gas system. The natural gas supply lines would be extended onsite to serve both Solar Plants.

The approved project proposed overhead transmission lines to transport electricity generated at the power blocks to the onsite switchyard. The modified project proposes underground electric cables for this purpose. The cable from Solar Plant 2 would be routed to Solar Plant 1 adjacent to major access roads. Cables serving each Solar Plant would then be routed to the onsite switchyard (Palen 2013r §20).

The typical trench would be 2-3 feet wide at the base and 3-6 feet deep, but a few trenches may have widths and/or depths up to 12 feet. In addition, buried conductors would require manholes located at intervals of approximately 1,000 to 2,000 feet for cable pulling during construction. The manholes will be approximately 8-10 feet in depth. Trench sides will be sloped or shored in accordance with applicable safety requirements to prevent trench walls from collapsing (Palen 2012a §2.13).

Total Soil Disturbance

Construction of the PSEGS would affect the areas shown on **Project Description Figure 6**. Soil disturbance would occur as a result of grubbing, grading, and/or excavation activities. After construction, some of these areas would be covered with impervious material (i.e. concrete foundations, asphalt pavement, heliostat assemblies) and temporary construction areas would be restored to pre-project grade and stabilized to prevent erosion and promote natural re-vegetation.[5] **Soil & Water Resources Table 4** summarizes the estimated graded areas and impervious areas.

Soil & Water Resources Table 4
Estimated Graded Areas and Impervious Areas

Graded Areas		Percent of Total Project Area[1]
Dirt Roads	244 acres	9.2%
Power Blocks	102 acres	
Switch Yard	3 acres	
Total	349 acres	
Impervious Areas		21.7%
Heliostats[2]	799 acres	
Paved Roads	25 acres	
Power Blocks		
Common Area		
Total	824 acres	
Temporary (during construction)		1.0%
Construction Laydown Area	28 acres	
Concrete Batch Plant	4 acres	
Underground electric cables	5 acres	
Natural Gas Line (onsite)	2 acres	
Total	39 acres	
Offsite Linear Facilities[3]	339 acres	--

(Source: Palen 2012a, Palen 2013a, Palen 2013r)

Note 1: Solar fields (3576 acres) + Common Area (15 acres) + Laydown Area (203 acres) = 3794 acres (Does not include offsite linear facilities.)

Note 2: Accounts for surface area of all mirrors in horizontal position. Assuming 170,000 heliostats total, each with a 204.7 square feet reflecting surface.

Water Use

The approved project would have used up to 1,917 acre feet per year (afy) during construction (for a total of 5,750 acre feet during the 39 months) from up to 10 groundwater wells. The modified project would use up to the same number of groundwater wells as the approved project. However, because less extensive grading

[5] As required by Condition of Certification **BIO-8**, Item 19 (see the **BIOLOGICAL RESOURCES** section of this **PSA**).

would be required for the solar field, the modified project would only use up to 400 afy (for a total of 1,130 acre feet) during the construction period (Palen 2012a §2.4).

The modified project would require water for various construction-related activities. These activities include:

- Dust control for areas experiencing construction work as well as mobilization and demobilization;
- dust control for roadways;
- water for grading activities associated with both cut and fill work;
- water for soil compaction in the utility and infrastructure trenches;
- water for soil compaction of the site grading activities;
- water for soil stockpile sites;
- water for the various building pads;
- water for hydrostatic testing for tanks and pipelines; and
- water for concrete pours on site.

Wastewater Management

Wastewater generated during construction would consist of similar types and quantities as the approved project (Palen 2012a §5.2). Anticipated sources of wastewater would include sanitary wastes, wash water, concrete washout water, paint wash water, piping and vessel hydrostatic test water, and drilling slurries and drilling fluids (Palen 2013e §3.11). Sanitary waste would be contained in portable facilities and routinely disposed of at an offsite treatment/disposal facility by a sanitary service. Excess concrete and concrete washout slurries would be discharged to a temporary washout facility (Palen 2013e §4.3).

PROJECT OPERATION

PSEGS would be designed for an operating life of 25 to 30 years. It is anticipated that the facilities would normally operate at high average annual capacity factors during periods of sunlight (Palen 2012a § 3.1.4). Commercial operation for both Solar Plants 1 and 2 is estimated to begin in June 2016 (Palen 2012a §2.11).

Soil Erosion

The project owner submitted a Preliminary Draft Construction Drainage, Erosion, and Sediment Control Plan/Storm Water Pollution Prevention Plan ([DESCP/SWPPP] Palen 2013e) that lists standard Best Management Practices (BMPs). Disturbed areas would be stabilized with effective soil cover (such as aggregate, paving, or vegetation) as soon as feasible, but no later than 14 days after construction or disturbance is complete in that portion of the site. To reduce erosion potential, BMPs would be implemented in accordance with the approved DESCP. Vegetation would remain, but would be cut (when necessary) to a height that would allow clearance for heliostat function while leaving the root structures intact. Occasional cutting of the vegetation would be performed as needed to permit unobstructed heliostat mirror movement.

Storm Water Control

The approved project would have constructed three large drainage control channels to bypass all offsite storm water runoff around the solar fields. The modified project would instead construct much smaller diversion channels to bypass runoff around Solar Plant 1, Solar Plant 2, and the administration complex. These channels would be maintained during the operational life of PSEGS. Periodic maintenance would be conducted as required after major storm events and when the volume of accumulated material behind the check dams exceeds 50 percent of the diversion channel's designed volume (Palen 2013e §3.4).

Areas compacted during construction activities would be restored, as appropriate, to approximate preconstruction compaction levels to minimize the opportunity for any increase in surface runoff. A majority of solar field development would maintain unobstructed sheet flow along existing natural contours and flowpaths. Relatively small rock filters and local diversion berms through the heliostat fields may be installed as required to discourage water from concentrating. Stone filters and check dams are not intended to alter drainage patterns, but to minimize soil erosion and promote sheet flow (Palen 2013e §4).

Grading and mowing during construction, and continued vegetation control during operations, could affect a large portion of the onsite ephemeral drainages over the life of the project. Despite these ongoing activities, the natural hydrologic processes would be maintained. These existing flow patterns are intermittent with variable channels, and ephemeral flows would continue to follow the same direction toward Palen (dry) Lake (Palen 2013e §4.4).

Each PSEGS Solar Plant would keep the potentially polluted contact[6] storm water from the power blocks and equipment areas, general facility drainage, process wastewater, and sanitary waste completely separated from non-contact storm water runoff, as described in the Wastewater Management discussion below.

Water Use

The approved project would have used up to 300 afy during operation from up to 10 groundwater wells. The modified project would utilize the same number of groundwater wells but would only use up to 201 afy during operation. The onsite groundwater production wells would supply both solar plants and the common area with make-up water, mirror-wash water, and domestic water. Each solar plant would include a water treatment and deionizing facility in the power block area. Water for domestic uses by project employees would be provided by onsite groundwater treated to potable water standards. The estimated annual water use for this purpose is 4 acre-feet per year (Palen 2012a §2.4).

[6] Contact runoff refers to storm water in contact with exposed polluted or hazardous materials and/or surfaces that can potentially result in contaminated runoff (containing trace oil, chemicals, metals, toxic substances, or other materials).

Wastewater Management

PSEGS would keep the potentially polluted waste water (contact runoff, general facility drainage, process wastewater, and sanitary waste) completely separated from non-contact storm water runoff (Palen 2012a §2.8).

General Facility Drainage

Each Solar Plant would collect contact runoff from the power block to prevent this potentially contaminated water from comingling with non-contact storm water runoff. The contact runoff would be collected along with wastewater from the plant's raw water use (such as sample drains, containment area washdown, and facility equipment wash water) through a system of floor drains, hub drains, sumps, and piping and routed to the oil/water separator. From there, the water would flow to the waste collection tank then to a thermal evaporator system with the process wastewater (Palen 2012a §2.8).

Process Wastewater

The primary wastewater collection system would collect process wastewater from all of the solar plant equipment, including blowdown[7] from the SRSG, natural-gas-fired boiler, demineralization, auxiliary cooling system, and water treatment equipment. Additional sources of wastewater include oil/water separator effluent from power block storm water runoff and general facility drainage. To the extent practical, process wastewater would be recycled and reused. A thermal evaporator system (vapor recompression evaporation system) would treat the collected wastewater by concentrating the soluble materials through evaporation. Distillate collected from the system would be recycled and routed to the well water storage tank for reuse. Concentrated waste brine from the evaporator would be transported to the evaporation ponds by tank truck (Palen 2012a §2.8).

The evaporation ponds for the approved project were located within the solar block area, with two 4-acre ponds in the approximate center of each solar field. For the modified project, the two 2-acre ponds would be located in the common area in the southwest portion of the project site. Each 2-acre pond would be divided into two cells and would be capable of evaporating the total waste stream from the entire facility for the life of the project. Two ponds allow the use of one pond when the other requires maintenance. The evaporation ponds would be double-lined with high-density polyethylene (HDPE) liners to prevent infiltration of process water into the soil below (Palen 2012a §2.8).

Sanitary Waste

Each solar plant and the administration complex would include a septic tank and leach field system for sanitary water streams, including showers and toilet. When needed, septic tank contents would be removed from site by a sanitary service. Based on the current estimate of approximately 3,010 gallons of sanitary wastewater production per

[7] Blowdown is the portion of water drained from a process to remove mineral build-up from concentrated recirculating water. These minerals would cause scaling on equipment surfaces and can damage the system.

day, a total leach field area of approximately 6,000 square feet would be required, spread out among three or more locations (Palen 2012a §2.8).

Mirror Washing

Regular mirror washing is anticipated to be needed once a week, and additional mirror washing may occur on an as-needed basis as determined by a reflectivity monitoring program. Mirror washing would occur primarily at night and involves a water truck spraying treated water on the mirrors in a drive-by fashion. Wash water falls from the mirrors to the ground and, due to the small volume, soaks in with no appreciable runoff. Remaining rinse water from the mirror washing operation is expected to evaporate on the mirror surface (Palen 2012a §2.4).

CONTAMINATED SOIL AND WATER

A Phase I Environmental Site Assessment (ESA) performed in May 2009 for the project area concluded that no recognized environmental conditions were associated with the project site.[8] Because the ESA is required to be updated within a year if a new project is proposed, the project owner will provide an updated Phase I ESA prior to the Final Staff Assessment. Although the potential of encountering contaminated soil would be low, staff would require that an experienced and qualified Professional Engineer or Professional Geologist be available for consultation during site characterization, soil grading or soil excavation to determine appropriate actions to be taken in the event contaminated soil is encountered. (Refer to the **WASTE MANAGEMENT** section of this PSA for additional information related to contaminated soil).

SETTING AND EXISTING CONDITIONS

The project is located between the communities of Blythe, California (approximately 35 miles southeast) and Desert Center, California (approximately 10 miles west).

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

Physiographically, the project site lies near the toe of alluvial fans emanating from the Chuckwalla Mountains to the south, the Coxcomb Mountains to the north, and the Palen Mountains to the northeast, and is bisected by a broad valley-axial drainage that extends southward between these mountains and drains to the Palen Lake playa located a short distance north of the site (see **Soil & Water Resources Figure 2**). The

[8] AECOM, Inc. "Phase I Environmental Site Assessment of Proposed Solar Power Plant Site Located in Eastern Riverside County, California". Prepared for Solar Millennium, LLC. May 2009.

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 ground surface in the region of the project site generally slopes gently downward to the southeast at a gradient of less than 1 percent. Ground surface elevations at the project site itself range from approximately 680 feet msl in the southwest to 425 feet msl in the northeast. Steeper grades are present at isolated sand dunes along the northern portion of the site. Toward the north and central portions of the site, the ground becomes hummocky as it transitions to the flat playa located along the northern portion of the site.

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 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 annual precipitation of just under four inches per year. **Soil & Water Resources Table 5** and **Soil & Water Resources Table 6** 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.

Average annual precipitation in the project area, based on the gauging station at Blythe Airport, is 3.59 inches, with August recording the highest monthly average of 0.64 inches and June recording the lowest monthly average of 0.02 inches. Per the National Oceanic and Atmospheric Administration (NOAA) Atlas 14 for the Southern California area, 3.51 inches of rain fall in the 100-year, 24-hour storm event.

Soil & Water Resources Table 5
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

Month	Temperatures °F					Mean Number of Days			
	Monthly Averages			Record Extremes		Max. Temp.		Min. Temp.	
	Daily Max.	Daily Min.	Monthly	Record High	Record Low	90°F & Above	32°F & Below	32°F & Below	0°F & Below
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 & Water Resources Table 6
Precipitation Data for Blythe Airport, California

Month	Rainfall (inches) [1913-2008]			
	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.

Soil & Water Resources Table 7 presents average monthly evapotranspiration rates for various stations located in the region.

Soil & Water Resources Table 7
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:
CIMIS monitoring station closest to project site are listed.
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 Millennium 2010a and CIMIS 2010.

SOILS

A general survey to characterize the soil conditions at the project site was commissioned by Solar Millennium, the project owner of PSPP. General soils data was derived from the United States General Soil Map which is a 4th Order survey (5th Order being the least detailed – scale of 1:250,000 to 1: 1,000,000). This data was used in conjunction with observations and laboratory testing conducted during a field reconnaissance to characterize the soils on site. Based on the General Soil Map, there are two map units on the project site: 1) the Rositas–Dune Land–Carsitas map unit and 2) the Vaiva-Quilotosa-Hyder-Cipriano-Cherioni map unit (**Soil & Water Resources Figure 3**). Only the Vaiva-Quilotosa-Hyder-Cipriano-Cherioni map unit is present under the transmission line (T-Line) alignment. The Rositas-Dune land-Carsitas map unit occurs on 54 percent of the site and is characterized by soils with a very high sand percentage (greater than 95 percent) and is highly susceptible to wind erosion. The remaining 46 percent of the site was mapped as the Vaiva-Quilotosa-Hyder-Cipriano-Cherioni map unit characterized by soils with high percentage (greater than 65 percent) of sand with moderate susceptibility to wind erosion. The laboratory and field observations are not consistent with the descriptions of the Vaiva-Quilotosa-Hyder-Cipriano-Cherioni map unit. The data from the current investigation is considered to be more accurate than the generalized soils map; therefore, the Rositas-Dune land-Carsitas map unit is considered to be the representative soil type at the project site. Active sand dunes are located in the northern portion of the project site.

Detailed soil descriptions were developed from the Official Series Descriptions (OSDs; NRCS 2009a). Soil characteristics including depth, texture, drainage, permeability, and erosion hazard of individual soil mapping units are included in **Soil & Water Resources Table 8**. Land capability classification is an indicator of the soils primary limitations for revegetation. Soil types on the plant site include VIIe and VIIIc Capability Subclasses, which means the soils have very severe limitations that make them unsuitable for cultivation and commercial crop production.

Soil & Water Resources Table 8
Soil Mapping Units and Descriptions

Map Unit	Description
Rositas	Wasco Series – Fine Sand - Formed in sandy eolian material - Somewhat excessively drained - Slopes range from 0 to 30% with hummocky or dune micro relief - Negligible to low runoff - Rapid permeability - High susceptibility of wind erosion - Capability Subclass VIIe nonirrigated - Taxonomic Class: Mixed, hyperthermic Typic Torripsamments
Vaiva	Vaiva Series – Gravelly Loam - Formed in slope alluvium from granite and gneiss - Well drained - Slopes range from 1 to 65% - Medium to rapid runoff - Moderate permeability - Taxonomic Class: Loamy-skeletal, mixed, superactive, hyperthermic Lithic Haplargids
Quilotosa	Quilotosa Series – Extremely Gravelly Coarse Sandy Loam - Formed in slope alluvium from granitic and metamorphic rock - Somewhat excessively drained - Slopes range from 3 to 65% - Medium to rapid runoff - Moderately rapid permeability - Low susceptibility to wind erosion - Capability Subclass VIIIc nonirrigated - Taxonomic Class: Loamy-skeletal, mixed, superactive, calcareous, hyperthermic Lithic Torriorthents
Hyder	Hyder Series – Extremely Gravelly Sandy Loam - Formed in alluvium from rhyolite and related volcanic rock - Somewhat excessively drained - Slopes range from 1 to 70% - High runoff - Moderate or moderately rapid permeability - Low susceptibility to wind erosion - Capability Subclass VIIIc nonirrigated - Taxonomic Class: Loamy-skeletal, mixed, superactive, calcareous, hyperthermic Lithic Torriorthents

Map Unit	Description
Cipriano	Cipriano Series – Very Gravelly Loam - Formed in fan alluvium from volcanic rock - Somewhat excessively drained - Slopes range from 0 to 55% - Low to very high runoff - Moderate permeability - Low susceptibility to wind erosion - Capability Subclass VIIIc nonirrigated - Taxonomic Class: Loamy-skeletal, mixed, superactive, hyperthermic, shallow Typic Haplodurids
Cherioni	Cherioni Series – Very Gravelly Fine Sandy Loam - Formed in slope alluvium on volcanic bedrock - Somewhat excessively drained - Slopes range from 0 to 70% - Medium to rapid runoff - Moderate permeability - Low susceptibility to wind erosion - Capability Subclass VIIIc nonirrigated - Taxonomic Class: Loamy-skeletal, mixed, superactive, hyperthermic, shallow Typic Haplodurids
Carsitas	Carsitas Series – Gravelly Sand - Formed in alluvial fans, moderately steep valley fills and dissected remnants of alluvial fans - Excessively drained - Slopes range from nearly level to strongly sloping - Slow runoff except during rare torrential showers - Rapid permeability - High susceptibility of wind erosion - Capability Subclass VIIe nonirrigated - Taxonomic Class: Mixed, hyperthermic Typic Torripsamments
Dune land	Dune land – Sand - Dunes can be as much as 25 feet high but are generally 10 feet high - Very slow runoff - High hazard of wind erosion - None or slight hazard of water erosion

Source: Solar Millennium 2010a

A preliminary site reconnaissance was conducted at the project site by CH2MHill in 2008, during which two soil samples were collected. Based on the reconnaissance and the two samples, soils on site were described as consisting of sandy material and classified as poorly graded sand with silt. Across most of the subject property, the soils would be expected to range from silty sand to poorly graded sand with silt.

Typical fines content in these soils would be expected to be in the range of 5 to 35 percent. Characterization of soils was made through field observations and laboratory testing by AECOM (Solar Millennium 2010a). Laboratory textural analysis and field observations characterized the on-site soils as being predominantly sands. Soil profiles observed in the test pits were typically sands and laboratory analysis measured sand content from 83 to 94 percent. Silt content measured in the soils ranged from 2 to 8 percent, and clay content from 2 to 11 percent. Observed profiles exhibited a range of effervescence from no effervescence to slight in the top layers to increasing effervescence with increasing depth indicating the presences of carbonates.

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 undergone 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.

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 et al. 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 et al. 1973). The fanglomerate is likely Miocene-age; however, it may in part be Pliocene-age (Metzger et al. 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 et al. 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 et al. 1973). The amount of tilting indicates a general decrease in structural movements since its deposition (Metzger et al. 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 the United States Geological Survey (USGS) and interpreted by Worley-Parsons (2009b), is illustrated in **Soil & Water Resources Figure 4**.

Mapped Geologic Units at the Project Site

Solar Millennium (2010a) reported that there are three mapped geologic units within the project limits. These units are listed and described below:

- Dune Sand (Qs), fine grained sand and silt deposited by wind. These deposits occur on the surface primarily in the northern portion of the site, but buried dune deposits were observed in test pits in the southern part of the site. However, for the purpose of this investigation, no distinction between alluvium and dune sands was made on the boring and test pit logs.
- Alluvium (Qal), fine to medium sand with silt and gravel. In general the alluvium will be coarser grained towards the south and fine towards the lake bed, but interfingering of alluvial layers and fine grained lake deposits should be anticipated at depth.
- Lake deposits (Ql), alternating layers of fine grained clay, silt, and sand deposits with varying mixtures of fine gravel.

Soil & Water Resources Figures 5A and 5B present a generalized geologic map of the project site.

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 very seismically quiescent. 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

This section describes the nature of, origin, processes, and development of dunes that are a critical habitat to the Mojave fringe-toed lizard (MFTL) that occupies areas on and adjacent to the ROW for the project.

The proposed modified project footprint covers several different land units including (from southwest to northeast) a stable coarse gravel alluvial fan surface, a more active wind-blown sand area with relatively shallow sand deposits, and an area of deeper and more active vegetated sand dunes (see **BIOLOGICAL RESOURCES**, Appendix A of this PSA) that appears to be MFTL habitat (for a discussion on the MFTL habitat, please see **BIOLOGICAL RESOURCES** of this PSA). The site is crossed by a series of small distributary alluvial fan channels, and two large wash complexes formed by concentrated drainage under I-10.

Most of the proposed western solar array lies in a relatively stable area of alluvial fan, where the offsite geomorphic impacts will be relatively minor except for impacts to the large wash complex that crosses the south east corner of the western array (see **BIOLOGICAL RESOURCES**, Appendix A of this PSA). This wash supports a corridor of sand dunes and associated MFTL habitat around it, and it will be necessary to either avoid or mitigate for impacts to this area.

The proposed eastern solar array is located in a much more geomorphically active area, and cuts into the combined PDL-Chuckwalla and Palen wind-borne sand transport corridor (see **BIOLOGICAL RESOURCES**, Appendix A of this PSA).

HYDROGEOLOGY

Groundwater Basins

The site is located within the Chuckwalla Valley Groundwater Basin (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 & Water Resources Figure 2**. The CVGB is bounded by the consolidated rocks of the surrounding mountains. Three water-bearing Quaternary- and Tertiary-age sedimentary units overlie non-water bearing bedrock in the CVGB (CDWR 2004; DWR 1963). Department of Water Resources (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 & Water Resources Figure 4**).

The basin 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 & Water Resources Figure 2)**. 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 & Water Resources Figure 2)**. 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 & Water Resources Figure 2)**. 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 the 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.

Groundwater Inflow

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 (CRBRWQCB 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 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% 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. The calculated average annual precipitation volume for the watershed is 258,000 acre-feet. Recharge for the CVGB 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 & Water Resources Table 9.**

Soil & Water Resources Table 9
Estimates of Runoff and Infiltration in Chuckwalla Valley Groundwater Basin

Layer (a)	Area (acres)	Mean Annual Precipitation (inches) (b)	Total Volume of Rainwater from Mean Annual Precipitation (af)	Runoff Curve Classification[2]	Runoff Curve Number (b)	Runoff (percent of Precipitation)	Total Annual Volume of Infiltration – Hely & Peck (af)	Total Annual Volume of Infiltration (af) based on 3 % (c)	Total Annual Volume of Infiltration (af) based on 5%(c)	Total Annual Volume of Infiltration (af) based on 7%c)
unit1-cw	30,303	5	12,626	Alluvium, Steep Slope	74	3.50 percent	442	379	631	884
	211,498	4	70,499	Alluvium, Flat Slope	69	2.00 percent	1,410	2,115	3,525	4,935
	41,073	3.5	11,980	Alluvium, Steep Slope	74	3.50 percent	419	359	599	839
	12,077	4	4,026	Alluvium, Steep Slope	74	3.50 percent	141	121	201	282
	910	4	303	Alluvium, Steep Slope	74	3.50 percent	11	9	15	21
	194	4	65	Alluvium, Steep Slope	74	3.50 percent	2	2	3	5
	81,233	5	33,847	Alluvium, Steep Slope	74	3.50 percent	1,185	1,015	1,692	2,369
bedrock chuckwalla	32,001	5	13,334	Mountains	93	29.10 percent	3,880	400	667	933
	21,456	5	8,940	Mountains	93	29.10 percent	2,602	268	447	626
	11,050	5	4,604	Mountains	93	29.10	1,340	138	230	322

Layer (a)	Area (acres)	Mean Annual Precipitation (inches) (b)	Total Volume of Rainwater from Mean Annual Precipitation (af)	Runoff Curve Classification[2]	Runoff Curve Number (b)	Runoff (percent of Precipitation)	Total Annual Volume of Infiltration – Hely & Peck (af)	Total Annual Volume of Infiltration (af) based on 3 % (c)	Total Annual Volume of Infiltration (af) based on 5%(c)	Total Annual Volume of Infiltration (af) based on 7%c)
						percent				
	109	5	46	Mountains	93	29.10 percent	13	1	2	3
	9,246	4	3,082	Mountains	93	29.10 percent	897	92	154	216
	10,042	4	3,347	Mountains	93	29.10 percent	974	100	167	234
	282	4	94	Mountains	93	29.10 percent	27	3	5	7
	3,480	4	1,160	Mountains	93	29.10 percent	338	35	58	81
	275	4	92	Mountains	93	29.10 percent	27	3	5	6
	90	4	30	Mountains	93	29.10 percent	9	1	2	2
	398	4	133	Mountains	93	29.10 percent	39	4	7	9
	316	4	105	Mountains	93	29.10 percent	31	3	5	7
	39,340	5	16,392	Mountains	93	29.10 percent	4,770	492	820	1,147
	194	5	81	Mountains	93	29.10 percent	24	2	4	6
unit3-cw	28,973	3	7,243	Alluvium, Flat Slope	69	2.00 percent	145	217	362	507
unit2-cw	198,558	3	49,640	Alluvium, Steep Slope	74	3.50 percent	1,737	1,489	2,482	3,475
bedrock chuckwalla	89,161	6	44,581	Mountains	93	29.10 percent	12,973	1,337	2,229	3,121
TOTALS	**822,259**	**---**	**286,250**		**---**	**---**	**33,436**	**8,588**	**14,313**	**20,038**

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

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). Accordingly, the 36 percent of the precipitation that falls on the bedrock areas would be equivalent 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

Under natural conditions, subsurface flow occurs from only two sources, subsurface underflow from the Pinto Valley Groundwater Basin and the Orocopia Valley Groundwater Basin. Underflow from the Colorado River is not expected to occur under natural conditions. 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 22 miles southeast of the project site in 1988, and the adjacent 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). 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% 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 are included in **Soil & Water Resources Table 10**.

Groundwater Demand/Outflow

Groundwater provides the only readily available natural water resource in Chuckwalla Valley. While the Colorado River Aqueduct traverses the northern portion of the basin, it does not contribute significant water to the basin (other than leaks and maintenance activities). In addition, any water diverted from the aqueduct would require entitlement. 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 Extraction

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 7,900 afy in the western CVGB and 2,605 afy in the eastern basin. 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).

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% 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% 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 ground surface and has a ground surface elevation of 500 feet msl (WorleyParsons 2009). 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 redeposition 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 of clay/silt mixtures and sandy sediments. A depth of 6 to 10 feet 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 (0.108 to 0.116 feet/acre/month) based on the Energy-Balance Eddy-Correlation method, which is reported to be the most reliable method by the USGS. 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 dependant, 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. Given the differences between Palen Lake and Franklin Lake Playa previously discussed, a groundwater discharge rate that is approximately half that at Franklin Lake Playa was adopted (approximately 0.0583 feet/acre/month of water) and was believed to occur. Over an area of 2,000 acres for three months of the year, this equates to approximately 350 afy.

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.

Staff compiled a comprehensive water budget 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 & Water Resources Table 10**, below.

Soil & Water Resources Table 10
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' included as **Soil & Water Resources Figure 6.** The location of the cross section is shown on **Soil & Water Resources Figure 5A**.

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 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 (CDWR 2004). The fanglomerate would likely yield water freely to wells, but the basalt would likely yield only small amounts of water (CDWR 1963). AECOM (2010) did not report the estimated thickness of the Quaternary Alluvium, but suggested the thickness of saturated sediments beneath the site is at least 560 feet and that saturated sediments to a depth of 758 feet consisted of a mixture of fine-grained sands with interbedded silt and clay layers. AECOM (2010) suggested that these sediments are likely to be the older alluvium/Bouse Formation sediments described in Bulletin 91-7 (CDWR 1963).

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 et al. 1973). The Bouse Formation in the CVGB is estimated to extend to approximately 1,900 feet bgs (approximately –1,500 feet msl) beneath the site based on geophysical modeling (see **Soil & Water Resources Figure 4**). 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 et al. 1973). The Fanglomerate is likely Miocene-age; however, it may in part be Pliocene-age (Metzger et al. 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 et al. 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 et al. 1973). The amount of tilting indicates a general decrease in structural movements since its deposition (Metzger et al. 1973). The Fanglomerate is estimated to extend to approximately 2,600 feet bgs (-2,000 feet msl) beneath the site based on geophysical modeling by Worley-Parsons (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 & Water Resources 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 & Water Resources 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 180-200 feet bgs (approximately 400 feet msl) based on site-specific investigation (Solar Millennium 2009a).

The DWR reports that groundwater levels in the basin are generally stable (CDWR 2004). **Soil & Water Resources Figure 8** shows hydrographs for selected wells within the Chuckwalla Valley from 1958 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 central and eastern part of the basin. This area includes the project site. 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.

The hydrographs for wells in the Desert Center area along Highway 177 show local effects of water level decline, attributable to increased agricultural pumping beginning in the early 1980s and ending in the mid 1980s. GEI estimated groundwater pumping in 1986 was about 20,000 afy, significantly up from the 1963 estimate of 9,100 afy from the DWR. Basin wide pumping declined rapidly since 1986 with recent estimates of about 6,000 afy.

The inconsistency in groundwater level measurements makes it difficult to establish a specific year for the groundwater decline to have started. However, the hydrograph for well 4/16-32M1 suggests the decline started in 1980 and the water level had dropped approximately 50 feet at the time of the last water level measurement. The hydrograph for well 5/15-12N1, located approximately four miles to the southwest of well 4/16-32M1, shows only a small decline (approximately five feet) in the water table elevation. The water level readings in well 5/15-12N1 suggest the water level, at this well, has recovered to pre-pumping levels. The data presented in the hydrographs suggest that pumping around Desert Center induced a local cone of depression in that area that did not extend eastward into the area of the project site. The differential response and recovery to pumping in this area would suggest some compartmentalization of the aquifer system that is not unexpected since it is comprised of interconnected and isolated alluvial fan deposits.

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 near the Genesis project site east of the project (Worley-Parsons 2010). **Soil & Water Resources Table 11** 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.

Soil & Water Resources Table 11
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 Project
	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 Genesis 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

Geologic Unit	Well ID	Well Depth	Specific Capacity (gpm/ft)	Transmissivity (gpd/ft)	Hydraulic Conductivity (ft day)	Storativity	Basis
	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).

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 (CDWR 2004). The detected concentrations of TDS in the basin range from 274 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 (CDWR 1975). Several of the wells sampled in the basin contain high levels of fluoride and boron.

Groundwater Wells in Proximity to the Proposed modified project

A total of 88 water supply wells were identified in online databases in the CVGB (Solar Millennium 2009a – Appendix J). A field survey was conducted by AECOM (Solar Millennium 2009a) in July 2009 to identify the well location, confirm operational status, and estimate the use within the basin. The wells were categorized as either domestic, industrial, agricultural or municipal wells based on land use or information provided by the property owner.

A total of 15 wells were identified, most of which supported historic agricultural operations and many of which have been discontinued. Available information for water supply wells located within a one-mile radius of the Project site are summarized on **Soil & Water Resources Table 12** and shown on **Soil & Water Resources Figure 9**.

Soil & Water Resources Table 12
Summary of Groundwater Quality Data(1),(2)
(all values reported in mg/L unless otherwise indicated)(3)

Analyte	Well 5/17-33N1 (2009)	Well 5/17-20F1 (May 1957)	Well 5/17-30F1 (January 1960)	Well 5/17-30P1 (October 1958)	All Chuckwalla Valley Wells (1)
Arsenic	0.0157	—	—	—	—
Bicarbonate (HCO_3)	122	104	90	420	21–1,950
Boron	1.82	0.0001	0.0006	0.0004	—
Calcium	31	50	30	12	5–585
Carbonates (CO_3)	ND(3)	ND	ND	ND	0–129
Fluoride	6.1	1.8	—	0.3	0–12
Chloride	200	203	225	150	8–2,780
Iron	ND<0.1	—	—	—	—
Magnesium	4.72	6		2	0–208
Manganese	0.0127	—	—	—	—
Nitrate (NO_3)	0.17(4)	—	—	—	—
Selenium	ND<0.015	—	—	—	—
Sodium	352	225	240	240	2–6,720
Sulfate	380	241	155	89	9–1,110
Total Hardness ($CaCO_3$)	830	150	75	38	3–2,300
TDS	1,010	803	695	783	274–12,300
pH (units)	—	7.4	8.1	8	7–8.7

Notes:
1 - Geochemical data for all wells within the Chuckwalla Groundwater Basin from available information in online databases and historic reports is provided in Solar Millennium 2009.
2 - Metals data reported from the unfiltered (“total”) sample
3 - mg/L = milligrams per liter; ND – not detected at the practical quantitation limit
4 - Nitrate as Nitrogen.

SURFACE WATER HYDROLOGY

The site is located within the Colorado River Basin, 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 1 mile north of the proposed plant location.

The only perennial surface water resources in the eastern portion of Chuckwalla Valley are McCoy Spring, at the foot of the McCoy Mountains approximately 19 miles northeast of the site, and Chuckwalla Spring, approximately 16 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 west and north of the site which covers approximately 44 square miles. FEMA flood insurance rate maps have not been prepared for the project site or surrounding lands and the project does not lie within a federally mapped floodplain. The upstream extents of the contributing watersheds extend into the Chuckwalla Mountains to the southwest. The extent of and approximate sub-basin boundaries of the overall watershed impacting the project were delineated utilizing a combination of USGS 7.5 minute quadrangle sheets and site specific aerial topography.

The overall watershed boundaries sub-basin delineations, as well as the 100-year peak discharges for each sub-basin are shown on **Soil & Water Resources Figure 10***.* The project owner calculated existing (pre-construction) peak discharges for each sub-basin using the hydrograph package HEC-1 and followed the guidelines presented in the *Riverside County Flood Control and Water Conservation District Hydrology Manual (Riverside County Manual),* and are summarized in **Soil & Water Resources Table 13*.***

Soil & Water Resources Table 13
Summary of Offsite Upstream Peak Flows

Upstream Flows	Tributary Area (sq.mi.)	24-hour 100-year (cfs)
Copa Ditch	30.77	8262
Aztec Ditch	30.8	6490
Tarantula Ditch	35.88	1466
Sutro Ditch	13.04	3193

Source: Palen 2013e Attachment G

Dry Washes

There are no perennial streams in the Palen Dry Lake or Ford Dry Lake watersheds which impact the project site. The vast majority of the time, the area is dry and devoid of any surface flow. Water runoff occurs only in response to infrequent intense rain storms. There are approximately a hundred minor washes that cross the site from southwest to northeast, draining the area downstream of I-10 towards Palen Dry Lake. Many of these channels do not reach the dry lake, but fade out on the vegetated sand dune surface. 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 across the project site perpendicular to the predominant flow direction which is to the northeast.

There are two more significant ephemeral wash complexes that cross the site from southwest to northeast, draining the area downstream of I-10 towards Palen Dry Lake. Both washes were traceable from the western project boundary to Palen Dry Lake. These major washes are observed as complexes of braided channels, with each channel being approximately 10-50 feet wide. The wash complexes widen out from their constriction at I-10 and are approximately 1,500 feet wide after approximately a mile, after which they become very dispersed, lose definition and resemble minor washes. Within a mile of I-10, the major washes have created sandy zones approximately 1,500 feet wide on the less sandy alluvial gravel or thin sand sheets.

Springs, Seeps and Playa Lakes

One spring is listed in the CVGB in the vicinity of where the Project site is located, according to the National Water Information System (NWIS) database of Water Resources of the United States, which is maintained by the USGS (http://wdr.water.usgs.gov/nwisqmap/). This spring (called Corn Spring) is also shown on a geologic map of the area (CDMG 1967). Corn Spring is approximately five to six miles southwest of the project site in the center of the Chuckwalla Mountains. The spring discharges into Corn Spring Wash, an ephemeral dry wash where surface water flows towards the northeast and onto the project site. Corn Spring appears to derive its water from precipitation falling onto the Chuckwalla Mountains, and movement of groundwater under pressure along an historic fault that bisects the mountains.

According to the NWIS database, seeps and surface discharge/outfall (along with streams, lakes, wetlands, and diversions) are categorized as “surface water sites” and four sites are located in the CVGB. One of the four locations is the aforementioned Corn Spring Wash, while two other sites are located near the northern edge of the Chuckwalla Mountains approximately eight and 13 miles west of the project site. Water in these three sites appear to originate from infiltration of precipitation that falls on the Chuckwalla Mountains as all three sites are located either within the Chuckwalla Mountains or are less than one mile downslope from the Chuckwalla Mountains.

The fourth “surface water site” listed in the NWIS database for the CVGB is Coxcomb Wash, located approximately eight miles northwest of the project site. Coxcomb Wash is an ephemeral dry wash that flows southeastward from the Coxcomb Mountains. As a result, groundwater extracted from the project site will not affect the flow of water in Coxcomb Wash. The locations of Corn Spring and other “surface water sites” identified in the NWIS database and through the several other data sources are shown on **Soil & Water Resources Figure 11**. The sites are listed on **Soil & Water Resources Table 14**.

Tenajas are defined as seasonal precipitation-fed or ephemeral stream basins which can hold significant quantities of water. By definition (AGI 2005), ephemeral streams are a stream or reach of a stream that “flows briefly only in direct response to precipitation in the immediate locality and whose channel is at all times above the water table.” Two tenaja locations were located in the study area and are noted, but will not be affected by groundwater extraction. Similarly, numerous wildlife water guzzlers (devices used to collect and store water derived from snow and/or rainwater for later use by wildlife in the area) for small and large game are identified, but these man-made structures are designed to store precipitation and will not be affected by groundwater pumping.

Soil & Water Resources Table 14
Springs and Surface Water Sites in Chuckwalla Valley
within Nine Miles of the Project Site

Site No.	Location Number	Location Name	Type	Distance from Project (miles)
1	USGS 10253750	Monument Wash near Desert Center, CA	Stream	7.2
2	USGS 10253540	Corn Springs Wash near Desert Center, CA	Stream	6.2
3	USGS 333731115193001	006S016E28DS01S (Corn Spring)	Spring	6.3
4	USGS 10253700	Palen Dry Lake near Desert Center, CA	Stream	13.8
5	USGS 10253800	Coxcomb Wash near Desert, Center CA	Stream	7.1
6	WHIPs ID S-376	Spring Tank	Spring	8.1
7	N/A	Tenaja	Pond	6.8
8	WHIPs ID S-375	Long Tank Tenaja	Pond	8.9
9	N/A	Desert Center Sewer Pond	Pond	8.5

Source: AECOM 2010

Stormwater Flow

Stormwater flow across and adjacent to the project occurs in a network of generally shallow and moderately expressed alluvial channels, and during larger events, as more widespread sheetflow. In general, the channels become shallower and less defined the further they are from the Chuckwalla Mountains. I-10 is an important local control on drainage across the project site, as it intercepts a large number of ephemeral washes draining towards the site from upstream (southwest) of the interstate. These channels are captured by a series of berms and interceptor channels that run parallel with I-10, periodically passing the collected water under I-10 at bridges and creating larger washes that pass under the interstate. There are three distinct locations where this occurs upstream of the project: Copa Ditch, Aztec Ditch, and Tarantula Ditch. These flows are relatively concentrated near the southern project boundary, but quickly disperse into a network of smaller and less defined channels under existing conditions (see **Soil & Water Resources Figure 12**).

SURFACE AND GROUNDWATER BENEFICIAL USES

The Basin Plan for the Colorado River Basin Regional Water Quality Control Board (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, hydropower generation, 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 total dissolved solids (TDS) exceed 3,000 mg/L, and it is not reasonably expected by the regional water 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 included in 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 activities, shall not cause concentration of total dissolved solids in surface waters to exceed the limits in **SOIL & WATER RESOURCES Table 15**.

Soil & Water Resources Table 15
Surface Water TDS Limits

Location	TDS (mg/L)	
	Annual Average	Maximum
Coachella Valley Drains	2,000	2,500
Palo Verde Valley Drains	2,000	2,500

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.

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

This section provides an evaluation of the expected direct, indirect, and cumulative impacts to soil and water resources that could be caused by construction, operation, and maintenance of the PSEGS. Staff's analysis consists of a description of the potentially significant impacts, gathering data related to construction and operation of the project, then reaching a conclusion to determine whether or not the project presents potentially significant impacts. If staff determines there is a significant impact, then staff evaluates the approved PSPP mitigation contained in the Commission Decision (CEC 2010f) for sufficiency and staff may or may not recommend additional or entirely different mitigation measures that are potentially more effective than those in the Commission Decision or proposed by the project owner. Mitigation is designed to reduce the effects of potentially significant PSEGS impacts to a level that is less than significant.

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

The modified project proposes a substantial reduction in potential soil loss compared to the approved project. The heliostat technology would not require an entirely flat surface that was needed for solar trough technology, so extensive grading would be avoided. The modified project would reduce the project footprint from 4,366 acres to 3,794 acres, a difference of 572 acres. The total earthwork proposed by the modified project would be prominently less at 213,000 cubic yards, which is roughly five percent of the approved project's 4,500,000 cubic yards of total earthwork. Although these differences would inherently reduce the grading impacts compared to the approved project, the substantial changes in earthwork could potentially recreate issues that were not analyzed during assessment of the approved project. Therefore, the following soil erosion discussion is entirely independent of the analysis found in the Revised Staff Assessment for PSPP.

Construction

Construction of the project is scheduled to last 33 months. Soil losses would be created by construction and grading activities that would expose and disturb the soil and leave soil particles vulnerable to detachment by wind and water. Soil erosion results in the loss of topsoil and increases in sediment loading to nearby water resources. In the absence of proper BMPs, earthwork could cause significant fugitive dust and erosion.

The magnitude, extent, and duration of those impacts would depend on several factors, including weather patterns in the vicinity of the PSEGS site, the types of soil that could be affected, and the method, duration, and time of year of construction activities. Prolonged periods of precipitation, or high intensity and short duration runoff events coupled with earth disturbance activities could result in accelerated onsite erosion. In addition, high winds during grading and excavation activities could cause wind borne erosion leading to increased particulate emissions that adversely impact air quality. The implementation of appropriate erosion control measures would help conserve soil resources, maintain water quality, prevent accelerated soil loss, and protect air quality.

Power Plant Sites, Common Area, and Laydown Area

The potential for erosion by water during construction is expected to increase as a result of the loss of vegetative cover, removal of surface crust, and increased local sediment transport through creation of localized gullies and rills on newly graded areas. The project owner submitted a Preliminary Draft Construction DESCP/SWPPP (Palen 2013e) that lists standard BMPs applicable to PSEGS construction activities along with drawings (Palen 2013g) that show locations of specific BMPs at each power block, the common area, and temporary construction laydown area. In addition, the DESCP identifies specific measures to reduce water-related erosion including:

- Temporary erosion control measures would be implemented on active and non-active disturbed areas prior to and at regular intervals throughout the defined rainy season, and year-round prior to storm events;

- Erosion in concentrated flow paths would be controlled by lining channels with a non-erodible material such as compacted riprap, geosynthetic matting, or engineered vegetation;
- Diversion berms (for example, earth dikes) or drainage swales would be used, as needed, to redirect storm water run-on or onsite storm water flow around critical facilities or away from disturbed soil areas and stockpiles;
- Disturbed areas would be stabilized with effective soil cover (such as aggregate, paving, or vegetation) as soon as feasible after construction or disturbance is complete and no later than 14 days after construction or disturbance in that portion of the site has temporarily or permanently ceased;
- Sediment controls would be implemented at the draining perimeter of disturbed soil areas, at the toe of slopes, and at outfall areas; and
- Stone filters and check dams would be strategically placed, as needed, throughout the project site to provide areas for sediment deposition and to promote the sheet flow of storm water prior to leaving the project site boundary. Where available, native materials (rock and gravel) would be used for the construction of the stone filter and check dams. Stone filters and check dams are not intended to alter drainage patterns but to minimize soil erosion and promote sheet flow.

The Preliminary Draft DESCP also includes a Monitoring and Reporting Program/Construction Site Monitoring Program to ensure performance standards and to monitor the effectiveness of BMPs.

Solar Fields – Heliostats and Roads

The Preliminary Draft DESCP states that each area of the PSEGS project would be designed to provide the minimum requirements for access of installation equipment and materials. Most of the natural drainage features would be maintained and any grading required would be designed to promote sheet flow where possible. Areas disturbed by grading and other ground disturbance would be protected from erosion by implementation of appropriate BMPs. Some of the measures listed include:

- Existing vegetation would be preserved when feasible. Vegetation would be cut to a height that will not interfere with construction and operation of the heliostat fields, instead of clearing or grading the entire field;
- Clearing and grading activities would be restricted to areas where foundations, drainage facilities, and all-weather roads must be placed;
- Areas compacted during construction activities would be restored, as appropriate, to approximate preconstruction compaction levels to minimize the opportunity for any increase in surface runoff; and
- Effective sediment perimeter controls would be established and maintained at locations where runoff discharges offsite.

Wind Erosion

The Preliminary Draft DESCP also includes standard BMPs for Wind Erosion Control. The following practices were listed to minimize the loss of wind-blown soil from the site:

- Disturbed soil areas of the project site would be watered regularly to control dust and to maintain optimum moisture levels for compaction as needed, but to avoid runoff, the areas would not be watered excessively. Sediment controls may be used at the edges of these areas as necessary to minimize sediment discharge;
- Areas of high erosion may require application of an approved palliative to reduce dust and prevent excess moisture on the road which may attract tortoises;
- At each structure site, the disturbed soil would be watered to form a crust following completion of construction in that location; and
- The construction site would post visible speed limit signs to prevent vehicles from traveling at excessive speeds.

Staff reviewed the Preliminary Draft DESCP and agrees that BMPs during construction would reduce or avoid impacts to soil from erosion. To protect surface waters, standardized storm water and soil erosion Best Management Practices[9] have been determined by the SWRCB and RWQCBs to be the most effective, practical means of preventing or reducing pollution from nonpoint sources. The conceptual plans for erosion control during construction appear reasonable, but there are additional elements that should be incorporated into the final DESCP that would be developed as required in Condition of Certification **SOIL&WATER-1**. The DESCP should reflect the most recent design plans of the proposed PSEGS project. If during the Energy Commission's amendment process any changes to the modified project are proposed, any adjustments that would alter the erosion control drawings, change the BMP strategy, or result in revised hydrology or hydraulic calculations should be reflected and addressed in an updated DESCP.

Staff believes that compliance with an approved DESCP accordance with Condition of Certification **SOIL&WATER-1** would reduce the impacts of soil erosion during construction. In addition, the project activities require that it be covered under the federal General Construction Permit (SWRCB Order No. 2009-0009-DWQ), which requires a construction SWPPP. Also, conditions of certification in the **AIR QUALITY** section of this PSA require a construction mitigation plan to prevent significant impacts from fugitive dust and wind erosion during construction. With the implementation of BMPs and associated monitoring activities included in the approved DESCP and SWPPP, impacts on soil would be expected to be less than significant during construction of the proposed PSEGS project.

Operation

Soil losses would be ongoing after the construction of the PSEGS project. Areas disturbed during the construction phase are subject to potential erosion during the operational life of the proposed project. PSEGS would be designed for an operating life of 25 to 30 years.

[9] BMPs can be classified as "structural" (i.e., devices installed or constructed on a site) or "non-structural" (procedures, such as modified landscaping practices). There are a variety of BMPs available, depending on pollutant removal capabilities.

Onsite Erosion

The estimated total area of land grading and excavation during construction of the PSEGS project would be about 752 acres,[10] as shown in **Soil & Water Resources Table 2**. After project completion, the temporary parking and construction laydown areas would be restored and about 25 acres would become impervious due to the addition of concrete foundations and asphalt paving. The balance of the previously disturbed area, roughly 730 acres, would be susceptible to potential erosion during the operational life of the proposed project. Furthermore, the addition of impervious surfaces to an area previously undeveloped would increase velocities of storm water runoff (see “Surface Water Hydrology” discussion below), which would increase the erosion potential of open soil areas.

The project owner submitted a Preliminary Draft DESCP/SWPPP (Palen 2013e) that states permanent erosion control measures would reduce potential soil related impacts, including gravel, landscaping, and engineering drainage channels. These would be stabilized areas with very little or essentially no risk of erosion. In addition, relatively small rock filters and local diversion berms through the heliostat fields may be installed as required to discourage water from concentrating and to maintain sheet flow. These all would serve to prevent wind and water erosion and maintain some water infiltration capacity of the soil.

Staff agrees that implementation and maintenance of permanent BMPs during operations would reduce or avoid impacts to onsite soil from erosion. The Preliminary Draft DESCP is reasonable in concept; however, it does not sufficiently discuss post construction measures for erosion and sediment control. The document should address exposed soil treatments proposed during operation of the project for both road and non-road surfaces, as described in item H of Condition of Certification **SOIL&WATER-1**. A maintenance schedule should include post construction maintenance of BMPs applied to disturbed areas following construction. These should also reflect requirements regarding ground disturbing activities and erosion control measures specified in Conditions of Certification **BIO-8**. Staff believes that compliance with Condition of Certification **SOIL&WATER-1** which would require the project owner to develop and implement an approved DESCP would reduce the impacts of soil erosion during operation of the proposed project.

Although modeling and calculations can be used to estimate post-construction flows and provide a basis for structural design parameters, alluvial flows are very complex. Flood flows from the mountains are initially confined in incised channels, but at the site the flood flows are broadly distributed (known as sheet flow) and less confined and can take random paths across the fan. Predicted flow depths and velocities have a potential uncertainty because they do not account for the dynamics of erosion and sedimentation which carry and deposit sediments at various locations along the margin of the alluvial fan where the site is located. Where obstructions such as heliostats and fences are encountered, flows can have erosive effects which could undermine their stability. The consequences of flash flood damage or modified sedimentation and erosion rates may

[10] This total does not include the surface areas of all the heliostat mirrors because all-terrain vehicles would install pylons and mount heliostat assembles. No grading would be required.

be significant. Staff proposes Condition of Certification **SOIL&WATER-20** requiring a Storm Water Damage Monitoring and Response Plan to reduce these potential impacts.

Offsite Erosion

The project's addition of impervious surfaces could also increase velocities of storm water runoff leaving its boundaries, possibly increasing the potential to erode offsite areas downstream of the project. To address the potential significant offsite erosion from storm damage, staff proposes Condition of Certification **SOIL&WATER-20** requiring a Storm Water Damage Monitoring and Response Plan to reduce these potential impacts in three ways:

1. Establish an ongoing maintenance plan to ensure all storm water management measures are functioning properly, through periodic inspection before the first seasonal storms and after each storm event throughout the year;

2. Establish and implement a response plan after every occurrence of damage (from a storm event or other cause) to clean up and repair damage to the berm; and

3. Develop and implement a process to monitor incidents and propose modifications and/or improvements to address ongoing issues.

Staff believes that compliance with an approved DESCP in accordance with Condition of Certification **SOIL&WATER-1** and an approved Storm Water Monitoring and Response Plan in accordance with Condition of Certification **SOIL&WATER-20** would reduce the impacts of soil offsite erosion during operation of the proposed project.

Mitigation

Construction and operation of the modified project could result in significant impacts related to water erosion of soils. Implementation of BMPs and Conditions of Certification would reduce the impacts to insignificant. Implementation of Conditions of Certification **SOIL&WATER-1** and **SOIL&WATER-20**, in addition to conditions of certification required in the **AIR QUALITY RESOURCES** and **BIOLOGICAL RESOURCES** sections of this PSA would ensure there would be no potential for impacts to soils related to water erosion.

Geomorphology

The combined sand corridor is a regionally significant geomorphic feature that transports sand downwind along the valley and to the Colorado River. The approved project would have intruded into the Chuckwalla Valley sand transport corridor by more than a mile, cutting its width in half and that would have created a "sand shadow" downwind – an area of current dune habitat where fine sand would be eroded downwind but not replaced from upwind, leading to loss of the sand dunes. Previous studies have shown that such sand shadows result in deflation, substrate coarsening and complete loss of Mojave Fringe Toad Lizard (MFTL) habitat (see the **BIOLOGICAL RESOURCES** section of this PSA) within a few years (4-17 years).

The project owner has proposed as part of the modified project to eliminate the approved project's 30-foot tall wind fence which contributed to disruption of the sand transport corridor. However, the modified project would still have a project boundary fence (security fence) and desert tortoise exclusion fencing. Any fence design could impede sand transport and result in downwind impacts to sand dune habitat. In addition, sand that would have been transported across the project footprint from upwind would also be potentially cut off by storm drainage channels and diversion channels and above ground infrastructure that are proposed as part of the modified project (Palen 2013r §19). Staff is revising the project owner's wind model to take account of the modified project's new arrangement of solar array. A complete analysis of indirect impacts for the modified project will be included in the **BIOLOGICAL RESOURCES** section of the Final Staff Assessment.

GROUNDWATER BASIN BALANCE

Because the modified PSEGS project would use a reduced amount of water during both construction and operation activities with the same proposed groundwater supply system as the approved PSPP project, staff believes that this does not constitute a project change from the approved project. Therefore, the following groundwater basin balance discussion has been included in this analysis verbatim from the Revised Staff Assessment for PSPP (CEC 2010c §C.9). Some minor edits were made for clarification.

Staff evaluated whether 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 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 and significant depletion of groundwater in storage to occur.

Construction and Operation

The PSPP project proposed to utilize underlying groundwater to supply project water needs during construction. There is a concern that the water demand of the project would exceed the groundwater basin budget and lead to overdraft conditions.

A comparison was made between the average annual basin budget with the PSPP project's anticipated water production requirements. **Soil & Water Resources Table 16** presents the anticipated water requirements along with the average annual basin budget for the PSPP's 39-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.

Soil & Water Resources Table 16
Estimated Change to Chuckwalla Valley Groundwater Basin Budget
(Average Year Conditions)

Project Component	Years	Annual Basin Budget Balance	PSPP Requirements (afy)	Net Budget Balance (afy)
Construction	1-3	2,608	1,917	691
Operations	4-33	2,608	300	3,050

Note: See Soil and Water Resources Table 8 for Groundwater Basin Budget

It is anticipated that groundwater extraction during PSPP construction (~1,917 afy) and operation (~300 afy) would not significantly impact the CVGB balance as the ~1,917 afy during construction and the 300 afy during operations would not exceed the positive yearly balance of 2,608 afy. Therefore, the anticipated groundwater extracted during PSEGS construction (~400 afy) and operation (~201 afy) would not significantly impact the CVGB balance.

The project's pumping could have an affect on the adjacent Palo Verde Mesa Groundwater Basin by inducing flows from the Colorado River into that basin. However, given the location of the project, the anticipated annual project water requirements, staff does not anticipate that the project would have a significant impact on the adjacent (Palo Verde Mesa) groundwater basin. Staff notes that future water use in the CVGB may be governed by impending regulations being formulated by the USBR. (See the discussion in the section addressing LORS, above.)

Solar Millennium, the PSPP project owner, 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 U.S. Supreme Court Decision (issued in *State of Arizona v. State of California* (2006) 547 U.S. 150, 126 S.Ct. 1543 "[c]onsumptive use from the mainstream 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 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 USGS has indicated that the PVMGB and the CVGB lie within a basin tributary to the Colorado River and that wells drawing groundwater could be considered withdrawing water from the Colorado River Aquifer (Wilson et al. 1994). In addition, using the groundwater model developed by Worley-Parsons (2010) suggests that the subsurface flow from CVGB to Palo Verde Mesa Groundwater Basin (PVMGB) could be reduced as much as 32 afy after 33 years of construction and operation of the project. The reduction in flow to the PVMGB could likely increase flow from the Colorado River into the PVMGB. Consequently, the project has the potential to indirectly divert

Colorado River water without any entitlement to the water. Staff believes the project owner should be required to implement Condition of Certification **SOIL&WATER-14** to replace the quantity of water contributed by the Colorado River from the project's proposed groundwater extraction.

Condition of Certification **SOIL&WATER-14** requires development of a Water Supply Plan that includes water conservation projects such as 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 participation in BLM's Tamarisk Removal Program. To support the fact that water conservation measures are available, an example of a Tamarisk Removal Program is provided below.

The purpose of a Tamarisk Removal Program is to provide for an additional mechanism to mitigate for potential impacts to groundwater supply as a result of water use by the project. This component not only provides benefits to the groundwater system (and replacement of Colorado River water), but also provides a potential biological benefit by the removal of an invasive species that out-competes native vegetation and alters the natural desert ecosystem functions and values by limiting the habitats that supports native flora and fauna populations (Shaforth et. al, 2009).

Tamarisk (salt cedar) is native to southwestern Asia and was introduced to the United States in the early 1800's for wind breaks. In the western United States, tamarisk is a highly invasive weed that has taken hold in semi-arid and arid watersheds in recent decades (de Gouvenain, 1996). Tamarisk can consume up to 250 gallons of ground water per day per mature tree (Department of Ecology, 2009).

A Tamarisk Removal Program has the potential to conserve a substantial amount of groundwater consumption within the Lower Colorado River area by removing a high water demand habitat that also monopolizes resources and negatively impacts native habitats in the area. A summary of water consumption estimates based on two scenarios is provided in **Soil & Water Resources Tables-17** and **-18**.

Soil & Water Resources Table 17
Water savings assuming mature trees

VARIABLES		CALCULATIONS	
5	acres	Trees/Acre	217.8
250	gallons/tree/day	Trees Removed	1,089
200	sf/tree	Gallons/Day	272,250
43560	sf/acre	Gallons/Year	99,371,250
365	days/year		
325,851	gal/acre-foot	Acre-feet/Year Savings	305

Soil & Water Resources Table 18
Water savings assuming a mixture of mature and immature trees

VARIABLES		CALCULATIONS	
7	acres	Trees/Acre	435.6
100	gallons/tree/day	Trees Removed	3,049
100	sf/tree	Gallons/Day	304,920
43560	sf/acre	Gallons/Year	111,295,800
365	days/year		
325,851	gal/acre-foot	Acre-feet/Year Savings	342

According to the Lower Colorado River Multi-Species Conservation Program – Final Biological Assessment (2004), the extent of land cover associated with salt cedar (Tamarisk) is over 26,000 acres in the area surrounding the Palo Verde Valley (referred to as Reach 4 of the Lower Colorado River). A Tamarisk Removal Program would only be required to remove 5 acres of mature trees or 7 acres of a mixture of mature/immature trees to achieve a water savings of over 300 afy. Correspondingly, there is more than sufficient salt cedar land cover type for the project owner to implement a water conservation mitigation program using tamarisk removal in the lower Colorado River area.

Program implementation, maintenance, and monitoring could be funded through an Endowment Fund established by the project owner. The fund could be held and managed by the BLM and/or Resource Conservation District based on resources and mechanisms available. The BLM and Resource Conservation District would use the fund to facilitate and manage implementation of the program.

With respect to the quantity of water that must be replaced, staff understands that the quantity of water identified in Condition of Certification **SOIL&WATER-14** is based on a simplified methodology for calculating contribution of water from the Colorado River from the project's proposed groundwater extraction and determining the appropriate mitigation. If the project owner chooses to refine the estimate of the quantity of water contributed by the Colorado River from project groundwater extraction they should be required to implement Condition of Certification **SOIL&WATER-17***.* The results of this analysis can be used to refine the estimate of the volume of water that must be replaced in accordance with Condition of Certification **SOIL&WATER-14**. Staff also notes 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 LORS section above (see "The U.S. Bureau of Reclamation, Colorado River – Proposed Accounting Surface Rule).

Mitigation

There is a potential that groundwater production at the project site may induce additional inflow from the Colorado River which would be a significant impact. Implementation of the Condition of Certification **SOIL&WATER-14** is anticipated to reduce the potential for impacts to the Colorado River below the level of significance. The project owner could choose to conduct the analysis described in Condition of

Certification **SOIL&WATER-17** to refine the quantity of water contributed by the Colorado River from Project groundwater extraction. Because the modified PSEGS project would use a reduced amount of water during both construction and operation activities with the same proposed groundwater supply system as the approved PSPP project, staff believes that Conditions of Certification **SOIL&WATER-14** and **SOIL&WATER-17** as approved in the Commission Decision would also apply to the modified PSEGS project.

GROUNDWATER LEVELS

Because the modified PSEGS project would use a reduced amount of water during both construction and operation activities with the same proposed groundwater supply system as the approved PSPP project, staff believes that this does not constitute a project change from the approved project. Therefore, the following groundwater levels discussion has been included in this analysis verbatim from the Revised Staff Assessment for PSPP (CEC 2010c §C.9). Some minor edits were made for clarification.

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 create a significant impact if the lowering of the groundwater levels: 1) impacts existing water wells in the basin; 2) lower the water table in areas where deep-rooted phreatophytes are prevalent[11], and/or 3) induce permanent ground subsidence.

Drawdown imposed by a well on another nearby pumping well can have adverse effects on the performance of that well and is referred to as interference drawdown or well interference. Specific potential adverse effects evaluated in this study include the following:

1. 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);

2. 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;

3. 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

4. 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.

[11] See the **BIOLOGICAL RESOURCES** section of this **PSA** for impacts related to biological resources.

The extent and type of well interference experienced by an affected well is dependent 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.

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

The maximum predicted water table drawdown associated with the PSPP project is approximately 7 to 11 feet in the area of the pumping wells (see **Soil & Water Resources Table 19**), and the area where drawdown exceeds 1 foot is limited to within approximately 1 to 3 miles of the project ROW. **Soil & Water Resources Figures 13** and **14** present groundwater level decline contours from the proposed production wells at the end of construction and end of operations, respectively.

Soil & Water Resources Table 19
Results of Numerical Modeling for PSPP project[1]

Model Runs	Zone 1[2]		Zone 2[2]		Zone 3[2]		Year	Maximum drawdown, feet				Change in storage, af[4]
	T, ft2/d	S	T, ft2/d	S	T, ft2/d	S		Well 1	Well 2	Well 3	Well 4	
Run 7[1]	1,000	0.2	6,300	0.2	26,000	0.2	2013	11.67	6.49	11.69	6.50	1,440
							2029	9.78	5.97	9.96	6.48	6,288
							2043	10.76	6.75	10.96	7.51	10,530
Run 19[3]	26,000	0.2	---	---	---	---	2013	3.1	---	---	---	---
							2029	2.4	---	---	---	---
							2043	2.6	---	---	---	---
Run 20[4]	10,000	0.2	---	---	---	---	2013	2.8	---	---	---	---
							2029	2.1	---	---	---	---
							2043	2.2	---	---	---	---
Run 21[5]	1,000	0.2	---	---	---	---	2013	57.3	---	---	---	---
							2029	42.2	---	---	---	---
							2043	43.7	---	---	---	---

Source: Derived from Solar Millennium, 2010a and Solar Millennium, 2010i.
Notes

1 Refer to Soil and Water Resources Table 19 for the water use schedule for the renewable projects identified in the area.
2 Figure DR-S&W-207-3 in Appendix E shows the areal distribution of transmissivities used in the model
3 Used to determine relative sensitivity of the aquifer parameters and a conservative radius of influence for Zone 1 delineation using upper bound transmissivity for a single pumping well
4 Used to determine relative sensitivity of the aquifer parameters and a conservative radius of influence for Zone 1 delineation using mid-value transmissivity for a single pumping well
5 Used to determine relative sensitivity of the aquifer parameters and a conservative radius of influence for Zone 1 delineation using lower bound transmissivity for a single pumping well

The nearest potential wetland or halophyte communities would be near Palen Dry Lake. Groundwater dependent vegetation lies approximately 3-6 miles from the project site. A preliminary estimate of the groundwater level decline indicates approximately 0.2 to 0.6 feet of decline at the end of operations 33 years). The **BIOLOGICAL RESOURCES** section of this PSA 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. However, groundwater levels will decline and 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 estimate and cannot be accurately quantified until actual long-term groundwater production occurs. Condition of Certification **SOIL&WATER-2** through **SOIL&WATER-5** are expected to minimize impacts to groundwater levels below the level of significance.

The potential for subsidence from groundwater level declines is believed to be remote. However, it is recommended that a monitoring and mitigation program be implemented to assess long term changes that may occur as a result of groundwater pumping in the area. The project owner should also be required to implement **SOIL&WATER-16** to monitor and mitigate any potential impacts associated with ground subsidence associated with groundwater pumping.

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 estimate and cannot be accurately quantified until actual long-term groundwater production occurs. Conditions of Certification **SOIL&WATER-2** through **SOIL&WATER-5** are expected to minimize impacts to groundwater levels below the level of significance. Staff has required these types of conditions in previous cases and finds that they are effective in addressing any impacts to nearby wells that may occur as a result of project pumping.

The project must implement Condition of Certification **SOIL&WATER-16** 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.

Because the modified PSEGS project would use a reduced amount of water during both construction and operation activities with the same proposed groundwater supply system as the approved PSPP project, staff believes that Conditions of Certification **SOIL&WATER-2** through **SOIL&WATER-5** and **SOIL&WATER-16** as approved in the Commission Decision would also apply to the modified PSEGS project.

GROUNDWATER QUALITY

Because the modified PSEGS project would use a reduced amount of water during both construction and operation activities with the same proposed groundwater supply system as the approved PSPP project, staff believes that this does not constitute a project change from the approved project. Additionally, the modified PSEGS project would use a reduced number of evaporation ponds using the same type proposed for the approved PSPP project. Therefore, the following groundwater quality discussion has been included in this analysis from the Revised Staff Assessment for PSPP (CEC 2010c §C.9). Some minor edits were made for clarification and additional information added to compare the approved PSPP project and modified PSEGS project.

Construction

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 (180 feet bgs) and the proposed implementation of a hazardous material management plan during construction[12], potential impacts to groundwater quality are expected to be maintained below the level of significance.

There is a potential that project extraction of groundwater may induce vertical flow of high saline groundwater from beneath Palen Dry Lake to lower aquifers (being used for water production) located beneath the site. At the present time, no significant differential in groundwater quality has been identified beneath the project. AECOM conducted a hypothetical analysis (AECOM 2012a) where high saline groundwater was present beneath Palen Dry Lake and that the production wells planned for the project would induce a gradient towards the production well. Using variable values of hydraulic conductivity based on site specific data, the results indicate that it will take between about 43 years to 4,424 years for groundwater to flow from beneath Palen Dry Lake to the project wells. Given that there are probably low permeability sediments present beneath Palen Dry Lake and the analysis did not take into consideration retardation, dispersion or dilution and/or interference from other producers, it is unlikely that significant vertical migration of poor quality water would migrate and degrade higher quality portions of the aquifer. However, due to the uncertainty associated with the amount of information available concerning shallow groundwater quality and vertical migration, Conditions of Certification **SOIL&WATER-2** through **SOIL&WATER-4**, and **SOIL&WATER-18** are expected to minimize impacts to groundwater quality below the level of significance.

Because the modified PSEGS project would use a reduced amount of water during construction activities with the same proposed groundwater supply system as the approved PSPP project, staff believes that Conditions of Certification **SOIL&WATER-2** through **SOIL&WATER-4** and **SOIL&WATER-18** as approved in the Commission Decision would also apply to the modified PSEGS project.

[12] As required by Conditions of Certification **HAZ-1** and **HAZ-2** (see the **HAZARDOUS MATERIALS MANAGEMENT** section of this PSA).

Operation

Groundwater Pumping

There is a potential that project extraction of groundwater may induce vertical flow of high saline groundwater from beneath Palen Dry Lake to lower aquifers (being used for water production) located beneath the site. At the present time, no significant differential in groundwater quality has been identified beneath the project. Given the possibility that there is shallow groundwater below the lake and the lake serves as a point of discharge of groundwater, it is reasonable to presume that there could be high concentrations of TDS below the lake (AECOM 2010a). A calculation was conducted by AECOM using estimates of hydraulic conductivity, effective porosity, gradient and distance and where high saline groundwater was present beneath Palen Dry Lake and that the production wells planned for the project would induce a gradient towards the production well. Using the estimated values of the variables based on site specific data, the hand calculated results indicate that it will take between about 43 years to 4,424 years for groundwater to flow from beneath Palen Dry Lake to the project wells (AECOM 2010a). Given that there are probably low permeability sediments present beneath Palen Dry Lake and the analysis did not take into consideration retardation, dispersion or dilution and/or interference from other producers, it is unlikely that significant vertical migration of poor quality water would migrate and degrade higher quality portions of the aquifer. However, due to the uncertainty associated with the amount of information available concerning shallow groundwater quality and vertical migration, Conditions of Certification **SOIL&WATER-2** through **SOIL&WATER-4**, and **SOIL&WATER-18** are expected to minimize impacts to groundwater quality below the level of significance.

Because the modified PSEGS project would use a reduced amount of water during operation activities with the same proposed groundwater supply system as the approved PSPP project, staff believes that Conditions of Certification **SOIL&WATER-2** through **SOIL&WATER-4** and **SOIL&WATER-18** as approved in the Commission Decision would also apply to the modified PSEGS project.

Evaporation Ponds

The approved PSPP project would have had four double-lined evaporation ponds. Each pond would have had an evaporative surface area of 4 acres resulting in a total of 8 acres of evaporation ponds for each unit or a total of 16 acres of ponds for the entire approved PSPP project. The modified PSEGS project would construct two double-lined evaporation ponds, each with 2 acres of evaporative surface area resulting in a total of four acres of ponds for the entire modified project.

The ponds would be designed and permitted as Class II Surface Impoundments in accordance with CRBRWQCB requirements, as well as the requirements of the California's Department of Resources Recycling and Recovery (CalRecycle). 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 would have enough surface area so the evaporation rate exceeds the input rate at maximum design conditions and annual average conditions.

For the approved PSPP project, the average pond depth is 7 feet and residual precipitated solids would have been removed every 4 years to maintain a solids depth no greater than approximately 2 feet for operational and safety purposes. The ponds would have maintained a minimum of 2 feet of freeboard to minimize the potential for overtopping due to a 100-year recurrence interval rainfall event. A total estimated amount of evaporites accumulated is 6,400 tons over 30 years.

For the modified PSEGS project, ponds 6 feet deep would be constructed without the need for periodic removal of solids over the 30 year life of the facility. Ponds are designed for an ultimate salt depth of 3.2 feet and a maximum water depth of 1.0 feet. A 100-yr, 24-hour storm event is estimated by NOAA to yield 0.4 feet (4.22 inches) of rain. A minimum freeboard of 1.0 foot will be maintained during the life of the ponds (Palen 2013a Appendix 2-B).

The pond liner system would 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 detection system (LDS), which will be directed back to the pond. There would be a hard surface protective layer on top of the 60 mil HPDE which will consist of a 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 would be required to detect the presence of liquid and/or constituents of concern. Although the modified project would create less process wastewater per year compared to the approved project, the constituents of concern would occur in higher concentrations.[13] Due to the aforementioned construction and operational procedures of the surface impoundments (see Condition of Certification **SOIL&WATER-6** and Appendices B, C, and D to be provided in the FSA) along with Condition of Certification **SOIL&WATER-18**, 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.

Land Treatment Unit

The approved project proposed use of a Land Treatment Unit (LTU) to treat contaminated soils as a result of accidental spills of heat transfer fluid (HTF) that occur during the course of daily operational or maintenance activities. The Commission Decision required compliance with Condition of Certification **SOIL&WATER-6** (with requirements specified in Appendices B, C, and D) to ensure that the operation of the LTU is in accordance with regulatory requirements and will minimize potential impacts to surface and groundwater quality. In addition, Condition of Certification **SOIL&WATER-18** required the approved project to monitor existing groundwater quality to monitor compliance with the requirements set forth in **SOIL&WATER-6**.

The modified PSEGS project does not require use of an LTU for solar tower technology. Although this results in a reduced impact compared to the approved project, the waste

[13] A thermal evaporator system would treat process wastewater, and concentrated waste brine would be transported to the evaporation ponds. See the Process Wastewater discussion under “Proposed Modified Project” above.

discharge requirements specified in Appendices B, C, and D must be revised to reflect the modified project. PSH is currently coordinating with CRBRWQCB to develop revisions to waste discharge requirements prior to publication of the Final Staff Assessment. Staff believes that the revisions in Appendices B, C, and D would not affect the language of existing Conditions of Certification **SOIL&WATER-6** or **SOIL&WATER-18**.

Septic Field

The use and application of septic fields is an established practice as a method of wastewater treatment. The septic system would have no affect on the surface water in or around the project site. The septic system would 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.

Individual septic systems and leach fields are planned for each of the two power blocks and the project's administrative, warehouse, and control room and facilities. The proposed septic systems and leach fields for the various facilities are hydraulically down-gradient 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 would be constructed in accordance with the requirements of Riverside County and Condition of Certification **SOIL&WATER-7**:

1. Ordinance 650.5 (amends Ordinance 650 that 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).

Because the modified PSEGS project employ a comparable number of fulltime workers during operation as the approved PSPP project,[14] staff believes that Condition of Certification **SOIL&WATER-7** as approved in the Commission Decision would also apply to the modified PSEGS project.

Mitigation

Groundwater quality in the vicinity of the project site could be impacted as a result of the operation of the surface evaporation impoundments and septic fields. Preliminary studies and calculations have been made to assess the potential for impact. These

[14] The approved PSPP project estimated 134 full time employees would be needed with both units operating. The modified PSEGS project estimates to employ up to 100 full time employees.

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 surface evaporation impoundments and septic systems, staff recommends implementation of specific monitoring and mitigation requirements.

The Commission Decision required Conditions of Certification **SOIL&WATER-6**, **SOIL&WATER-7** and **SOIL&WATER-18** to minimize impacts below a level of significance. Staff believes these conditions as approved in the Commission Decision would also apply to the modified PSEGS project.

SURFACE WATER HYDROLOGY

The modified project proposes substantial changes to the site hydrology compared to the approved project. The modified project removes the three major drainage channels from the approved project that was designed to route the water through and around the entire field of solar troughs. Instead, the heliostat technology of the modified project would allow most flows to maintain existing, pre-project natural drainage patterns through the solar fields.[15] Although these differences would inherently reduce the impacts of water diversion compared to the approved project, these changes in hydrology could potentially create issues that were not analyzed during assessment of the approved project. Therefore, the following surface water hydrology discussion is entirely independent of the analysis found in the Revised Staff Assessment for PSPP.

Flooding

Flooding is usually defined as the inundation of dry land adjacent to a channel when excess flow exceeds its banks. Because ephemeral streams like those at the site do not have permanent flow, their banks are formed in response to rainfall events which are infrequent and vary in intensity. The extreme changes in flow conditions causes flooding, erosion, and sedimentation that can drastically alter the channel’s shape and alignment. Consequently, desert washes can be transient and may vary in course from one storm event to another (resulting in heavy braiding of shallow channels). For purposes of this analysis, impacts of flooding will consider the natural behavior of ephemeral streams.

Onsite Area Flooding

Proposed construction of the PSEGS project would alter existing onsite drainage patterns which could potentially cause or increase onsite flooding. For the majority of the project site, existing drainage patterns would generally remain the same. However, changes to a number of areas such as grading, adding impervious surfaces, diverting flows, and impeding flows can increase the amount of storm water runoff volume and rate. An analysis of each impact and the project owner’s proposal to address impacts follows below.

[15] Because the modified project does not propose the major drainage channels, staff recommends deletion of the following Conditions of Certification pertaining to these large channels: SOIL&WATER-8 through SOIL&WATER-12. (See “Proposed Conditions of Certification” below.)

Grading and Increase of Impervious Area

Heavy to medium grading would be performed within each solar plant's power block area and the common area complex. Grading would also be needed to create a system of roadways for access to each facility and maintenance of the heliostats, although grading in the solar fields would match natural contours and promote sheet flow where possible. Estimated amount of total grading (both temporary and permanent) would be about 413 acres, as shown in **Soil & Water Resources Table 4**. After project completion, the temporary parking and construction laydown areas would be restored to pre-project grade and stabilized to prevent erosion and promote natural revegetation.[16]

While most of the permanently graded area would remain "dirt" surface, the addition of concrete foundations and asphalt paving would create approximately 25 acres of impervious surface. Because water is not able to infiltrate into impervious surfaces, storm water runoff quickly concentrates and flows downstream, increasing both the volume and velocity of accumulated water. In addition, the heliostat assemblies would essentially function as thousands of rooftops and create approximately 799 acres of impervious surfaces, covering about 21 percent of the project site (see **Soil & Water Resources Table 4**). However, because the heliostats would be installed such that surface runoff flows to the pervious dirt areas of the solar field, impacts are considerably less severe than a contiguous stretch of impervious area.

The project manager submitted Preconstruction Hydrology Calculations (Palen 2013e Attachment G) showing that a 100-year, 24-hour storm event[17] would likely result in flood flows approximately one-to two-feet deep, with spot locations of three to four feet deep (see **Soil & Water Resources Figure 12**). Staff acknowledges the project owner has completed a thorough hydrologic analysis, but notes that predicted flow depths and velocities on undeveloped alluvial fans have potential uncertainty. The consequences of flash flood damage or modified sedimentation and erosion rates may be significant. Staff proposes Condition of Certification **SOIL&WATER-20** (Storm Water Damage Monitoring and Response Plan) to reduce potential impacts caused by large storm event in four ways:

1. Establish specifications for heliostat installation based on site specific studies and reports (e.g. Pylon Insertion Depth and Heliostat Stability Report). This ensures that heliostats are designed to withstand storm water scour of a 100-year storm event;

2. establish an ongoing maintenance plan to ensure all storm water management measures are functioning properly, though periodic inspection before the first seasonal storms and after each storm event throughout the year;

[16] As required by Condition of Certification **BIO-8**, Item 19 (see the **BIOLOGICAL RESOURCES** section of this PSA).

[17] A design storm event is a hypothetical storm event, of a given frequency interval and duration, used to estimate how often storms of a given magnitude will occur, based on historical rainfall information. A 100-year, 24-hour design storm event corresponds to a major storm (the probability of occurrence in any given year is one in 100, or a one percent chance) and is used to represent flows with the potential to cause property damage and other impacts.

3. establish and implement a response plan to clean up damage and prevent release of sediment or pollutants after every occurrence of damage from a storm event or other cause; and

4. develop and implement a process to monitor incidents and propose modifications and/or improvements to address ongoing issues.

Furthermore, as the modified project plans evolve from the conceptual and preliminary phases, any changes affecting hydrology or hydraulics would require an updated comprehensive analysis for purposes of **SOIL&WATER-20**. For example: the use of certain commercial dust suppressants applied onto dirt roads that would increase the total impervious area of the site.

In addition, standing water onsite might have impacts to biological resources given the scarcity of water in the desert. For example, standing water has the potential to attract nuisance predators such as ravens to the site. (See the **BIOLOGICAL RESOURCES** section of this PSA for further discussion on the potential impacts of standing water to biological resources and possible mitigation required.)

Diversion Channels

In three areas (Solar Plant 1, Solar Plant 2, and the administration building), permanent diversion channels would be constructed to redirect storm runoff around these structures and prevent damage from flooding that occurs naturally due to existing topography. The diversion channels around the administration building and each solar block would protect these structures from natural ephemeral flooding. Although the administration building and solar blocks would be generally located outside these flooded areas (see **Soil & Water Resources Figure 15**), desert washes can be transient and may vary in course from one storm event to another. Additional temporary diversion channels would also redirect flows around construction laydown and temporary parking areas during the construction activities of the project. Because of the general flow-through design of the solar fields, the diversion channels would not redirect runoff flows in a way that would adversely flood other areas either onsite or offsite. Also, **SOIL&WATER-20** (Storm Water Damage Monitoring and Response Plan) would require maintenance and monitoring of diversion channels during operations for added protection against storm damage.

Offsite Area Flooding

Grading and Increase of Impervious Area

Numerous ephemeral drainages flow through the proposed PSEGS site, originating from the southwest and discharging to the northeast toward the Palen dry lake bed. Due to the episodic rainfall of the region and transient nature of the drainages, offsite flows can easily exceed these shallow channels and result in flooding. Modeling of the site in its present undeveloped state results in offsite flows to areas downstream as shown in **Soil & Water Resources Figure 15**. Proposed grading and construction of PSEGS would increase the amount of impervious area onsite. This would increase the amount of storm water peak discharge leaving the site and could exacerbate the naturally occurring floods downstream of the site.

The project owner submitted a Developed Conditions Drainage Assessment (Palen 2013a Appendix A) that modeled post-construction onsite peak flows, runoff volumes, maximum velocities, and maximum depths of potential floods. The analysis represented post-construction site conditions by incorporating the following proposed elements: impervious surfaces (heliostats, buildings, asphalt roadways and parking lots), and graded dirt roads, **Soil & Water Resources Table 20** presents the estimated peak flows leaving the site calculated from cross-sections located along the northeast border (as shown in **Soil & Water Resources Figure 15**). Because cross sections are different widths, the table calculates the average flow per foot across each cross section.

Soil & Water Resources Table 20
Estimated Peak Flows Discharging from PSEGS Site

Floodplain Cross Section		100-year Storm Event					
		Pre-construction		Post-construction		Flow Increase	
No.	Approx. Width	Peak Flow	Flow per foot	Peak Flow	Flow per foot	cfs	Flow per foot
CS-1	6200 ft	7053.8 cfs	1.14	7160.3 cfs	1.15	106.4	0.02
CS-2	1400 ft	299.0 cfs	0.21	520.8 cfs	1.74	221.8	0.16
CS-3	6400 ft	5132.1 cfs	0.80	5342.9 cfs	0.83	210.8	0.03
CS-4	9000 ft	1005.5 cfs	0.11	1059.8 cfs	0.12	54.3	0.01

Source: Palen 2013a Appendix A

Because the peak discharge of the 100-year, 24-hour storm event leaving the site during post construction conditions would be very close to discharge of preconstruction conditions, the impacts of offsite downstream would be reduced. Staff acknowledges the project owner has completed a thorough hydrologic analysis, but notes that predicted flow depths and velocities on undeveloped alluvial fans have potential uncertainty. The consequences of flash flood damage or modified sedimentation and erosion rates may be significant. Staff proposes Condition of Certification **SOIL&WATER-20** requiring a Storm Water Damage Monitoring and Response Plan to reduce these potential impacts.

Flood Hazards

Flood hazards include direct flooding due to overtopping of nearby rivers or streams resulting from severe rainstorms, or secondary flooding due to seismic activity creating tsunamis (tidal waves) or seiches (waves in inland bodies of water).

To identify the different types of flood risks for a given location, flood hazard maps were developed by the Federal Emergency Management Agency (FEMA) to identify areas prone to flooding. Comparing the PSEGS site location to these maps, staff found that:

- PSEGS is not located within the 100-year floodplain as defined by FEMA; and
- PSEGS site is located roughly 150 miles inland with no dams in the region. In addition, no levees or inland bodies of water are located in the area.

The proposed project would not impede or significantly redirect flood flows of the FEMA designated 100-year floodplain. In addition, the project would not be affected by dam failure, tsunami, or seiche. PSEGS would not have significant impacts pertaining to these identified flood hazard areas. (For discussion on additional potential hazards that could be caused by soil failure such as mudflow, landslide and liquefaction, see the **GEOLOGY AND PALEONTOLOGY** section of this PSA.)

Mitigation

The Implementation of Conditions of Certification **SOIL&WATER-1**and **SOIL&WATER-20** are anticipated to minimize impacts related to flood hazards and erosion associated with construction and operation of the modified project to below the level of significance. They will also provide the basic information to assist 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 runoff may encounter soil or chemicals deleterious to aquatic and terrestrial plant and wildlife. The project owner proposes to implement BMPs for managing potentially harmful stormwater 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. Contact runoff[18] could concentrate various pollutants that would then discharge to an offsite water resource. The modified project would alter natural storm water drainages around the common area and around each solar power block. BMPs would be implemented to reduce potentially significant impacts related to concentrated drainage and ensuing soil erosion and sediment transport offsite. The following discusses the potential impacts and the proposed Conditions of Certification below.

Construction

Potential threats to surface water quality related to construction includes potential increases in sediment loads to adjacent streams and washes, and accidental spills of hydrocarbon fuels and greases associated with construction equipment. The SWRCB and CRBRWQCB have determined that standardized storm water and soil erosion BMPs are the most effective, practical means to protect surface waters by preventing or reducing pollution from nonpoint sources. Staff agrees that carefully chosen BMPs for both construction and operation activities would effectively prevent or reduce sediment discharge into water resources. Potential increased sediment loads would be mitigated through development and implementation of a Drainage Erosion and Sedimentation Control Plan (DESCP) which is required as part of Condition of Certification **SOIL&WATER-1.**

To prevent contact runoff from discharging offsite during construction activities, the project owner has identified a combination of standard BMPs within the DESCP for pollution control measures to be implemented during construction. The BMPs would limit or reduce potential pollutants at their source before they come into contact with storm water. These BMPs also involve daily activities of the construction site, are under the control of the construction contractor, and are additional “good housekeeping practices,” which involve maintaining a clean and orderly construction site.

[18] Contact runoff refers to storm water in contact with exposed polluted or hazardous materials and/or surfaces can potentially result in contaminated runoff (containing trace oil, chemicals, metals, toxic substances, or other materials).

Accidental spills of hydrocarbon fuels and greases associated with construction equipment would also be mitigated by the development and implementation of Condition of Certification **HAZ-1** and **HAZ-2** as modified in the **HAZARDOUS MATERIALS MANAGEMENT** section of this PSA, which includes development of a Spill Prevention, Control and Countermeasure (SPCC) Plan. The SPCC Plan sets forth spill prevention methods as well as actions to be taken in the event of an accidental spill or release of hazardous materials. In summary, implementation of BMPs as defined in Condition of Certification **SOIL&WATER-1** and Conditions of Certification **HAZ-1 and HAZ-2** would reduce potential water quality impacts to insignificant.

Operation

Potential threats to surface water quality related to operations includes: potential increases in sediment loads to adjacent washes; accidental spills of hydrocarbon fuels and greases associated with operations equipment; and accidental releases from the surface impoundments that include process wastewater.

To prevent the discharge of untreated industrial wastewater or untreated sanitary wastewater from entering nearby water resources, each PSEGS Solar Plant would keep the potentially polluted waste water (contact runoff, general facility drainage, process wastewater, and sanitary waste) completely separated from non-contact storm water runoff. Sanitary waste would remain contained within the septic system. Industrial wastewater would remain within the power block, processed through the thermal evaporator system, then disposed into the evaporation ponds. Hazardous liquids would be handled to prevent spills and accidental release. Non-contact storm water would be directed away from the power blocks and allowed to flow offsite toward the northeast. All BMPs and conditions of certification would strive to prevent any chemical or hazardous pollutants from mixing with the "clean" storm water. With the implementation of these measures, impacts from sanitary or industrial wastewater would be avoided or reduced to less than significant during operation of the proposed project.

A DESCP would be required (see Condition of Certification **SOIL&WATER-1**) prior to onsite operations and would reduce the potential for increased sediment loads to less than significant. Potential spills would be managed through hazardous materials management (see the **HAZARDOUS MATERIALS MANAGEMENT** section of this PSA). The operation of the surface impoundments would include *one foot of freeboard to minimize the potential for overtopping during a 100-year precipitation event. In addition, the surface impoundments would operate under the waste discharge requirements that include operational and leak detection monitoring as stipulated in **SOIL&WATER-6** and would reduce the potential for impacts to surface water quality to less than significant. Also, **SOIL&WATER-20** would reduce the potential of pollutants caused by storm damage from leaving the site.

Mitigation

No significant impacts are anticipated related to surface water quality. Implementation of Condition of Certification **SOIL&WATER-1**, **-6,**and **-20** and **HAZ-1** and **-2** is anticipated to reduce impacts to surface water quality to below the level of significance associated with construction and operation of the modified 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 surface impoundment that would be included in Condition of Certification **SOIL&WATER-6.**

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 Regulations, Title 14, section 15130).

There is the potential for future development in the Chuckwalla Valley area and throughout the southern California desert region. Cumulative impacts can occur if implementation of the proposed modified project could combine with those of other local or regional projects. The locations of existing and reasonably foreseeable developments in the Chuckwalla Valley area are presented in the following sections.

Geographic Extent

As identified in the **EXECUTIVE SUMMARY** of this PSA, a number of projects within the region of the PSEGS have been approved, are under review, or in operation (see **Executive Summary Figure 1**). The geographic extent used as part of the cumulative impact assessment for soil and water resources includes the CVGB. The extent of the basin is described in the “Setting and Existing Conditions” discussion above, and shown in **Soil & Water Resources Figure 2**. 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 & Water Resources Table 21** lists the foreseeable projects analyzed by staff in the Revised Staff Assessment for PSPP (CEC 2010c §C.9). Staff is currently analyzing expected water use of additional recently proposed projects in the CVGB for an updated cumulative analysis in the Final Staff Assessment.

Construction and Operation

The construction of the modified project is expected to result in short term adverse impacts related to construction activities. It is expected that some of the cumulative projects listed in **Soil & Water Resources Table 21** which are not yet built may be under construction the same time as the modified project. In addition, it is expected that some of the future and foreseeable projects may be operational at the same time as the modified project. As a result, there may be substantial long term cumulative impacts during construction and operation of these projects related to soils and water resources.

These impacts may include: soil erosion, geomorphology, changes in the groundwater basin balance, groundwater levels, and groundwater quality, and changes in surface water hydrology and surface water quality.

Soil Erosion

Construction of the PSEGS would result in both temporary changes at the project site which could incrementally increase local soil erosion and storm water runoff during construction. The PSEGS would be expected to contribute only a small amount to the possible short term cumulative impacts related to soil erosion because the project owner would be required to implement the Conditions of Certification defined in this analysis, which are expected to bring short term impacts below the level of significance.

Soil & Water Resources Table 21
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 (200 MW)	Chuckwalla Basin	Construction	20	20	10	—	—	—	—	—	—	Estimates
					Operation	—	5	7	10	10	10	10	10	10	
Eagle Mountain Soleil	enXco	CACA 49492	Photovoltaic (100 MW)	Chuckwalla Basin	Construction	—	10	10	—	—	—	—	—	—	Estimates
					Operation	—	—	—	5	5	5	5	5	5	
Desert Lily Soleil	enXco	CACA 49494	Photovoltaic (100 MW)	Chuckwalla Basin	Construction	—	20	20	—	—	—	—	—	—	Estimates
					Operation	—	—	—	5	5	5	5	5	5	
Desert Sunlight Solar Farm	First Solar	CACA 48649	Photovoltaic (550 MW)	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 (1276 MW)	Chuckwalla Basin	Construction	—	308	308	8,066	8,066	8,066	8,066	—	—	Application to FERC
					Operation	—	—	—	—	—	—	—	2,688	1,763	
Eagle Mountain Landfill	Kaiser Ventures Inc.	---	Landfill	Chuckwalla Basin	Operation	—	—	—	1,299 (a)	1,299	1,299	1,299	1,299	1,299	Eagle Mtn Landfill & Recycling Center EIS/EIR
Genesis Solar Energy	Genesis Solar LLC	CACA 48880	Parabolic Trough (250 MW)	Chuckwalla Basin	Construction	1,368	616	616	—	—	—	—	—	—	Application to Energy Commission
					Operation	—	—		202	202	202	202	202	202	
Mule Mountain Solar Project	Bullfrog Green Energy, LLC	CACA 49097	Photovoltaic (500 MW)	Chuckwalla Basin	Construction	20	20	20	—	—	—	—	—	—	Estimates
					Operation	—	—	—	1	1	1	1	1	1	
Mule Mountain Soleil	enXco	CACA 49488	Photovoltaic (200 MW)	Chuckwalla Basin	Construction	—	20	20	—	—	—	—	—	—	Estimates
					Operation	—	—		10	10	10	10	10	10	
Palen Solar Power	Palen Solar I, LLC	CACA 48810	Parabolic Trough (500 MW)	Chuckwalla Basin	Construction	1,917	1,917	1,917	—	—	—	—	—	—	Application to Energy Commission
					Operation	—	—	—	303	303	303	303	303	303	
Totals						3,352	2,963	2,955	9,905	9,905	9,905	9,905	4,527	3,602	

(a) Actual start date of the landfill is unknown.

Operation of the PSEGS would result in permanent changes at the project site. These changes could incrementally increase local soil erosion and stormwater runoff.

The PSEGS would not be expected to cumulatively contribute 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 specified below.

Geomorphology

There is a concern that implementation of all of the 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 MFTL. See the **BIOLOGICAL RESOURCES** section for further analysis of potential cumulative impacts related to geomorphic processes.

Groundwater Basin Balance

Staff evaluated whether the amount of groundwater used for both construction and operations would place the groundwater basin into overdraft and deplete the CVGB. 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. Appendix G of the CEQA Guidelines refers to “[substantial interference] with groundwater recharge such that there would be a net deficit in aquifer volume". The following discussion presents an analysis of the potential impacts to the groundwater basin balance and the potential for overdraft 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 & Water Resources Table 22** presents the anticipated projects water requirements (Years 2011-2043) along with the average annual basin budget. In 2010, the CVGB balance was 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.

Soil & Water Resources Table 22
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	3,352	-744	-744	-0.005 percent
2012	2,608	2,963	-355	-1,099	-0.0072 percent
2013	2,608	2,955	-347	-1,446	-0.010 percent
2014	2,608	9,905	-7,297	-8,743	-0.058 percent
2015	2,608	9,905	-7,297	-16,040	-0.107 percent
2016	2,608	9,905	-7,297	-23,337	-0.156 percent
2017	2,608	9,905	-7,297	-30,634	-0.204 percent
2018	2,608	4,527	-1,919	-32,553	-0.217 percent
2019	2,608	3,602	-994	-33,547	-0.224 percent
2043	2,608	3,602	-994	-57,403	-0.383 percent

Notes:
1 - See Soil and Water Resources Table 10
2 - See Soil and Water Resources Table 21
3 - Based on a total recoverable storage of 15,000,000 af.

It was anticipated that groundwater extraction of foreseeable projects listed in **Soil & Water Resources Table 21** would peak in Year 2011 at 3,352 afy and decrease to 2,955 afy in Year 2013 which would exceed the basin balance in 2011 by 744 afy. This would place the Chuckwalla groundwater basin into overdraft conditions commencing in Year 2011.

Based on this information, it is anticipated that groundwater extraction during operation of foreseeable projects will be approximately 8,606 afy in Year 2014 which would exceed the basin balance by 5,998 afy and place the basin into overdraft for 7 years.

The storage capacity of the CVGB is approximately 15,000,000 af. The amount of cumulative groundwater extraction anticipated for construction of the approved project and the future/foreseeable projects would have amounted to 0.01% of the total stored groundwater, which is not considered a significant impact. The approved project was expected to reduce the amount of total stored groundwater by 0.383% by the end of project operations, which is also not considered a significant impact. Because water usage for the modified project would be less than the approved project, these impacts are also expected to be less than significant. However, the list of foreseeable projects presented in **Soil & Water Resources Table 21** may be obsolete. The Final Staff Assessment will use an updated project list and revise the cumulative analysis if needed.

Lastly, the I-10 corridor within the CVGB has been targeted for renewable energy projects that have not been identified or quantified as to quantity 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 (approximately 15,000,000 af), the impact would be insignificant.

In addition, the cumulative impact analysis conducted by the Genesis Solar Power Project located to the east of the Project suggested that during the course of operations for all foreseeable projects, the subsurface outflow from the CVGB would decline from approximately 400 afy to approximately 71 afy in 2043 (see Genesis 2010 Table 5-2). 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 mitigated such that the project would not contribute to cumulative impacts. **SOIL&WATER-14** and **SOIL&WATER-17** will minimize impacts to the Colorado River below a level of significance.

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 & Water Resources Table 23**) that during the life of the foreseeable projects listed, groundwater level declines between one and five feet or more would be located at a distance of approximately 1-2 miles from the project ROW. The closest existing well is located within 2 miles of the ROW (see **Soil & Water Resources Figures 16** and **17**). Consequently, staff believes it is appropriate to assume that the potential impact to water levels in existing wells appears to be cumulatively significant, and require monitoring and mitigation in the event that monitoring indicates significant impacts. Implementation of the Condition of Certification **SOIL&WATER-4** would mitigate any such impacts to groundwater users (wells) due to lowering of the groundwater table.

Soil & Water Resources Table 23
Results of Predictive Simulations Numerical Groundwater Model for PSPP and All Foreseeable Projects[1]

Model Runs	Zone 1[2]		Zone 2[2]		Zone 3[2]		Year	Maximum drawdown, feet				Change in storage, af[4]
	T, ft2/d	S	T, ft2/d	S	T, ft2/d	S		Well 1	Well 2	Well 3	Well 4	
Run 15[1]	1,000	0.2	6,300	0.2	26,000	0.2	2013	11.67	6.49	11.69	6.50	4,109
							2029	9.80	5.97	10.00	6.48	89,633
							2043	10.93	6.76	11.23	7.54	142,526

Source: Derived from Solar Millennium, 2010i.
Notes
1 Refer to Soil and Water Resources Table 21 for the water use schedule for the renewable projects identified in the area.
2 Figure DR-S&W-207-3 in Appendix E shows the areal distribution of transmissivities used in the model

Groundwater Quality

There is a potential that significant cumulative groundwater quality impacts could occur 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 modified project would not be expected to cumulatively contribute to the possible long-term operational cumulative impacts, given the distance to the groundwater table (>100 feet bgs) over the CVGB and the proposed implementation of a hazardous material management plan as well as monitoring plans associated with operation of surface impoundments, septic systems and other various operations. With implementation of the Conditions of Certification specified below, cumulative impacts to groundwater quality are anticipated to be below the level of significance.

Surface Water Hydrology

The cumulative impacts of the foreseeable projects 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 various projects from flooding. The foreseeable projects will change both the extent and physical characteristics of the existing floodplain within each project site as well as downstream of each project site, as well as change the sediment transport and depositional characteristics of each of the project sites.

The PSEGS would not be expected to cumulatively contribute to the possible short-term cumulative impacts related to surface water hydrology because the implementation of the Conditions of Certification below would reduce the cumulative impacts below the level of significance.

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 stormwater and protect water quality. Potentially significant water quality impacts could occur during operations if contaminated or hazardous materials used during operations were to contact stormwater and drain offsite. It is expected that all of the projects would have Hazardous Material Management Plans to reduce this potential impact to insignificant.

All of the foreseeable projects would alter natural stormwater 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 PSEGS would not be expected to cumulatively contribute to the possible short-term cumulative impacts related to surface water quality with implementation of the Conditions of Certification described below.

DECOMMISSIONING

PSEGS is designed for an operating life of 25 to 30 years. Facility closure can be either temporary or permanent, and closure options range from “unplanned temporary closure," with the intent of a restart at some time, to the removal of all equipment and facilities. Closure can result from two circumstances: (1) the facility is closed suddenly and/or unexpectedly because of unplanned events, such as a natural disaster or economic forces or (2) the facility is closed in a planned, orderly manner, such as at the end of its useful economic or mechanical life or due to gradual obsolescence.

In the event of a temporary or unplanned closure, PSEGS would be required to comply with all applicable Conditions of Certification, including an emergency Risk Management Plan to manage the possible release of hazardous substances present onsite (see the **HAZARDOUS MATERIALS** section of this PSA). Depending on the expected duration of the shutdown, other appropriate measures would be taken such as removing chemicals from storage tanks or equipment.

Permanent closure (decommissioning) requires a Facility Closure Plan, as discussed in the **FACILITY DESIGN** and **GENERAL CONDITIONS** sections of this PSA*,* which would be submitted to the Energy Commission for approval prior to decommissioning. Future conditions that could affect decommissioning are largely unknown at this time, however compliance with all applicable LORS, and any local and/or regional plans would be required. The plan would address all concerns in regard to potential erosion and impacts on water quality, as described in Condition of Certification **SOIL&WATER-13**. Refer to the **FACILITY DESIGN** section of this PSA for further discussion on temporary and permanent facility closure.

COMPLIANCE WITH LORS AND STATE POLICIES

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 Colorado River Basin Regional Water Quality Control Board that the PSEGS 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.

In August 2010, the USACE determined that "federal waters", also known as waters of the U.S., are not present on the approved PSPP project site. The project owner intends to use the existing jurisdictional delineation, which is valid for five years from the USACE verification, for the PSEGS project as impacts would occur within a sub-set of the original project footprint. The project owner is currently conducting a jurisdictional delineation for the PSEGES modified project linears including the gas pipeline and the transmission line alignment. Conclusions regarding the presence of waters regulated by the USACE are not expected to change. (For further discussion on waters of the U.S., see the **BIOLOGICAL RESOURCES** section of this PSA.)

The CRBRWQCB has authority under the Porter-Cologne Water Quality Control Act of 1967, Water Code Section 13000 et. seq. (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. The modified project has filed a ROWD for evaluation of 401 water quality impacts and in association with the proposed surface impoundments (evaporation ponds). Condition of Certification **SOIL&WATER-6** sets forth the Waste Discharge Requirements for operation of the surface impoundments.

Clean Water Act Section 402

Direct and indirect discharges and storm water discharges into waters of the U.S. 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 storm water discharges for industrial and construction activities. Storm water discharge is covered by an NPDES permit, either as an individual or general permit. The CRBRWQCB administers the NPDES permit program under the CWA in the project area. The modified project would obtain to a Construction General Permit to meet the Section 402 NPDES requirements.

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.

As explained above under the Clean Water Act Section 401, the USACE made a determination that there were no waters of the U.S. present on the PSPP project site. Although the project owner is currently conducting a jurisdictional delineation for the gas pipeline and transmission line alignment which were modified for the PSEGS project, conclusions regarding the presence of waters regulated by the USACE are not expected to change.

STATE

The administering agencies for the State LORS are the Energy Commission, the State Water Resources Control Board (SWRCB), and the CRBRWQCB.

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 modified project’s use of dry cooling would 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 SWRCB’s NPDES General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities, (Order No. 2009-0009-DWQ NPDES No. 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 stormwater 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; stormwater collection and discharge points, general topography both before and after construction; and drainage patterns across the site.

The modified project would prepare a SWPPP as a requirement of the Construction General Permit. The project would also prepare a DESCP to meet Energy Commission requirements. 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, SWRCB's NPDES General Permit for Discharges of Storm Water Associated with Industrial Activities (Order 97-03-DWQ,NPDES No. 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. At the present time, the facility does not have a Standard Industrial Classification (SIC) code that would require compliance with the California's Industrial Storm Water Program.

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 modified project does not plan to use reclaimed water. However, dry cooling has been proposed and the project would minimize water usage and recycle water where appropriate.

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 USBR

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 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 as 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 Chuckwalla Valley Ground Water Basin (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-15** would ensure the project owner complies with Section 1200 “Water Rights” requirement.

The project 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 modified 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.

Title 23 CCR Division 3, Chapters 9 and 15 regards 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, land treatment units, 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.

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's authority to issue WDRs for construction and industrial stormwater activities.

Section 13260 et seq. This section requires filing with 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 California 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. In accordance with Water Code Section 13263, the [State Water Board / Regional Water Board] hereby "prescribes" the waste discharge requirements as adopted by the Energy Commission for the Project. Because the Energy Commission has exclusive permitting authority over the project under Public Resources Code section 25500, the State Board "prescribes" the waste discharge requirements for the sole purpose of authorizing the Regional Board to enforce them and undertake associated monitoring, inspection, and annual fee collection as if the waste discharge requirements were adopted by the Board.

Section 13173 (Designated Wastes). Traditionally the State Water Resources Control Board along with the applicable California Regional Water Quality Control Board (hereafter "Water Boards") develop, adopt, and enforce waste discharge requirements for facilities that discharge waste. When such a facility is an electrical generating facility under the Energy Commission's jurisdiction, however, the Energy Commission permit takes the place of the Water Boards' permit and the WDRs are folded into the Energy Commission's conditions of certification. Nevertheless, Energy Commission staff believe it is important to have the Water Boards retain the authority to enforce these requirements, along with the authority to monitor, inspect, and collect an annual fee, because they are state and local agencies with expertise in this subject area. Therefore, staff recommends that the Energy Commission delegate this authority the Water Boards pursuant to title 20, California Code of Regulations, section 1770(b), and has provided language to that effect in Condition of Certification **SOIL&WATER-6.** The Water Boards may also take action in tandem with delegation by the Energy Commission to prescribe the requirements adopted by the Energy Commission to ensure that their agents are fully informed and authorized to enforce the WDRs in the Commission's decision.

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.

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 regulates the discharges 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. Condition of Certification SOIL&WATER-6 would ensure the applicant complies with this requirement.

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.

The project would not be subject to this policy because it has no nearby sources of municipal recycled water. However, the project proposes to supplement its groundwater supply with recycled water produced from onsite wastewater treatment using a thermal evaporator system.

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, from using 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. The project would not be subject to this policy because it has no nearby sources of municipal recycled water.

Section 13552. This section specifically identifies the use of potable domestic water for cooling towers as an 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. The project would not be subject to this policy because it has no nearby sources of municipal recycled water.

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 would be constructed at the site. These wells are required as part of the evaluation of water resources for the project. A well completion report would be filed with DWR for each well that is constructed. Measures would 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 would 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 would be subject to this requirement, because it will employ approximately 100 workers during operations. Regulated wells must be sampled for bacteriological quality once a month and the results submitted to the California Department of Public Health (CDPH). The wells must also be monitored for inorganic chemicals once and organic chemicals quarterly during the year designated by the CDPH. CDPH will designate the year based on historical monitoring frequency and laboratory capacity. Condition of Certification **SOIL&WATER-15** would ensure the project owner complies with requirements of non-transient, non-community water systems.

Title 23, Division 3, Chapter 9. This chapter 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. Condition of Certification **SOIL&WATER-6** would meet the requirements of a report of waste discharge for discharges of waste to land and obtain waste discharge requirements.

With respect to onsite wastewater discharge, the CRBRWQCB adopted in 1984 "Guidelines for Sewage Disposal from Land Developments" that provides exclusion of on-site sanitary wastewater flows less than 5,000 gpd. Based on the estimate of approximately 3,010 gpd of sanitary wastewater spread out among three or more locations, the exclusion applies. Condition of Certification **SOIL&WATER-7** would ensure the sanitary wastewater disposal systems meet County of Riverside requirements.

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.

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. Conditions of Certification **SOIL&WATER-1**, **-6**, **-7**, **-18**, and **-20** would protect the quality of groundwater and surface water.

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. State policy 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.

The project would use dry-cooling methods and does not propose to use groundwater for power plant cooling. The project would use groundwater for mirror washing, auxiliary equipment cooling, process makeup, dust suppression, and potable supply.

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. The project would not be subject to this policy because it has no nearby sources of municipal recycled water. However, the project proposes to supplement its groundwater supply with recycled water produced from onsite wastewater treatment using a thermal evaporator system.

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 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. The project is not likely to be subject to this requirement because a Phase 1 Environmental Site Assessment conducted in 2009 concluded that no recognized environmental conditions (such as contaminated soil) were associated with the project site.

Water Quality Control Policy for Recycled Water (Resolution No. 209-0011). 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. The project would not be subject to this policy because it has no nearby sources of municipal recycled water. However, the project proposes to supplement its groundwater supply with recycled water produced from onsite wastewater treatment using a thermal evaporator system.

Public Resources Code

Section 25300 et seq. In the 2003 "Integrated Energy Policy Report", consistent with SWRCB Policy No. 75-58 and the Warren-Alquist Act, the Energy Commission adopted a policy stating they would approve the use of "fresh inland" water for cooling purposes by power plants only where alternative water supply sources and alternative cooling technologies are shown to be "environmentally undesirable" or "economically unsound." The project does not propose to use groundwater for power plant cooling. The project would use dry-cooling methods and does not propose to use groundwater for power plant cooling. The Project would use groundwater for mirror washing, auxiliary equipment cooling, process makeup, dust suppression, and potable supply.

Project Compliance with State Water Policy

The Energy Commission has five authoritative 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 a letter from the Board to the Energy Commission interpreting Resolutions 75-58 and 88-63 [collectively referred to as the state's water policies - see Genesis Solar Project (09-AFC-08)].

California Constitution

California's interest in conserving water is so important to our thirsty state that in 1928, the common law doctrine of reasonable use became part of the state Constitution. Article X, section 2 calls for water to be put to beneficial use, and that "waste or unreasonable use or unreasonable *method of use* be prevented." (Cal. Const., art. X, § 2; emphasis added.) The article also limits water rights to reasonable use, including reasonable methods of use. (*Ibid*.) Even earlier in the 20th Century, a state Supreme Court case firmly established that groundwater is subject to reasonable use. (*Katz v. Walkinshaw* (1903) 141 Cal. 116.) Thus, as modern technology has made dry-cooling of power plants feasible, the Commission may regard wet-cooling as an unreasonable method of use of surface or groundwater, and even as a wasteful use of the state's most precious resource.

Warren-Alquist Act

Section 25008 of the 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 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 determined that water with total dissolved solids ("TDS") 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 powerplant cooling to that *minimally essential*" for the welfare of the state. (*Ibid*; emphasis added.) In 1988, the Board determined that water with TDS of 3,000 mg/l or less should be protected for and considered as water for municipal or domestic use. (Resolution 88-63.)

Discussion

The project proposes a dry-cooled facility that would use 201 acre-feet a year (afy) of groundwater from onsite wells. Groundwater is the only available source of water. Pumped water would be used for various purposes, 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 solar plants. Process makeup water would be recycled to supplement groundwater supplies. Overall use of the water is efficient for this technology, requiring about 40 afy per 100 MW of capacity.

Quality of the groundwater varies significantly throughout the Chuckwalla Valley groundwater basin, and varies with depth. In general, groundwater below the project site would not meet water quality standards for domestic supply without treatment, because of high concentrations of fluoride and sulfate. Staff concludes that the modified PSEGS project complies with the state's water policies to feasibly use the least amount of the lowest-quality water available.

REGIONAL AND LOCAL

Riverside County Ordinance Codes, 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.

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 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.

Condition of Certification **SOIL&WATER-15** would ensure the project owner complies with requirements to construct and operate groundwater wells.

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.

Condition of Condition of Certification **SOIL&WATER-7** would ensure the sanitary wastewater disposal systems meet County of Riverside requirements.

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%.

Condition of Condition of Certification **SOIL&WATER-7** would ensure the sanitary wastewater disposal systems meet County of Riverside requirements.

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. Therefore, the project would not be subject to these requirements.

NOTEWORTHY PUBLIC BENEFITS

No noteworthy public benefits of the proposed modified project were identified associated with soil and water resources.

PUBLIC AND AGENCY COMMENTS

BASIN AND RANGE WATCH, STATUS REPORT NO. 1, MARCH 29, 2013 (TN #70178)

Comment #1: The commenter states that project groundwater pumping could impact groundwater-dependent vegetation and asks if staff and project owner would agree to a “stop pumping trigger” of groundwater if negative impacts are detected.

Staff Response: Because the PSEGS project would use a reduced amount of water during both construction and operation activities with the same proposed groundwater supply system as the approved PSPP project, staff believes the current Conditions of Certification for mitigation of groundwater level impacts are appropriate. Therefore this does not constitute a need for a project change from the approved project. Condition of Certification **SOIL&WATER-4** does not include a "stop pumping trigger", but does require groundwater level monitoring, mitigation, and reporting.

Comment #2: The commenter states that a regional groundwater study should be completed to evaluate the cumulative impacts to both groundwater and the Colorado River Basin relating to large industrial scale energy projects being built in the region.

Staff Response: Because the PSEGS project would use a reduced amount of water during both construction and operation activities with the same proposed groundwater supply system as the approved PSPP project, staff believes the current Conditions of Certification for mitigation of groundwater level impacts are appropriate. Therefore, this does not constitute a need for a project change from the approved project. To mitigate the project's contribution to impacts to the Colorado River, Condition of Certification **SOIL&WATER-14** and **-17** would require entitlements or offsets to Lower Colorado River water.

CONCLUSIONS

Staff's conclusions based on analysis of the information submitted to-date are as follows:

1. The 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 by implementing Best Management Practices (BMPs) during construction and operations. These Conditions of Certification are included in **SOIL&WATER-1** and **20.**

2. The PSEGS 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 project owner 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 project and other pumping in the basin would be documented by this monitoring and reporting program and mitigation would be required in accordance with Conditions of Certification **SOIL&WATER-2, -3**, **-4**, and **-5**.These measures will be sufficient to ensure that significant impacts to groundwater levels do not occur.

3. A preliminary 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 in storage in the basin greatly exceeds the amount of cumulative overdraft, even taking into account the potential for dramatically increased water demand, rendering the project's relatively small contribution to this cumulative impact less than cumulatively considerable. An updated cumulative impact analysis will be conducted for the Final Staff Assessment.

4. The cumulative effects may indirectly impact the adjacent Palo Verde Mesa Groundwater Basin by inducing underflow from the Colorado River. To mitigate the project's contribution to impacts to the Colorado River, staff recommends adoption of **SOIL&WATER-14** that would require the project owner to acquire entitlements or offsets to Lower Colorado River water. Staff has also proposed Condition of Certification **SOIL&WATER-17** which allows the project owner to refine estimates of the amount of induced Colorado River underflow through computer modeling analysis and adjust the required acquisition of entitlements or offsets to Lower Colorado River water accordingly.

5. The project owner proposes a dry-cooled facility that when fully operational would use 201 acre feet a year (afy) of groundwater from onsite wells. Groundwater is the only available source of water. Pumped water would be used for various purposes, 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. Process makeup water would be recycled to supplement groundwater supplies. Overall use of the water is efficient for this technology, requiring about 40 afy per 100 MW of capacity.

   The quality of the groundwater varies significantly throughout the CVGB, and varies with depth. In general, groundwater below the project site would not meet water quality standards for domestic supply without treatment, because of elevated levels of total dissolved solids (TDS) and high concentrations of fluoride, chloride, boron, and sulfate. Staff concludes that the Project complies with the state's water policy to feasibly use the least amount of the lowest-quality water available.

6. The PSEGS would generate wastewater that would include: reverse osmosis (RO) reject water, auxiliary equipment blowdown water and sanitary wastewater. The project proposes to use evaporation ponds to treat the RO reject water and auxiliary equipment blowdown water; and sanitary leachfields to treat the sanitary wastewater. Conditions of Certification **SOIL&WATER-6** and **SOIL&WATER-7** would ensure that the operation of the wastewater treatment systems are in accordance with regulatory requirements and minimize potential impacts to surface and groundwater quality. In addition, Condition of Certification **SOIL&WATER-18** would monitor existing groundwater quality to monitor compliance with the requirements set forth in **SOIL&WATER-6** and **SOIL&WATER-7.**

7. The project owner proposes to operate a non-transient, non-community water system during operation of the project. The project owner would be required to submit all requirements, specifications, certifications to permit and operate of a non-transient, non-community water system as per Condition of Certification **SOIL&WATER-19.** In addition, the project owner would be required to comply with groundwater production reporting requirements following Condition of Certification **SOIL&WATER-15.** Lastly, the project owner would be required to monitor and mitigate potential ground subsidence associated with groundwater production following Condition of Certification **SOIL&WATER-16.**

8. The project owner would be required to submit a project closure and decommissioning plan prior to site operations to ensure that at the time of project closure, the site is restored to pre-project conditions as required by Condition of Certification **SOIL&WATER-13**.

PROPOSED CONDITIONS OF CERTIFICATION

Staff has proposed modifications to the **Soil & Water Resources** Conditions of Certification as shown below. (**Note:** Deleted text is in ~~strikethrough~~, new text is **<u>bold and underlined</u>**)

DRAINAGE EROSION AND SEDIMENTATION CONTROL PLAN (DESCP)

SOIL&WATER-1 Prior to site mobilization, the project owner shall obtain the 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 any 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 plan must also cover all linear project features such as offsite transmission mains. The DESCP shall contain, at minimum, the elements presented below that outline site management activities and erosion and sediment-control Best Management Practices (BMP) 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 to 500 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 to 200 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 estimated 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 the 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 stormwater 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 Colorado River Basin Regional Water Quality Control Board (CRBRWQCB).

N. **Monitoring Plan:** Monitoring activities shall include routine measurement of the volume of accumulated sediment in the onsite drainage ditches, and stormwater diversions. ~~The monitoring plan shall be part of the Channel Monitoring and Maintenance Plan, **SOIL&WATER-12.**~~

<u>**Verification:**</u> No later than 30 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 the CPM for review and comment and to the County of Riverside and the CRBRWQCB if required. The CPM shall consider comments if received by the county and CRBRWQCB before approval of the DESCP.

The DESCP shall be consistent with the grading and drainage plan 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 National Pollutant Discharge Elimination System (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.

PROJECT GROUNDWATER WELLS, PRE-WELL INSTALLATION

SOIL&WATER-2 The project owner proposes to construct and operate up to ten (10) onsite groundwater water supply 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 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 the CPM. The Project shall not construct a well or extract and use groundwater until approval has been issued by the County and the CPM to construct and operate the well. Wells permitted and installed as part of pre-construction field investigations that subsequently are planned for use as project water supply wells require CPM approval prior to their use to supply water to the project.

Post-Well Installation. The project owner shall provide documentation as required under County permit conditions to the 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 the County requirements for the life of the wells, and shall provide the 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.

<u>Verification:</u> The project owner shall do all of the following:

a. No later than 60 days prior to the construction of the onsite groundwater production wells, the project owner shall submit to the CPM a copy of the water well construction packet submitted to the County of Riverside.

b. No later than 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. The CPM will provide approval to the project owner of the well location and operation within 10 days of receipt of the County of Riverside's concurrence with the proposed well construction activities.

c. No later than 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 the CPM. The project owner shall submit to the CPM together with the Well Completion Report a copy of well drilling logs, water quality analyses, and any inspection reports. Additionally no later than 60 days after installation of each well (including closure of any associated mud pits) the project owner shall submit documentation to the CPM and the CRBWQCB 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.) and that any onsite drilling sumps used for Project drilling activities were removed in compliance with 23 CCR section 2511(c).

d. During well construction and for the operational life of the well, the project owner shall submit two copies each to the CPM of any proposed well construction or operation changes.

CONSTRUCTION AND OPERATION WATER USE

SOIL&WATER-3 The proposed Project's use of groundwater during construction shall not exceed ~~1,917~~ **400** afy (total of ~~5,750~~ **1,130** af during the ~~39~~ **34** months) during construction and ~~300~~ **201** afy during operation. Water quality used for project construction and operation shall be reported in accordance with Condition of Certification **SOIL&WATER-18** 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 60 days prior to the start of construction of the proposed Project, the project owner shall submit to the CPM a copy of evidence that metering devices have been installed and are operational.

Beginning six 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 shall 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 shall also include the yearly range and yearly average water use by source. For calculating the total water use, the term "year" shall correspond to the date established for the annual compliance report submittal.

GROUNDWATER LEVEL MONITORING, MITIGATION, AND REPORTING

SOIL&WATER-4 The project owner shall submit a Groundwater Level Monitoring, Mitigation, and Reporting Plan to the CPM for review and approval in advance of construction activities and prior to the operation of onsite groundwater supply wells. The Groundwater Level Monitoring, Mitigation, 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 plan shall establish pre-construction and Project related groundwater level and water quality trends that can be quantitatively compared against observed and simulated trends near the Project pumping wells and near potentially impacted existing wells.

A. Prior to Project Construction

1. A well reconnaissance shall be conducted to investigate and document the condition of existing water supply wells located within 3 miles of the project site, provided that access is granted by the well owners. The reconnaissance shall include sending notices by registered mail to all property owners within a 3 mile radius of the project area.

2. Monitor to establish preconstruction conditions. The monitoring plan and network of monitoring wells shall make use of existing wells in the basin that would satisfy the requirements for the monitoring program. The monitoring network shall be defined by the groundwater model developed for the AFC as the area predicted to show a water level change of 1 feet or more at the end of construction and at the end of operation and any monitoring wells that are installed to comply with Waste Discharge Requirements issued by the Energy Commission for the evaporation ponds and land treatment unit associated with the Project. The projected area of groundwater drawdown shall be refined on an annual basis during project construction and every three (3) years during project operations using the data acquired as part of Condition of Certification SOIL&WATER-4 as well as the numerical groundwater model developed as part of the AFC and subsequent Data Responses by the ~~applicant~~**project owner**. If the area predicted to show a water level change of 1 feet increases, the project owner will be required to submit a revised monitoring plan with additional monitoring wells (if required).

3. Identified additional wells shall be located outside of this area to serve as background monitoring wells. Abandoned wells, or wells no longer in use, that are accessible and provide reliable water level data within the potentially impacted area shall also be included as part of the monitoring network. A site reconnaissance shall be performed to identify wells that could be accessible for monitoring. As access to these wells is available, historic water level, water quality, well construction and well performance information shall be obtained for both pumping and non-pumping conditions.

4. As access allows, measure groundwater levels from the off-site and on-site wells within the network and background wells to provide initial groundwater levels for pre-project trend analysis.

5. Construct water level maps within the CVGB within 5 miles of the site 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 from wells within the monitoring network and flows from 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. 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 year of operation and semi-annually thereafter for the following four years, collect water level measurements from any wells 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 based on available data.

2. On an annual basis, perform statistical trend analysis for water levels data and comparison to predicted water level declines due to project pumping. 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 and comparison to predicted water level declines due to Project pumping, the project owner shall determine the area where 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 more than 5 feet 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 impacted well owner(s). Mitigation shall be provided to the impacted well owners that experience 5 feet or more of Project-induced drawdown if the 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 (private owners well in question) yield or performance has been significantly affected by Project pumping. The type and extent of mitigation shall be determined by the amount of water level decline induced by the Project, the type of impact, and site specific well construction and water use characteristics. If an impact is determined

to be caused by drawdown from more than one source, the level of mitigation provided shall be proportional to the amount of drawdown induced by the Project relative to other sources. In order to be eligible, a well owner must provide documentation of the well location and construction, including pump intake depth, and that the well was constructed and usable before Project pumping was initiated. The mitigation of impacts shall be determined as follows:

a. If Project pumping has lowered water levels by 5 feet or more 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 on an annual basis. In the absence of specific electrical use data supplied by the well owner, the project owner shall use **SOIL&WATER-5** to calculate increased energy costs.

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% or more of the pre-Project average seasonal 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 the well yield reductions be recurring, the project owner shall provide payment or reimbursement for periodic maintenance throughout the life of the Project. If with treatment the well yield is incapable of meeting 110% of the well owner’s maximum daily demand, dry season demand, or annual demand the well owner should be compensated by reimbursement or well replacement as described under Condition 3.c.

c. If Project pumping has lowered water levels to significantly impact well yield so that it can no longer meet its intended purpose, causes the well to go dry, 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 of comparable design and yield (only deeper).. 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 110% 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.

d. The project owner shall notify any owners of the impacted wells within one month of the CPM approval of the compensation analysis for increased energy costs.

e. Pump lowering – In the event that groundwater is lowered as a result of Project pumping to an extent where pumps are exposed but well screens remain submerged the pumps shall be lowered to maintain production in the well. The Project shall reimburse the impacted well owner for the costs associated with lowering pumps.

f. Deepening of wells – If the groundwater is lowered enough as a result of Project pumping that well screens and/or pump intakes are exposed, and pump lowering is not an option, such affected wells shall be deepened or new wells constructed. The project owner shall reimburse the impacted well owner for 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 the CPM shall evaluate the data and determine if the monitoring program for water level measurements 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 CPM.

5. If mitigation includes monetary compensation, the project owner shall provide documentation to the CPM that compensation payments have been made by March 31 of each year of Project operation or, if lump-sum payments 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 CPM a compliance report describing compensation for increased energy costs necessary to comply with the provisions of this condition.

6. At the end of every subsequent five-year monitoring period, the collected data shall be evaluated by the CPM and they shall determine if the sampling frequency should be revised or eliminated.

7. During the life of the Project, the project owner shall provide to the 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:

At least 60 days prior to operation of the site groundwater supply wells, the project owner shall submit to the CPM, a comprehensive report presenting all the data and information required in item A above. The CPM will provide comments to the plan 15 days following submittal, and the final plan shall be approved 15 days prior to operation of the site groundwater supply wells. The project owner shall submit to the CPM all calculations and assumptions made in development of the report data and interpretations.

During Project construction, the project owner shall submit to the CPM quarterly reports presenting all the data and information required in item B above. The quarterly reports shall be provided 30 days following the end of the quarter. The project owner shall also submit to the CPM all calculations and assumptions made in development of the report data and interpretations.

No later than March 31 of each year of construction or 60 days prior to Project operation, the project owner shall provide to the 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 the CPM.

During Project operation, the project owner shall submit to the CPM, applicable quarterly, semi-annual and annual reports presenting all the data and information required in item C above. Quarterly reports shall be submitted to the CPM 30 days following the end of the quarter. The fourth quarter report shall serve as the annual report and shall be provided on January 31 in the following year.

The project owner shall submit to the CPM all calculations and assumptions made in development of report data and interpretations, calculations, and assumptions used in development of any reports.

After the first five year operational and monitoring period, the project owner shall submit a 5 year monitoring report to the CPM that includes all monitoring data collected and a summary of the findings. The CPM will determine if the water level measurements and water quality sampling frequencies should be revised or eliminated.

COMPENSATION FOR WELL IMPACTS

SOIL&WATER-5 Where it is determined that the project owner shall reimburse a private well owner for increased energy costs identified as a result of analysis performed in Condition of Certification **SOIL&WATER-4,** the project owner shall calculate the compensation owed to any owner of an impacted well as described below.

<u>Increased cost for energy</u>	=	change in lift/total system head x total energy consumption x costs/unit of energy

Where:

change in lift (ft)	=	calculated change in water level in the well resulting from project
total system head (ft)	=	elevation head + discharge pressure head

elevation head (ft)	=	difference in elevation between wellhead discharge pressure gauge and water level in well during pumping.
discharge pressure head (ft)	=	pressure at wellhead discharge gauge (psi) X 2.31

The project owner shall submit to the CPM for review and approval the documentation showing which well owners must be compensated for increased energy costs and that the proposed amount is sufficient compensation to comply with the provisions of this condition.

- Any reimbursements (either lump sum or annual) to impacted well owners shall be only to those well owners whose wells were in service within six months of the Commission decision and within a 5-mile radius of the project site.
- The project owner shall notify all owners of the impacted wells within one month of the CPM approval of the compensation analysis for increase energy costs.
- Compensation shall be provided on either a one-time lump-sum basis, or on an annual basis, as described below.

Annual Compensation: Compensation provided on an annual basis shall be calculated prospectively for each year by estimating energy costs that will be incurred to provide the additional lift required as a result of the project. With the permission of the impacted well owner, the project owner shall provide energy meters for each well or well field affected by the project. The impacted well owner to receive compensation must provide documentation of energy consumption in the form of meter readings or other verification of fuel consumption. For each year after the first year of operation, the project owner shall include an adjustment for any deviations between projected and actual energy costs for the previous calendar year.

One-Time Lump-Sum Compensation: Compensation provided on a one-time lump-sum basis shall be based on a well-interference analysis, assuming the maximum project-pumping rate of 300 afy. Compensation associated with increased pumping lift for the life of the project shall be estimated as a lump sum payment as follows:

- The current cost of energy to the affected party considering time of use or tiers of energy cost applicable to the party's billing of electricity from the utility providing electric service, or a reasonable equivalent if the party independently generates their electricity;
- An annual inflation factor for energy cost of 3%; and
- A net present value determination assuming a term of 30 years and a discount rate of 9%;

The project owner shall do all of the following:

1. No later than 30 days after CPM approval of the well drawdown analysis, the project owner shall submit to the CPM for review and approval all documentation and calculations describing necessary compensation for energy costs associated with additional lift requirements.

2. The project owner shall submit to the CPM all calculations, along with any letters signed by the well owners indicating agreement with the calculations, and the name and phone numbers of those well owners that do not agree with the calculations.

Compensation payments shall be made by March 31 of each year of project operation or, if lump-sum payment is selected, payment shall be made by March 31 of the first year of operation only. Within 30 days after compensation is paid, the project owner shall submit to the CPM a compliance report describing compensation for increased energy costs necessary to comply with the provisions of this condition.

WASTE DISCHARGE REQUIREMENTS

SOIL&WATER-6 The project owner shall comply with the requirements specified in Appendix B, C, and D. These requirements relate to discharges, or potential discharges, of waste that could affect the quality of waters of the state, and were developed in consultation with staff of the State Water Resources Control Board and/or the applicable California Regional Water Quality Control Board (hereafter "Water Boards"). It is the Commission's intent that these requirements be enforceable by both the Commission and the Water Boards. In furtherance of that objective, the Commission hereby delegates the enforcement of these requirements, and associated monitoring, inspection and annual fee collection authority, to the Water Boards. Accordingly, the Commission and the Water Board shall confer with each other and coordinate, as needed, in the enforcement of the requirements. The project owner shall pay the annual waste discharge permit fee associated with this facility to the Water Boards. In addition, the Water Boards may "prescribe" these requirements as waste discharge requirements pursuant to Water Code Section 13263 solely for the purposes of enforcement, monitoring, inspection, and the assessment of annual fees, consistent with Public Resources Code Section 25531, subdivision (c).

Verification: The Project owner shall follow the groundwater quality monitoring requirements as provided in SOIL&WATER-18 by providing Groundwater Quality Monitoring and Reporting Plan 90 days prior to operation of water supply wells for construction activities. The plan shall provide methods and procedures for monitoring background water quality, and site groundwater quality related to operation of the waste management units. Well locations, groundwater sampling procedures and analytical methods shall be provided consistent with requirements stipulated in the Waste Discharge Requirements provided in Appendix B, C and D.

No later than 60 days prior to any wastewater discharge or use of land treatment units, the project owner shall provide documentation to the CPM, with copies to the CRBRWQCB, demonstrating compliance with the WDRs established in Appendices B, C, and D. Any changes to the design, construction, or operation of the evaporation basins, treatment units, or storm water system shall be requested in writing to the CPM, with copies to the CRBRWQCB, and approved by the CPM, in consultation with the CRBRWQCB, prior to initiation of any PSPP Soil and Water Opening Testimony Page 5 changes. The project owner shall provide to the CPM, with copies to the CRBRWQCB, all monitoring reports required by the WDRs, and fully explain any violations, exceedances, enforcement actions, or corrective actions related to construction or operation of the evaporation basins or treatment units.

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 and the CRBRWQCB to ensure that the project has complied with county and state sanitary waste disposal facilities requirements. Written assessments prepared by the County of Riverside and the CRBRWQCB regarding the project's compliance with these requirements must be submitted to the CPM for review and approval 30 days prior to the start of power plant operation.

~~REVISED PROJECT DRAINAGE REPORT AND PLANS~~

SOIL&WATER-8: **DELETED** ~~The project owner shall provide a revised Drainage Report which includes the following additional information:~~

~~A. Sizing of the Center Channel which considers the potential failure of the earthen berm located along the Corn Spring Wash crossing under I-10.~~

~~B. Revised onsite hydrology calculations using CN values consistent with the Riverside County Hydrology Manual for graded areas.~~

~~C. Detailed analysis and documentation of onsite swales and drainage channels demonstrating adequate capacity to ensure overtopping will not occur. This is of special concern for collector channels which are located at the top of terraces where there is a large drop (20 feet ±) from the outside of the channel to the lower terrace. It shall be demonstrated that seepage from these channels will not compromise the adjacent slope to the lower terrace.~~

~~D. 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.~~

~~E. Revised onsite hydrology map showing peak discharge values at locations where the onsite drainage system discharges into the West, Center, or East channels, or directly offsite.~~

~~F. Hydraulic and scour analysis for proposed drainage modifications associated with the construction of linear features including culvert crossings, at-grade crossings, bank protection and other potential features.~~

~~G. Digital copies of all HEC-HMS and HEC-RAS analysis.~~

~~H. A specific discussion of how the proposed onsite drainage design will protect the facility from erosion and the possible failure of the facilities resulting in a release of HTF.~~

~~The project owner shall also provide the 30% 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% Grading and Drainage Plans to the CPM for their review and comments 30 days prior to construction activities. The project owner shall address comments provided by the CPM until approval of the report is issued. All comments and concepts presented in the approved Revised Project Drainage Report with the 30%Grading and Drainage Plans shall be included in the final Grading and Drainage Plans. The Revised Project Drainage Report and 30% Grading and Drainage Plans shall be approved by the CPM.~~

DETAILED FLO-2D ANALYSIS

SOIL&WATER-9: **DELETED** ~~The project owner shall provide a detailed hydraulic analysis utilizing FLO-2D which models pre- and post-development flood conditions for the 10-, 25- and 100-year storm events. The post-development model must include all proposed collector channels, end diffuser structures and berms. The methods and results of the analysis must be fully documented in a Technical Memorandum or in the revised Project Drainage Report required in **SOIL&WATER-8**. Graphical output must include depth and velocity mapping as well as mapping which graphically shows the changes in both of these parameters between the pre- and post development conditions. 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 shall be provided at a scale of no less than 1 inch 200 feet which show the extent and depths of flows entering the North, South and West channels for the 100-year event. A figure at the same scale shall also be provided for depth, velocity and the relative change in these parameters at~~

~~and downstream of the four end diffuser structures for the 10-, 25- and 100-year events. Digital input and output files associated with the FLO-2D analysis must be included with all submittals. The results of this analysis shall be used for design of the 30% project grading and drainage plans.~~

~~**Verification:**~~ ~~The project owner shall submit a detailed FLO-2D analysis to the CPM for review and comment in addition to the 30% Grading and Drainage Plans and revised Project Drainage Report required in **SOIL&WATER-8**. The project owner shall address comments provided by the CPM until approval of the analysis is issued.~~

DRAINAGE CHANNEL DESIGN

SOIL&WATER-10: **DELETED**~~All collector and conveyance channels shall be constructed consistent with Riverside County Flood Control and Water Conservation District (RCFCWCD) guidelines where applicable. 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 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 shall 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 of all drainage modifications associated with the construction of linear features such as culverts, at-grade crossings, bank protection and other potential features.~~

F. ~~Consistent nomenclature and stationing on all plans, sections, profiles and details.~~

~~**Verification:** The project owner shall prepare preliminary, 30% channel design drawings and submit two copies for the 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 shall update and modify the design as necessary to obtain the CPM approval.~~

CHANNEL EROSION PROTECTION

SOIL&WATER-11: **DELETED**~~The project owner shall provide revised preliminary Grading and Drainage Plans which incorporate the items and information as listed below for the channels designated as North, West, South, Southeast and Central on the existing plans (AECOM 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. ~~Design and construction criteria for the use of soil cement on the site shall be prepared by the Owner/Developer's engineer in conjunction with the design methodology established by the Geotechnical Engineer of Record. The design and construction criteria shall be based on local and/or regional requirements and specifications. The design and construction criteria, the geotechnical design for the soil cement, the site specific~~

~~specifications for the soil cement, the method of installation for the soil cement, and the local or regional standards being used for the design criteria shall be provided to the CPM for review and comment consistent with the verification requirements for this Condition of Certification. The slope requirements that are proposed for use (3:1 or 4:1), and the associated method of installation (i.e., 8 inch lift versus slope application) shall be fully documented for review and approval by the CPM prior to any field installation of soil cement.~~

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. ~~Modifications to the existing drainages to allow construction of and future access to linear facilities shall require stabilization of the channels in the vicinity of those modifications. Locations of disturbance to the existing drainages shall be stabilized consistent with sound engineering practice to eliminate future negative impacts 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** and **SOIL&WATER-9**. The project owner shall address all comments by the CPM related to the channel erosion protection design through final plan approval.~~

CHANNEL MAINTENANCE PROGRAM

SOIL&WATER-12: **DELETED**~~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 and approved by the 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 Project mitigation, protect wildlife habitat and movement/ migration, and maintain groundwater recharge.~~

~~**B. Application and Use** - The channel maintenance work area is defined as the Project engineered channel, typically extending to the top of bank, include access roads, and any adjacent property that the Project owns or holds an easement for access and maintenance. The Program shall include all channel maintenance as needed to protect the Project 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 shall implement instream repairs when the problem: (1) causes or could cause significant damage to the Project; 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 Project storm drain outfalls.~~

5. ~~**Channel Maintenance Program – Exclusions** including: emergency repair and CIP.~~

~~**D. Related Programmatic Documentation** – the CPM will review and approve the Channel Maintenance Program programmatic documentation. Maintenance activities shall comply with the streambed 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. The Project'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** – the 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 shall 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 (excluding linear construction), the project owner shall coordinate with the 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 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 Project Construction and Operation Managers receive training on the Channel Maintenance Program;~~

- ~~As part of the Project Annual Compliance Report to the 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-13 The project owner shall prepare a decommissioning plan that will meet the requirements of the BLM. 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 60 days prior to the start of site mobilization or alternate date as agreed to with the CPM, the project owner shall submit decommissioning plans to the CPM for review and approval. The project owner shall amend these documents as necessary, with approval from the CPM, should the decommissioning scenario change in the future.

MITIGATION OF IMPACTS TO THE PALO VERDE MESA GROUNDWATER BASIN

SOIL&WATER-14 To mitigate the impact from Project pumping, the Project owner shall identify and implement offset measures to mitigate the increase in discharge from surface water to groundwater that affects recharge in the Palo Verde Valley Groundwater Basin (USGS). The project owner shall implement **SOIL&WATER-17** to evaluate the change in recharge over the life of the project including any latency effects from Project pumping. The activities shall include the following water conservation projects: payment for irrigation improvements in Palo Verde Irrigation District, payment for irrigation improvements in Imperial Irrigation District, purchase of water rights within the Colorado River Basin that will be held in reserve, and/or BLM's Tamarisk Removal Program or other proposed mitigation activities acceptable to the CPM.

The activities proposed for mitigation shall be outlined in a Water Offset Plan that will be provided to the CPM for review and approval and which shall include the following at a minimum:

A. Identification of the water offsets as determined in **SOIL&WATER-17**;

B. Demonstration of the Project owner's ability to conduct the activity;

C. Whether any governmental approval of the identified offset will be needed, and if so, whether additional approval will require compliance with CEQA or NEPA;

D. Demonstration of how much water is provided by each of the offset measures;

E. An estimated schedule for completion of the activities;

F. Performance measures that would be used to evaluate the amount of water replaced by the proposed offset measure; and,

G. A Monitoring and Reporting Plan outlining the steps necessary and proposed frequency of reporting to show the activities are achieving the intended benefits of the water supply offsets;

Verification: The project Owner shall submit a Water Offset Plan to the CPM for review and approval thirty (30) days before the start of extraction of groundwater for construction or operation.

The Project owner shall implement the activities reviewed and approved in the Water Offset Plan in accordance with the agreed upon schedule in the Water Offset Plan. If agreement with the CPM on identification or implementation of offset activities cannot be achieved the Project owner shall immediately halt construction or operation until the agreed upon activities can be identified and implemented.

GROUNDWATER PRODUCTION REPORTING

SOIL&WATER-15 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 filing in the annual compliance report.

GROUND SUBSIDENCE MONITORING AND ACTION PLAN

SOIL&WATER-16 One monument monitoring station per production well or a minimum of three stations shall be constructed to measure potential inelastic subsidence that may alter surface characteristics of the Chuckwalla Valley near the proposed production wells. The project owner shall:

A. Prepare and submit a Subsidence Monitoring Plan (SMP). The plan shall include the following elements:

1. Construction diagrams of the proposed monument monitoring station including size and description, planned depth, measuring points, and protection measures;

2. Map depicting locations (minimum of three) of the planned monument monitoring stations;

3. Monitoring program that includes monitoring frequency, thresholds of significance, reporting format.

B. Prepare quarterly reports commencing three (3) months following commencement of groundwater production during construction and operations.

   1. The reports shall include presentation and interpretation of the data collected including comparison to the thresholds developed in Item C.

C. Prepare a Mitigation Action Plan that details 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;

      c. Any subsidence that violates (a) or (b) will result in the project owner investigating the need to immediately reduce/cease pumping until the cause is identified or subsidence caused by project pumping abates and the structures and/or drainage patterns are stabilized and corrected.

   2. Action Plan that details proposed actions by the ~~applicant~~**project owner** in the event thresholds are achieved during the monitoring program.

   The ~~applicant~~**project owner** shall 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 CPM, a comprehensive report presenting all the data and information required in item A above.

2. The project owner shall submit to the CPM all calculations and assumptions made in development of the SMP.

3. During Project construction and operations, the project owner shall submit to the CPM quarterly reports presenting all the data and information required in item B above.

4. The project owner shall submit to the 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 the CPM that submits all monitoring data collected and provides a summary of the findings. The CPM will determine if the Ground Subsidence Monitoring and Action Plan frequencies should be revised or eliminated.

ESTIMATION OF SURFACE WATER IMPACTS

SOIL&WATER-17 To further assess the impacts from Project pumping, the Project owner shall estimate the increase in discharge from surface water to groundwater that affects recharge in the Palo Verde Valley Groundwater Basin (PVVGB)(USGS). This estimate may be used for determining the appropriate offset volume in accordance with **SOIL&WATER-14**. The Project owner shall do the following to provide an estimate for review and approval by the CPM:

1. The Project owner shall conduct a detailed analysis of the affect from Project pumping on at the end of the 30 year operational period the change in groundwater outflow from the Chuckwalla Valley Groundwater Basin to the Palo Verde Valley and how the change in outflow may affect recharge of surface water to the PVVGB from the Project's groundwater extraction activities. The detailed analysis shall include:

   a. The conceptual model developed in the AFC and the Staff Assessment, for the Chuckwalla Valley Groundwater Basin and the Palo Verde Valley, and any changes resultant from further analysis in support of numerical modeling;

   b. The use of an appropriately constructed groundwater model 1.) for the eastern portion of the Chuckwalla Valley Groundwater Basin that describes the effect from Project pumping on the outflow of groundwater to the Palo Verde Valley, and 2.) an appropriately constructed groundwater model of the Palo Verde Valley, inclusive of the mesa and floodplain. The models shall be coupled as appropriate to determine the effect from Project pumping on the surface water recharge in the Palo Verde Valley. Each model shall be constructed in consideration of the following:

      i. Horizontal and vertical geometry information gained through on- and offsite investigations conducted as part of the hydrogeological field investigations for the AFC, and any subsequently documented investigation performed as part of the model development ;

      ii. Aquifer properties developed as part of the AFC and any subsequently documented investigations performed as part of the model development, and an assessment of aquifer properties available from other published sources. The properties used shall be representative of the available data; and

      iii. The modeling effort shall include a sensitivity analysis where in the most sensitive variables will be identified and varied within a reasonable range outside of the calibration value to provide an assessment of the range of potential impacts from the Project pumping on the recharge from the Palo Verde Valley Groundwater Basin.

   c. Reporting of the results of the modeling effort

d. Estimation of the increased contribution of surface water discharge to groundwater and the change in recharge to the Palo Verde Valley Groundwater Basin attributable to Project groundwater pumping.

2. The analysis shall include the following elements:

   a. The change in groundwater flux to the regional aquifer from surface water sources attributable to Project pumping in afy for the life of the Project (30 years) until pre-project (within 95%) conditions are achieved;

   b. A sensitivity analysis that would provide a range in the potential changes in flux relative to variation in the key model variables within each model as a result of Project pumping for life of the Project until pre-project (within 95%) conditions are achieved;

3. The project owner shall present the results of the conceptual model, numerical model, transient runs and sensitivity analysis in a report for review and approval by the CPM. The report shall include all pertinent information regarding the development of the numerical models. The report shall include as discussion of the following as appropriate to each model:

   a. Introduction

   b. Previous Investigations

   c. Conceptual Model

   d. Numerical Model and Input Parameters

   e. Sensitivity Analysis

   f. Transient Modeling Runs

   g. Conclusions

<u>Verification:</u> Within thirty (30) days following certification of the proposed Project, the project owner shall submit to the CPM for their review and approval a report detailing the results of the modeling effort. The report shall include the estimated amount of change in discharge from surface water to groundwater within the Palo Verde Valley due to Project pumping. This estimate shall be used for determining the appropriate volume of water for offset in accordance with **SOIL&WATER-14.**

GROUNDWATER QUALITY MONITORING AND REPORTING PLAN

SOIL&WATER-18 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 quality following the Waste Discharge Requirements of **SOIL&WATER-6**, to assess the effects from pumping on changes in the aquifer water chemistry, and to monitor potential impacts from operation of proposed septic leach fields, if required. The initial background water quality sampling shall be implemented during the background groundwater level monitoring events in accordance with **SOIL&WATER-4**. Prior to project construction, access to offsite wells shall be obtained and samples collected and monitoring wells shall be installed to evaluate background water quality in the shallow and deep regional aquifer in areas that will be affected by Project pumping. These data will be used to establish pre-construction water quality that can be quantitatively compared against data gathered during construction and operation to assess if project pumping or a release from the waste management units (See **SOIL&WATER-6**), or septic systems (if required) has adversely affected the water supply or sensitive receptors.

1. A Groundwater Quality Monitoring and Reporting Plan shall be submitted to the CPM 90 days prior to operation of the water supply wells for construction. 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). Additional monitoring wells that shall be installed include wells required in accordance with Condition of Certification **SOIL&WATER-6**, for the evaporation ponds and land treatment unit proposed for the project, and if required for the sanitary leachfield system. 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. A Well Monitoring Installation and Groundwater Quality Network Report shall be submitted to the CPM for review and approval in conjunction with Condition of Certification **SOIL&WATER-4** and 60 days prior to operation of the water supply wells.. 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. Prior to use of any groundwater for construction, all groundwater quality and groundwater level monitoring data shall be reported to the CPM in the Well Monitoring Installation and Groundwater Quality Network Report that

is due in conjunction with the background water level monitoring report under **SOIL&WATER-4** and 60 days prior to construction. 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~~**project owner's** groundwater model.

b. An assessment of pre-project groundwater quality with groundwater samples analyzed for those constituents required under the Waste Discharge Requirements (Appendix B, C and D) and if not included total dissolved solids (TDS), chloride, nitrates, major cations and anions, oxygen-18 and deuterium isotopes, and soluble metals.

c. The data shall be tabulated and include the estimated range (minimum and maximum values), average, and median for each constituent analyzed. If a sufficient number of data points are available from the background sampling, the data shall also be analyzed using the Mann-Kendall test for trend at 90% confidence to assess whether pre-project water quality trends, if any, are statistically significant.

5. During project construction and during the first five years of project operations, the project owner shall semi-annually monitor the quality of groundwater and changes in groundwater elevation and submit data semiannually to the CPM one month following the end of the 1st and 3rd quarter and following the operation reporting requirement under **SOIL&WATER-4**. After five years of project operations, the frequency and scope of the monitoring program shall be reassessed by the CPM. The semi-annual 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) from the nearest meteorological monitoring station, and a comparison and assessment of water level data relative to the assumptions and simulated spatial trends predicted by the ~~applicant~~**project owner's** groundwater model.

a. Groundwater samples from all wells in the monitoring well network shall be analyzed and reported semi-annually for those constituents required in the Waste Discharge Requirements (Appendix B, C and D) and if not included TDS, chloride, nitrates, cations and anions, oxygen-18 and deuterium isotopes.

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 to determine the effects from Project pumping and after the installation and operation of the waste management units in compliance with the Waste Discharge Requirements (Appendix B, C and D) and the sanitary leachfields, if required.

c. Trends in water quality data shall be analyzed using the Mann-Kendall test for trend at the 90% confidence. 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) or other appropriate statistical method approved by the CRBRWQCB for evaluation of water quality impacts. 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 at 90% confidence 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 to evaluate the effects from Project pumping or potential impacts from operation of sanitary leachfield indicate that the water supply quality has deteriorated in (exceeds pre-project constituent concentrations in TDS, sodium, chloride, or other constituents identified as part of the monitoring plan and applicable Water Quality Objectives are exceeded for the applicable beneficial uses of the water supply) adjacent water supply wells that can be shown to be adversely influenced by Project Pumping for three consecutive years, the Project owner shall provide well-head treatment or a new water supply to either meet or exceed pre-project water quality conditions to any impacted water supply wells.

Verification: The project owner shall complete the following:

At least 90 days prior to construction, a Groundwater Level and Quality Monitoring and Reporting Plan shall be submitted to the CPM for review and approval.

At least 60 days prior to construction, a Well Monitoring Installation and Groundwater Level Network Report shall be submitted to the CPM for review and approval.

At least 60 days prior to use of any groundwater for construction, all groundwater quality and groundwater level monitoring data shall be reported to the CPM.

On a semiannual basis water quality data shall be collected during construction and 5 years following initial operation. The results of the monitoring will be reported on a semiannual basis, one month following the end of the 1st and 3rd quarters.

NON-TRANSIENT, NON-COMMUNITY WATER SYSTEM

SOIL&WATER-19 The Project is subject to the requirement of Title 22, Article 3, Sections 64400.80 through 64445 for a non-transient, non-community water system (serving 25 people or more for more than six months). In addition, the system shall require periodic monitoring for various bacteriological, inorganic and organic constituents.

Verification: The project owner shall submit the equivalent County of Riverside requirements to operate a non-transient, non-community water system with the County of Riverside at least 60 days prior to commencement of operations at the site. In addition, the project owner shall submit to the CPM a monitoring and reporting plan for production wells operated as part of the domestic water supply system prior to plant operations. The plan shall include reporting requirements including monthly, quarterly and annual submissions.

The project owner shall designate a California Certified Water Treatment Plant Operator as well as the technical, managerial and financial requirements as prescribed by State law. The project owner shall supply updates on an annual basis of monitoring requirements, any required submittals equivalent to the County of Riverside requirements including annual renewal requirements.

STORM WATER DAMAGE MONITORING AND RESPONSE PLAN

SOIL&WATER-20 The project owner shall reduce impacts caused by large storms by ensuring heliostats, diversion channels, and perimeter fencing withstand the 100-year storm event, establishing ongoing maintenance and inspection of storm water controls, and implementing a response plan to clean up damage and address ongoing issues.

The project owner shall ensure that the heliostats, diversion channels, and perimeter fencing are designed and installed to withstand storm water scour that may occur as a result of a 100-year, 24-hour storm event. The analysis of the storm event and resulting heliostat stability will be provided within a Pylon Insertion Depth and Heliostat Stability Report to be completed by the project owner. This analysis will incorporate results from site-specific geotechnical stability testing, as well as hydrologic and hydraulic storm water modeling performed by the project owner. The modeling will be completed using methodology and assumptions approved by the CPM.

The project owner shall also develop a Storm Water Damage Monitoring and Response Plan to evaluate potential impacts from storm water, including damage to diversion channels, perimeter fencing, and heliostats that fail due to storm water flow or otherwise break and scatter mirror debris or other potential pollutants on to the ground surface.

The basis for determination of pylon embedment depths shall employ a step-by-step process as identified below and approved by the CPM:

A. Determination of peak storm water flow within each sub-watershed from a 100-year event:

- Use of *Riverside County Flood Control and Water Conservation District Hydrology Manual (Riverside County Manual)* to specify hydrologic parameters to use in calculations; and
- HEC -1 and Flo-2D models (or other approved models) will be developed to calculate storm flows from the mountain watersheds upstream of the project site, and flood flows at the project site, based upon hydrologic parameters from Riverside County.

B. Determination of potential total pylon scour depth:

- Potential channel erosion depths will be determined using the calculated design flows, as determined in A above, combined with Flo-2D to model onsite sediment transport.
- Potential local scour will be determined using the calculated design flows, as determined in A above, combined with the Federal Highway Administration (FHWA) equation for local bridge pier scour from the FHWA 2001 report, "Evaluating Scour at Bridges."

C. The results of the scour depth calculations and pylon stability testing will be used to determine the minimum necessary pylon embedment depth within the active channels. In the inactive portions of the alluvial fans that are not subject to channel erosion and local scour, the minimum pylon embedment depths will be based on the results of the pylon stability testing.

D. The results of the calculated peak storm water flows and channel erosion and heliostat scour analysis together with the recommended heliostat installation depths shall be submitted to the CPM for review and approval sixty (60) days before the start of heliostat installation.

The Storm Water Damage Monitoring and Response Plan shall be submitted to the CPM for review and approval and shall include the following:

- Detailed maps showing the installed location of all heliostats within each project phase;
- Description of the method of removing all soil spoils should any be generated;
- Each heliostat should be identified by a unique ID number marked to show initial ground surface at its base, and the depth of the pylon below ground;
- Minimum Depth Stability Threshold to be maintained of pylons to meet long-term stability for applicable wind, water (flowing and static), and debris loading effects;

- **Above and below ground construction details of a typical installed heliostat;**
- **BMPs to be employed to minimize the potential impact of broken mirrors to soil resources;**
- **Methods and response time of mirror cleanup and measures that may be used to mitigate further impact to soil resources from broken mirror fragments; and**
- **Monitoring, documenting, and restoring the adjacent offsite downstream property when impacted by sedimentation or broken mirror shards.**

A plan to monitor and inspect periodically, before first seasonal and after every storm event:

- **Security and Tortoise Exclusion Fence: Inspect for damage and buildup of sediment or debris**
- **Heliostats within drainages or subject to drainage overflow or flooding: Inspect for tilting, mirror damage, depth of scour compared to pylon depth below ground and the Minimum Depth Stability Threshold, collapse, and downstream transport.**
- **Drainage channels: Inspect for substantial migration or changes in depth, and transport of broken glass.**
- **Constructed diversion channels: Inspect for scour and structural integrity issues caused by erosion, and for sediment and debris buildup.**
- **Adjacent offsite downstream property: Inspect for changes in the surface texture and quality from sediment buildup, erosion, or broken glass.**

Short-Term Incident-Based Response:

- **Security and Tortoise Exclusion Fence: repair damage, and remove built-up sediment and debris.**
- **Heliostats: Remove broken glass, damaged structure, and damaged wiring from the ground, and for pylons no longer meeting the Minimum Depth Stability Threshold, either replace/reinforce or remove the mirrors to avoid exposure for broken glass.**
- **Drainage channels: no short-term response necessary unless changes indicate risk to facility structures.**
- **Constructed diversion channels: repair damage, maintain erosion control measures and remove built-up sediment and debris.**

Long-Term Design-Based Response:

- **Propose operation/BMP modifications to address ongoing issues. Include proposed changes to monitoring and response procedures, frequency, or standards.**
- **Replace/reinforce pylons no longer meeting the Minimum Depth Stability Threshold or remove the mirrors to avoid exposure for broken glass.**
- **Propose design modifications to address ongoing issues. This may include construction of active storm water management diversion channels and/or detention ponds.**

Inspection, short-term incident response, and long-term design based response may include activities both inside and outside of the project boundaries. For activities outside of the project boundaries the owner shall ensure all appropriate environmental review and approval has been completed before field activities begin.

Verification: At least sixty (60) days prior to installation of the first pylon, the project owner shall submit to the CPM a copy of the Pylon Insertion Depth and Heliostat Stability Report for review and approval prior to construction. At least sixty (60) days prior to commercial operation, the project owner shall submit to the CPM a copy of the Storm Water Damage Monitoring and Response Plan for review and approval prior to commercial operation. The project owner shall retain a copy of this plan onsite at the power plant at all times. The project owner shall prepare an annual summary of the number of heliostats failed due to damage, cause and extent of the damage, and cleanup and mitigation performed for each damaged heliostat. The annual summary shall also report on the effectiveness of the diversion channels against storms, including information on the damage and repair work or associated erosion control elements. The project owner shall submit proposed changes or revisions to the Storm Water Damage Monitoring and Response Plan to the CPM for review and approval.

.

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SOIL AND WATER RESOURCES - APPENDIX A

Acronyms Used in the Soil and Water Resources Section

af	acre-feet
AFC	Application for Certification
afy	acre-feet per year
amsl	above mean sea level
bgs	below ground surface
BLM	United States Bureau of Land Management
BMPs	Best Management Practices
BP	Before Present
CEC	California Energy Commission
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
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
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
PSEGS	Palen Solar Electric Generating System
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
U.S. EPA	United States Environmental Protection Agency
USGS	United States Geological Survey

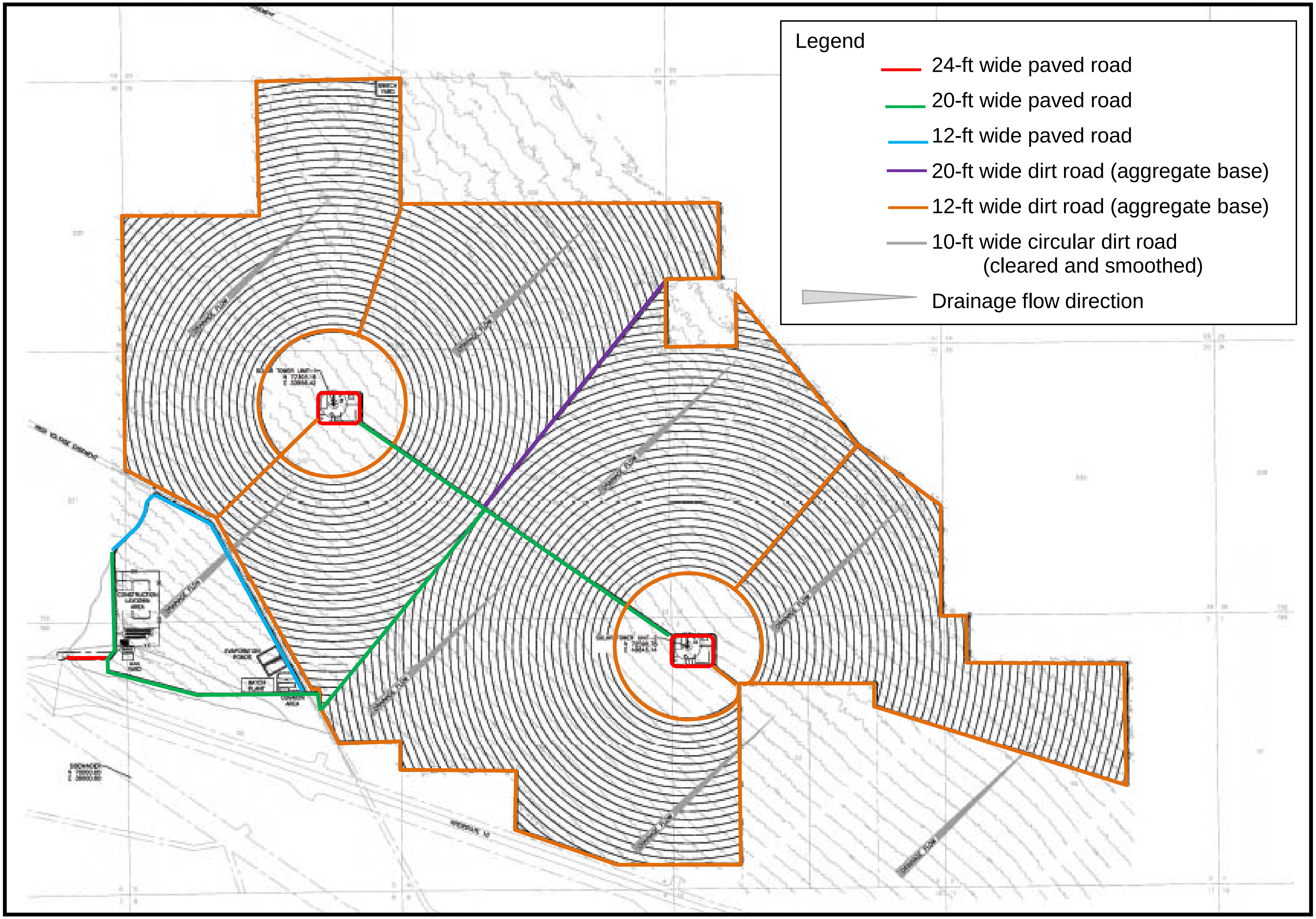
GLOSSARY

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).

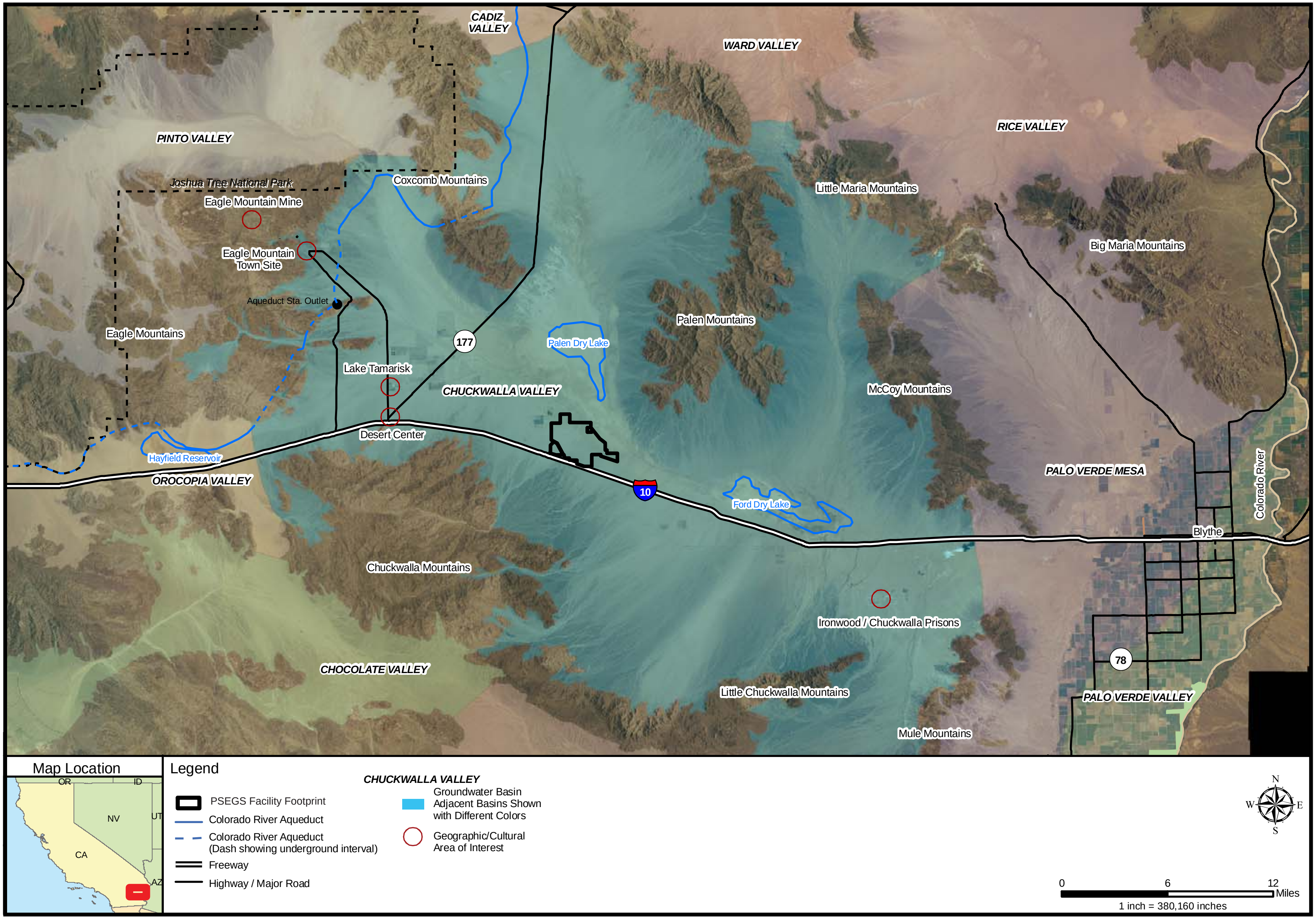
SOIL AND WATER RESOURCES - FIGURE 1
Palen Solar Electric Generating System - Civil Overall Grading and Drainage Plan



SOURCE: Palen 2012a, Palen 2013a

SOIL AND WATER RESOURCES - FIGURE 2

Palen Solar Electric Generating System - Chuckwalla Valley Regional Groundwater Basins



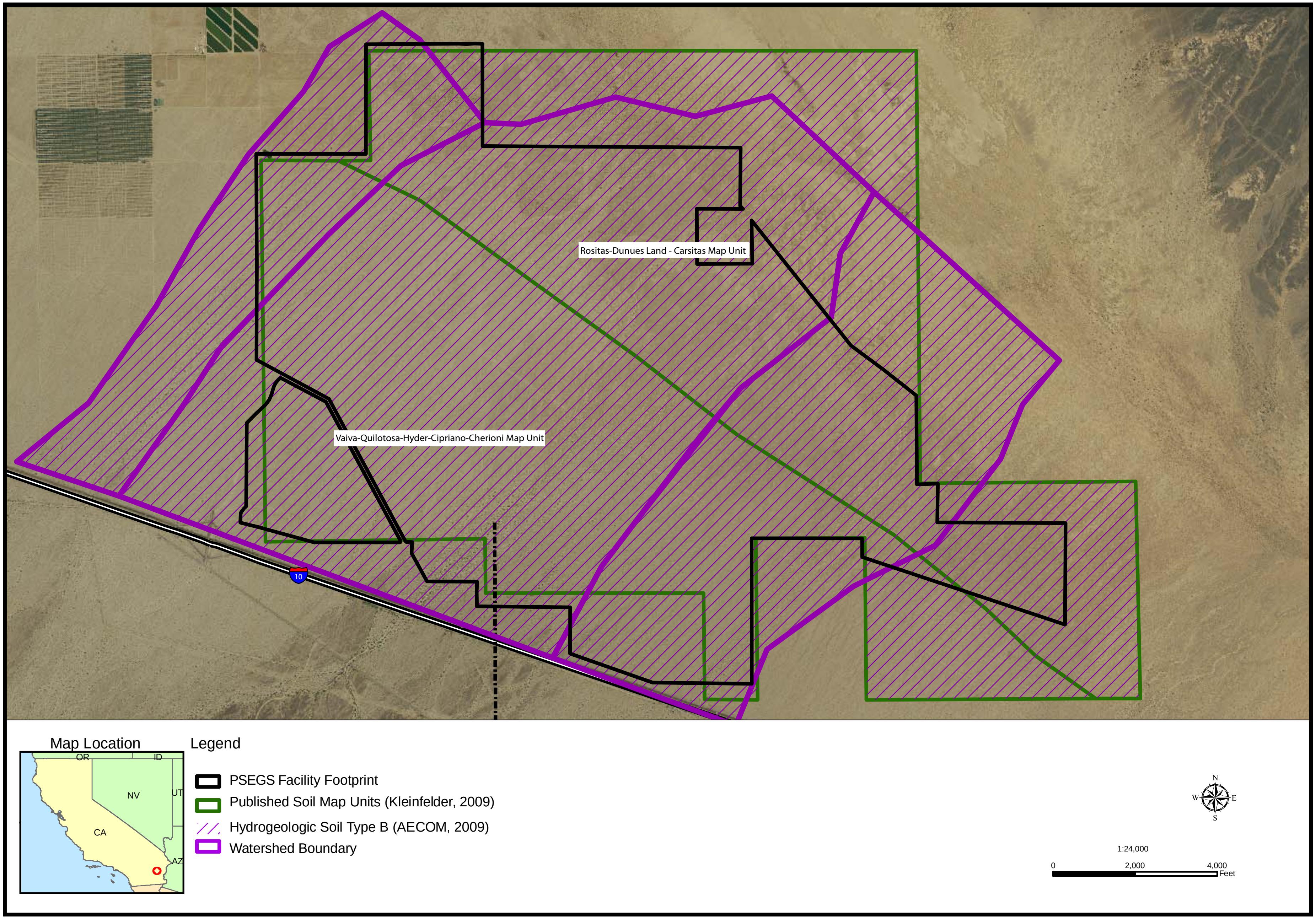
SOIL AND WATER RESOURCES

CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: AECOM 2010

SOIL AND WATER RESOURCES - FIGURE 3

Palen Solar Electric Generating System - Regional Soils Map

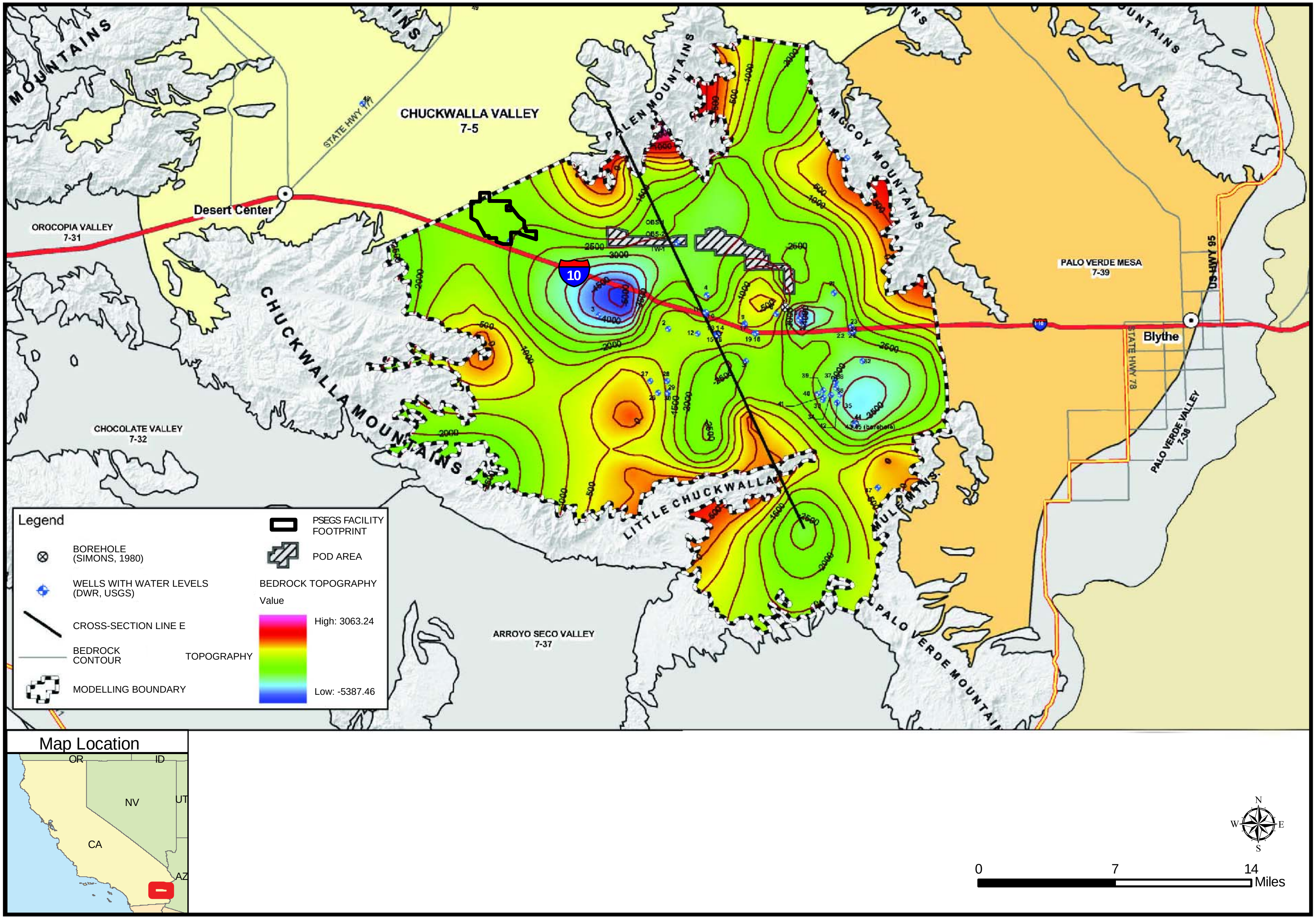


CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: Solar Millennium 2009b

SOIL AND WATER RESOURCES - FIGURE 4

Palen Solar Electric Generating System - Chuckwalla Valley Groundwater Basin Bedrock Topography - Ford Dry Lake Site



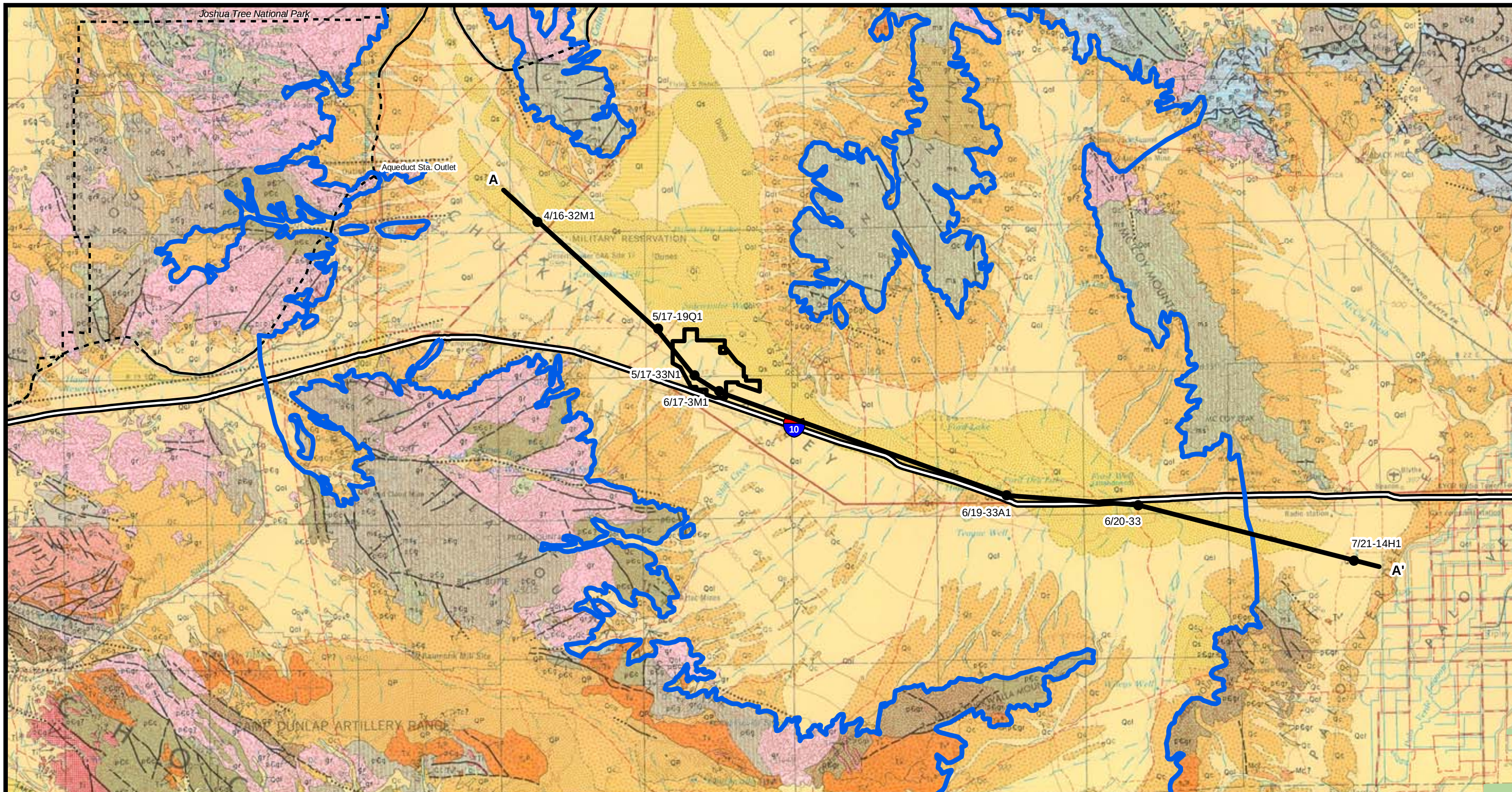
SOIL AND WATER RESOURCES

CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: WorleyParsons 2009

SOIL AND WATER RESOURCES - FIGURE 5A

Palen Solar Electric Generating System - Regional Geology Map



MAP LOCATION

LEGEND

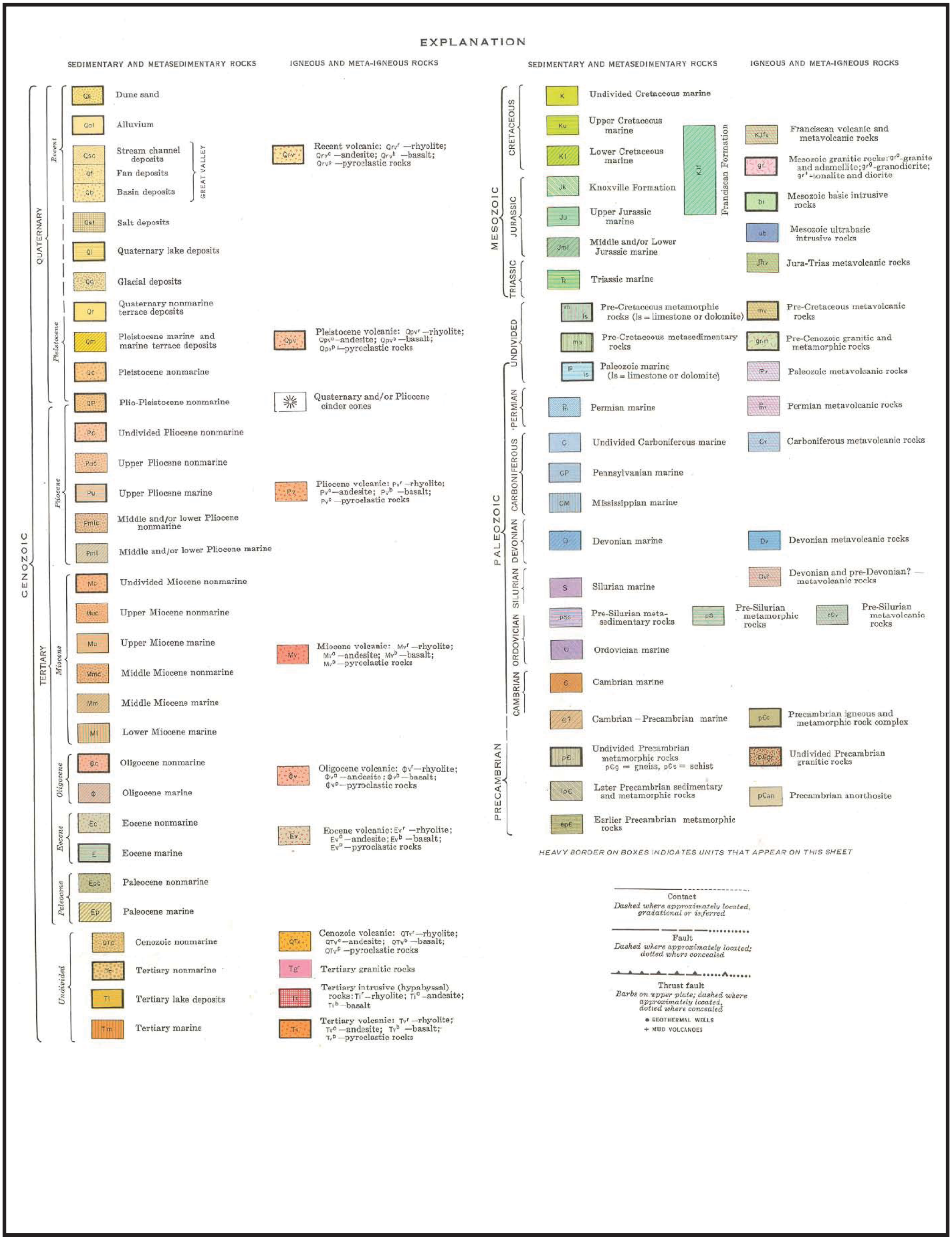
PSEGS Facility Footprint
Colorado River Aqueduct
Colorado River Aqueduct
(Dash showing underground interval)
Groundwater Well
Chuckwalla Valley Groundwater
Basin Boundary
Cross-Section Line
Freeway

0 4 8 Miles
1 inch = 21,120 feet

SOURCE: AECOM 2010

SOIL AND WATER RESOURCES - FIGURE 5B

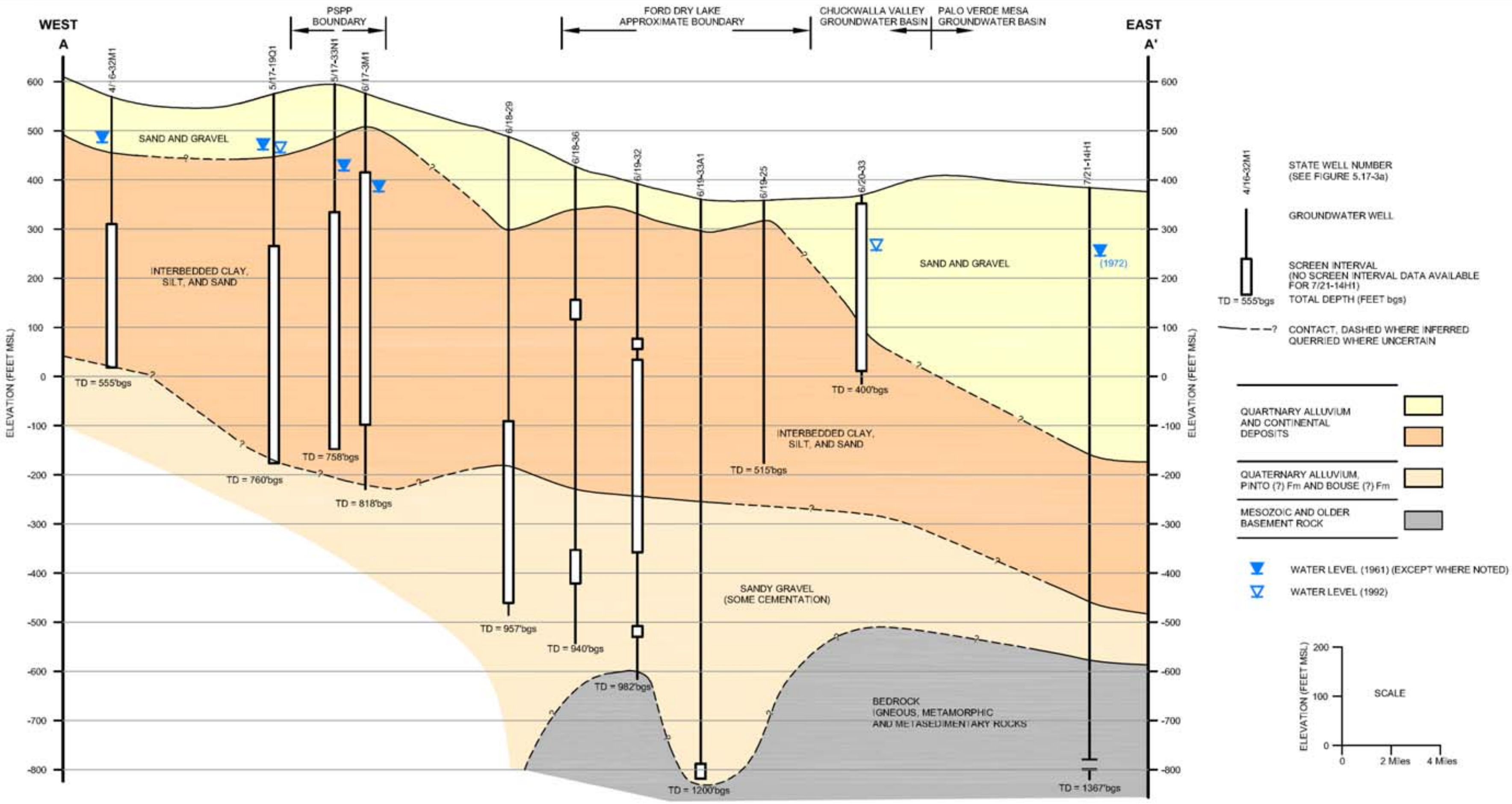
Palen Solar Electric Generating System - Regional Geology Map Legend



SOURCE: AECOM 2010

SOIL AND WATER RESOURCES - FIGURE 6

Palen Solar Electric Generating System - Chuckwalla Valley Groundwater Basin Cross Section A-A



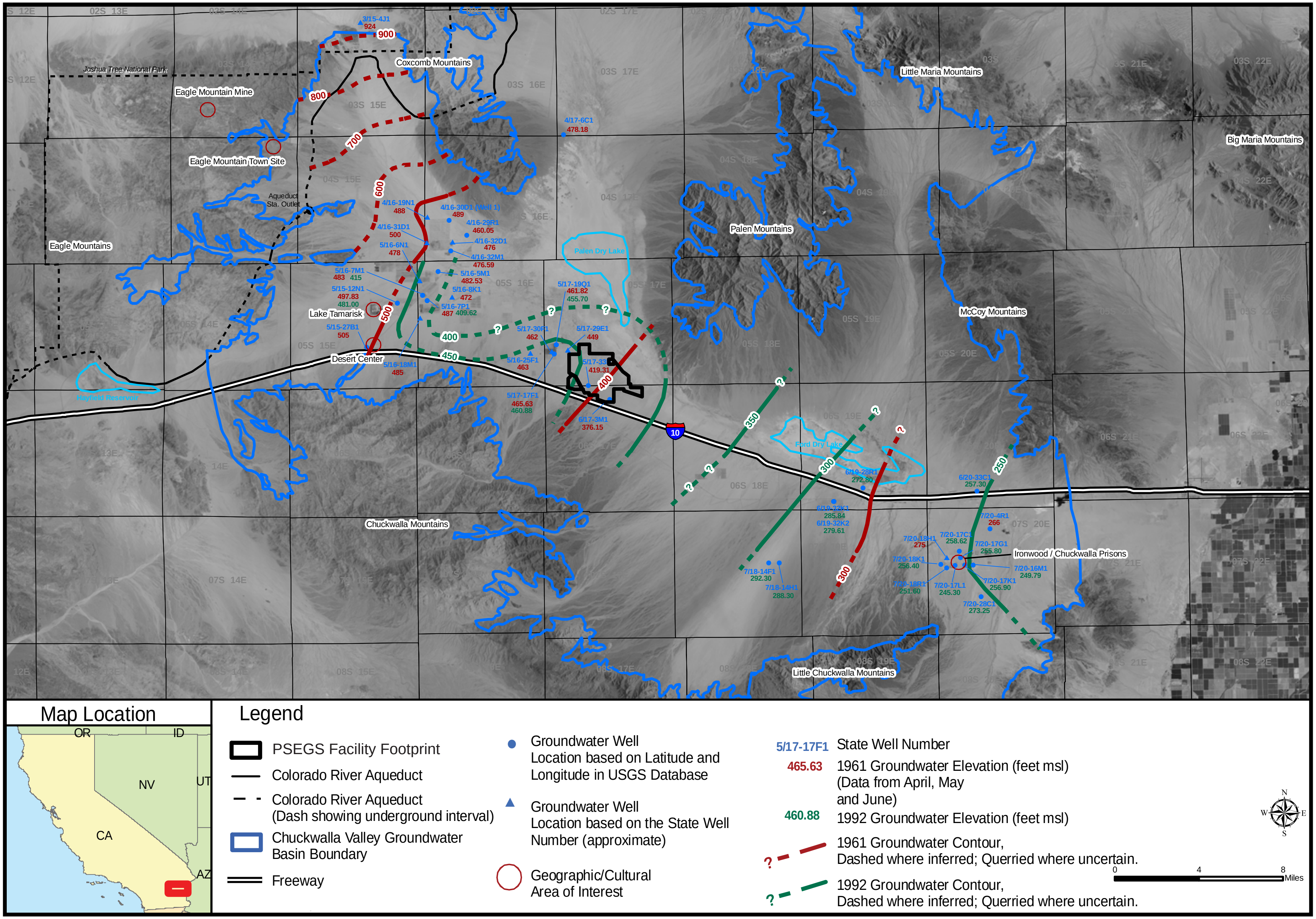
Map Location

CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: AECOM 2010

SOIL AND WATER RESOURCES - FIGURE 7

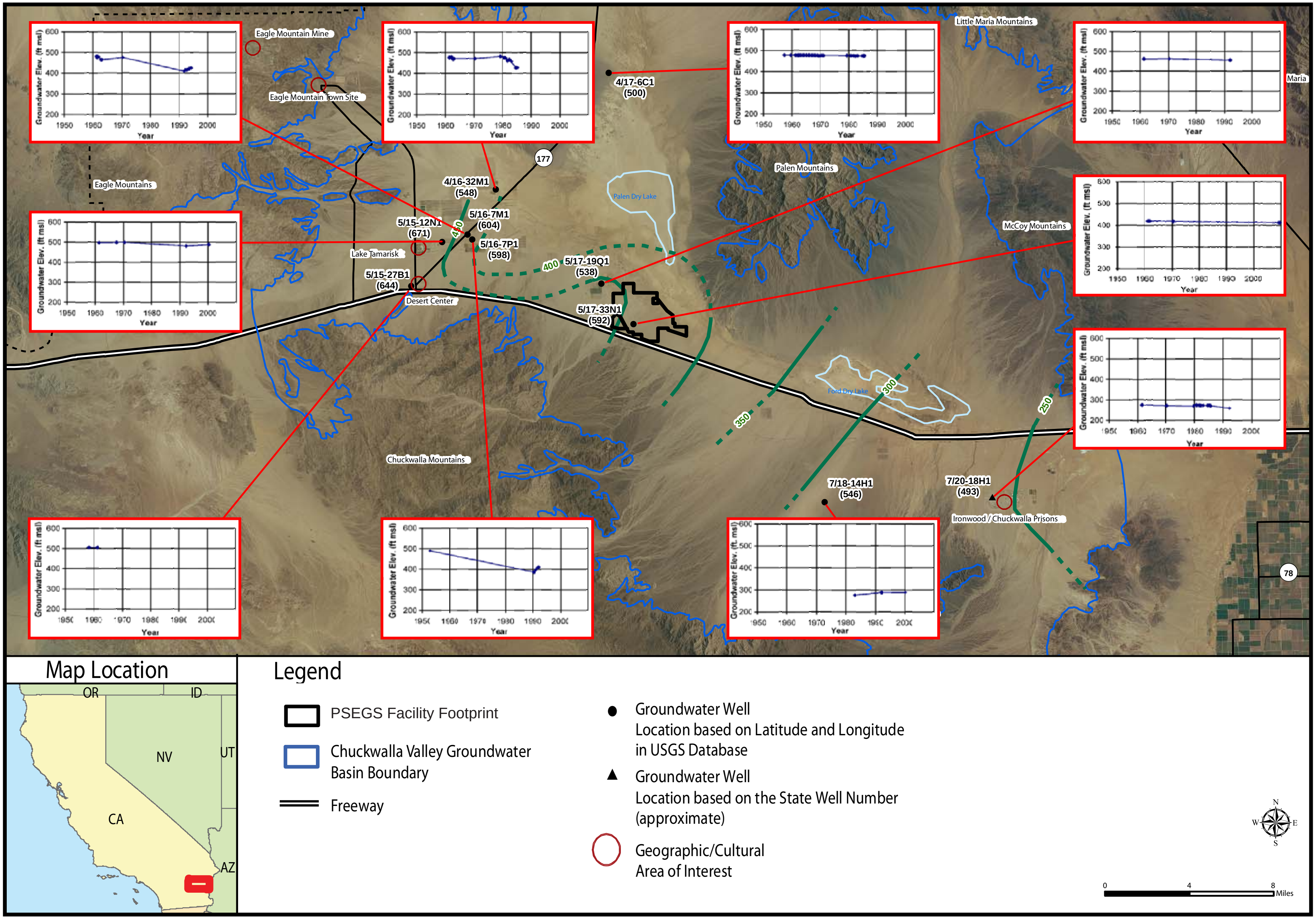
Palen Solar Electric Generating System - Chuckwalla Valley Groundwater Basin Pre Project Conditions



SOIL AND WATER RESOURCES

SOIL AND WATER RESOURCES - FIGURE 8

Palen Solar Electric Generating System - Basin Wide Groundwater Hydrographs

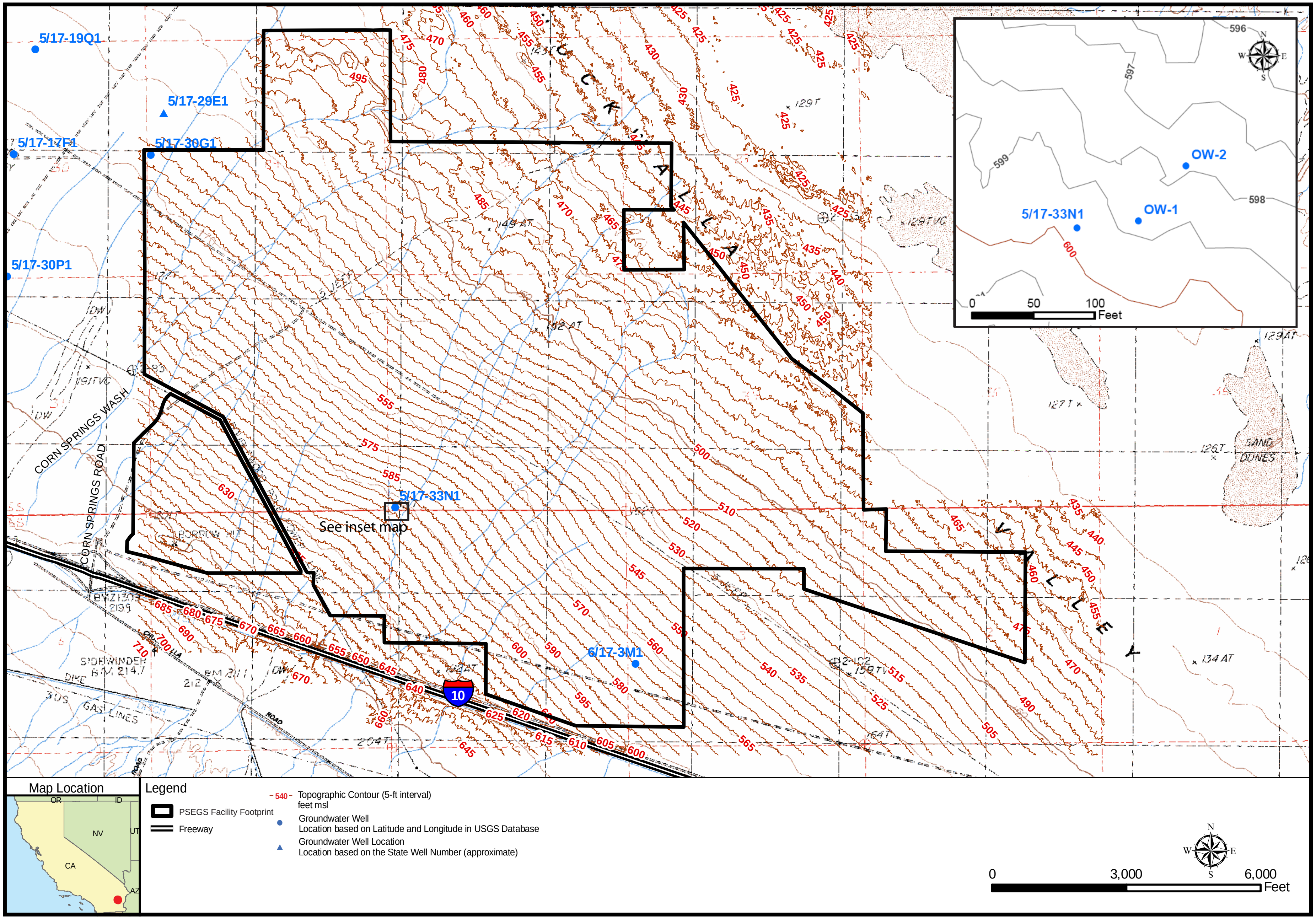


CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: AECOM 2010

SOIL AND WATER RESOURCES - FIGURE 9

Palen Solar Electric Generating System - Chuckwalla Valley Groundwater Basin Well Locations

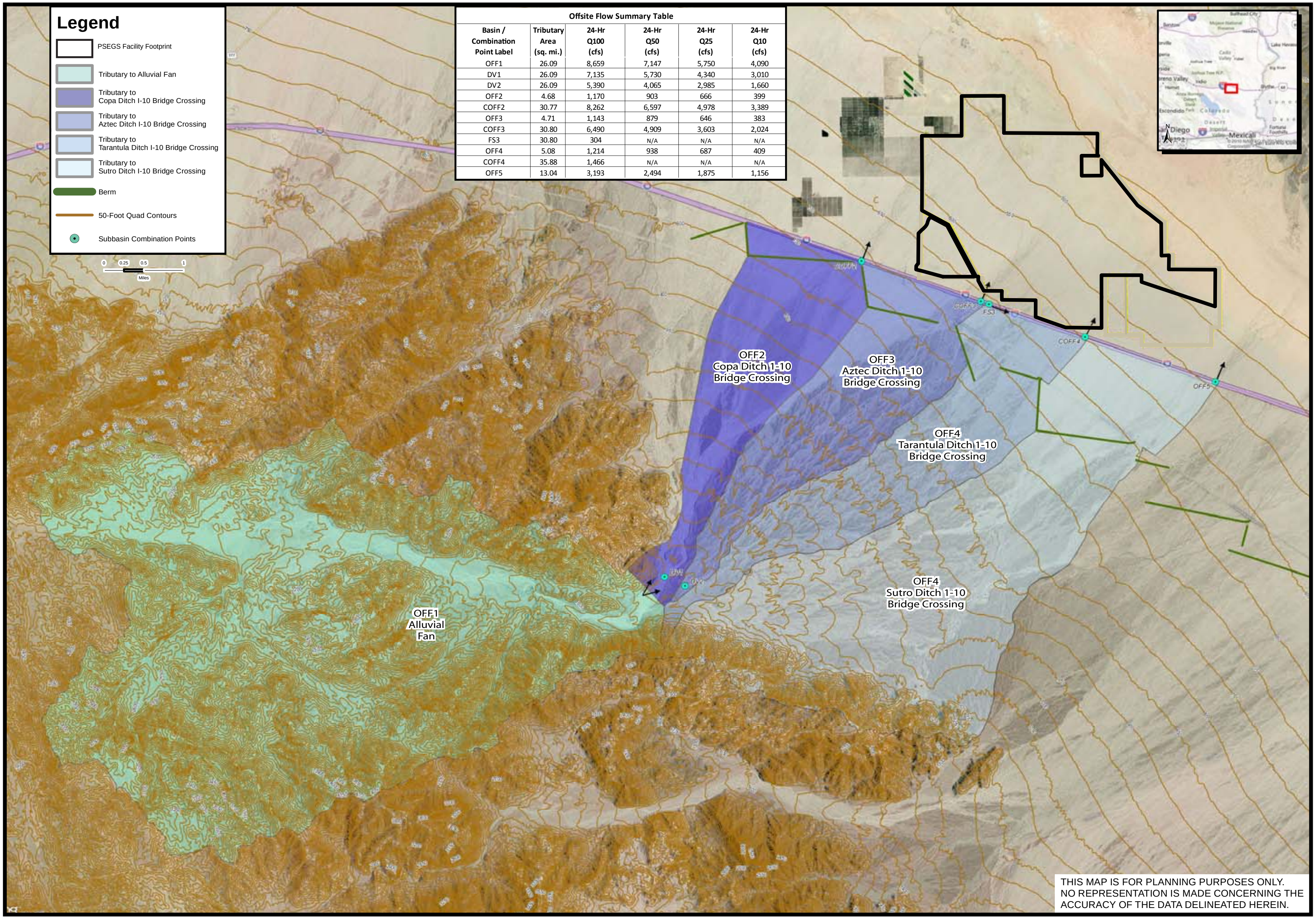


CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: Solar Millennium2009a

SOIL AND WATER RESOURCES - FIGURE 10

Palen Solar Electric Generating Sytem - Existing Condition Basin Map



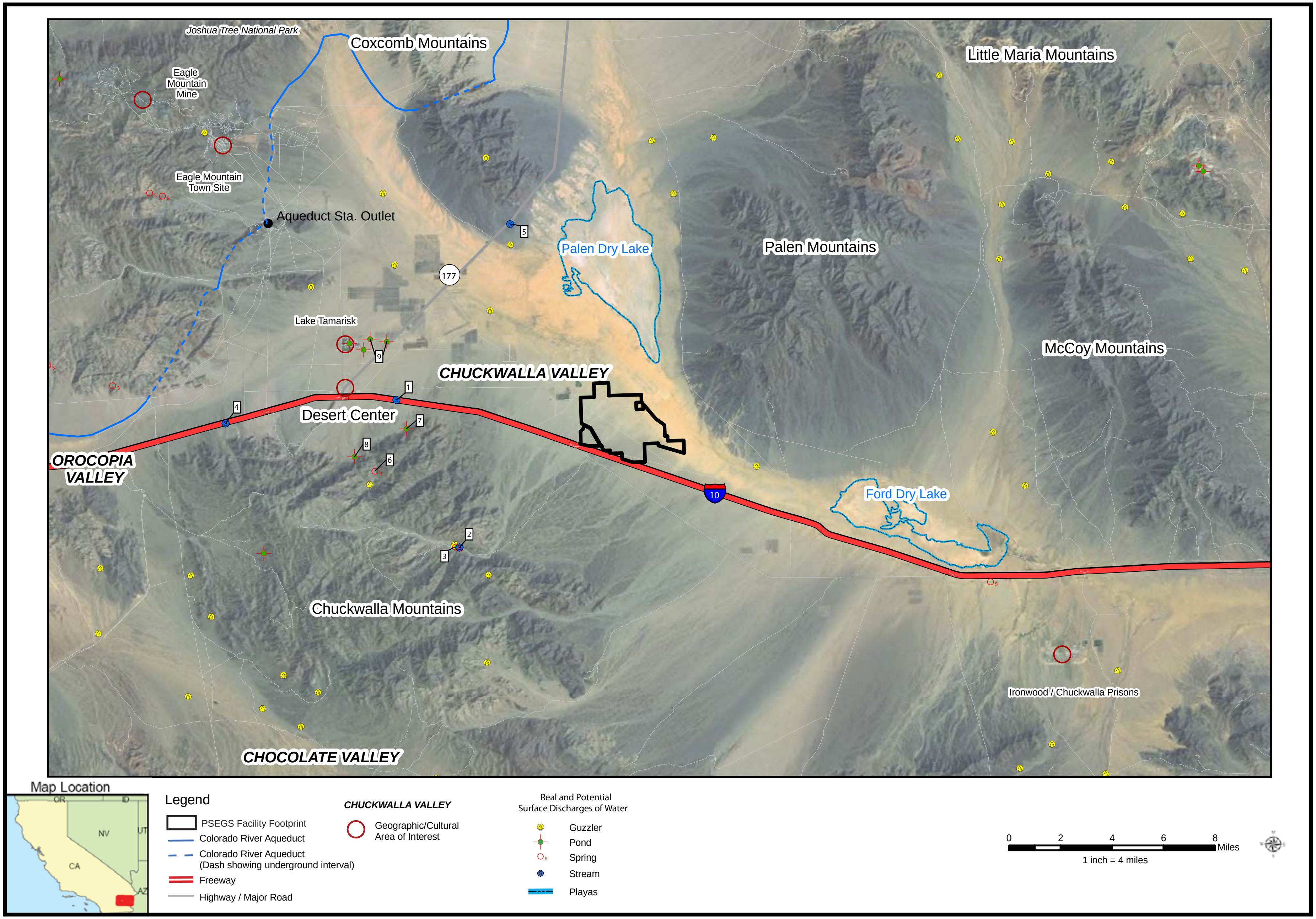
Offsite Flow Summary Table

Basin / Combination Point Label	Tributary Area (sq. mi.)	24-Hr Q100 (cfs)	24-Hr Q50 (cfs)	24-Hr Q25 (cfs)	24-Hr Q10 (cfs)
OFF1	26.09	8,659	7,147	5,750	4,090
DV1	26.09	7,135	5,730	4,340	3,010
DV2	26.09	5,390	4,065	2,985	1,660
OFF2	4.68	1,170	903	666	399
COFF2	30.77	8,262	6,597	4,978	3,389
OFF3	4.71	1,143	879	646	383
COFF3	30.80	6,490	4,909	3,603	2,024
FS3	30.80	304	N/A	N/A	N/A
OFF4	5.08	1,214	938	687	409
COFF4	35.88	1,466	N/A	N/A	N/A
OFF5	13.04	3,193	2,494	1,875	1,156

CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: Palen 2013e Attachment G

SOIL AND WATER RESOURCES - FIGURE 11
Palen Solar Electric Generating System - Chuckwalla Valley Springs and Seeps

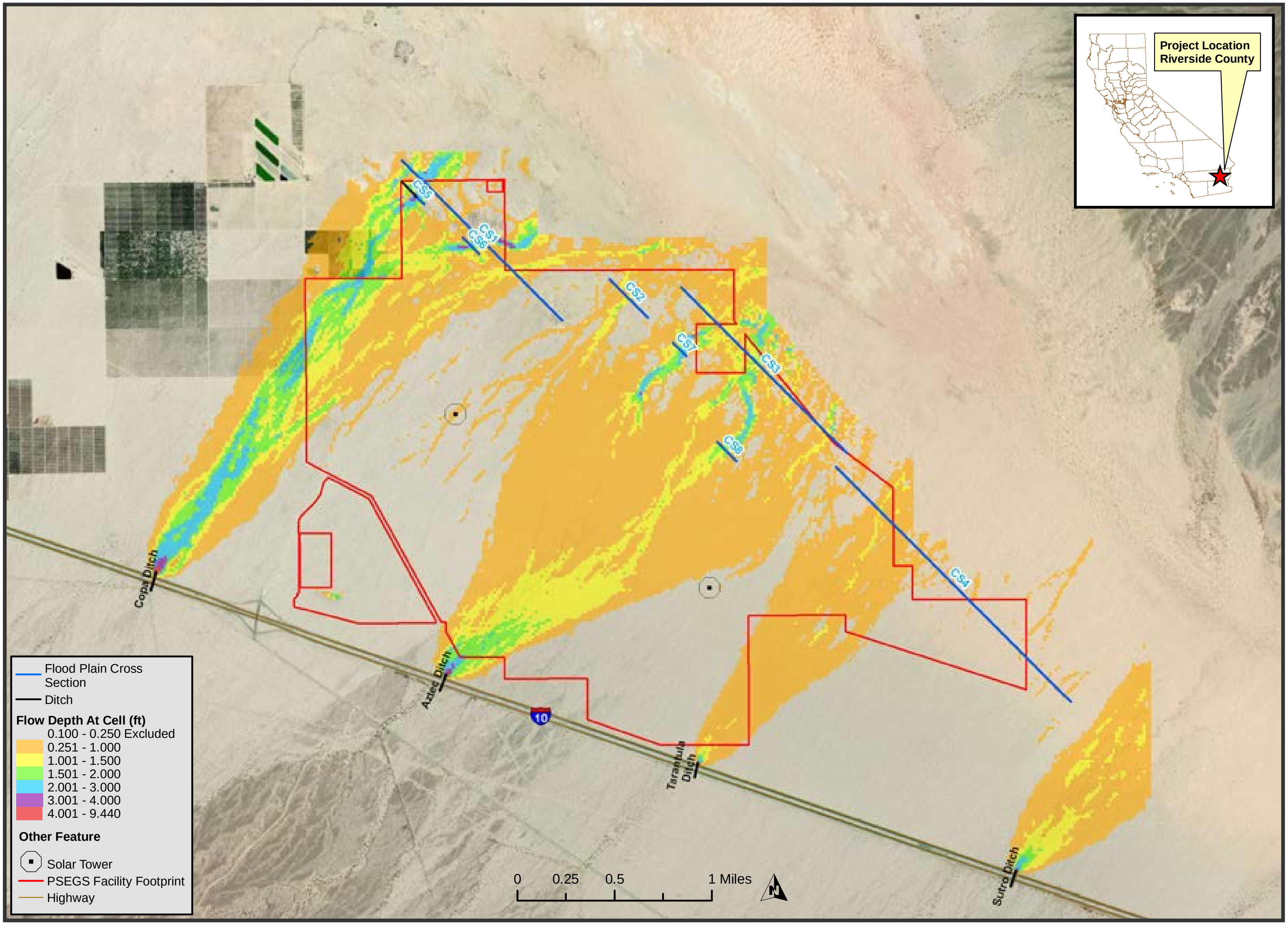


SOIL AND WATER RESOURCES

CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION
SOURCE: AECOM 2010

SOIL AND WATER RESOURCES - FIGURE 12

Palen Solar Electric Generating System - Existing Construction Depth Map (24-hour 100-year storm)



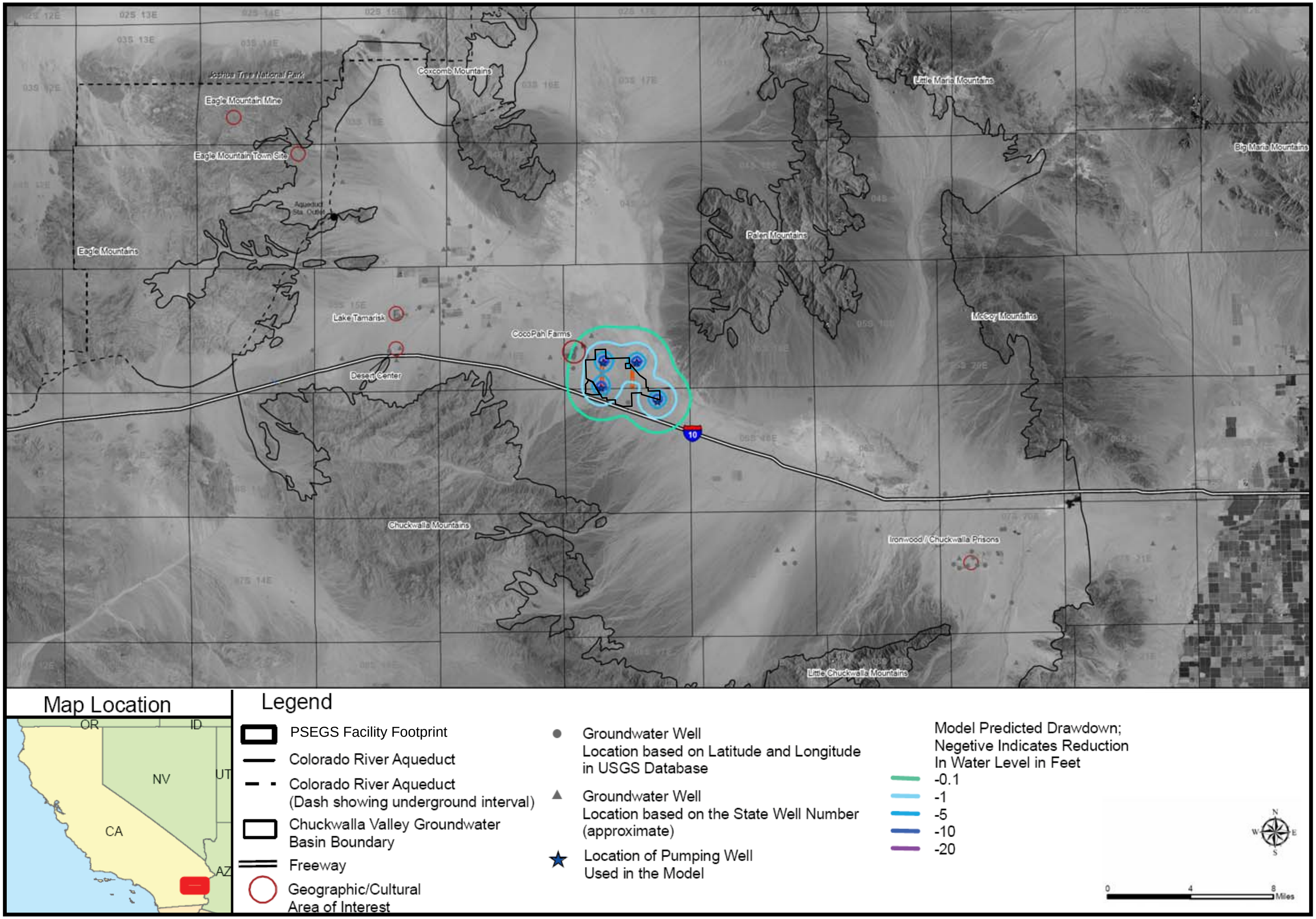
SOIL AND WATER RESOURCES

CALIFORNIA ENERGY COMMISSION, SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: BrightSource, Bing Aerial

SOIL AND WATER RESOURCES - FIGURE 13

Palen Solar Electric Generating System - Chuckwalla Valley Groundwater Basin Impacts to Groundwater Levels, End of Construction

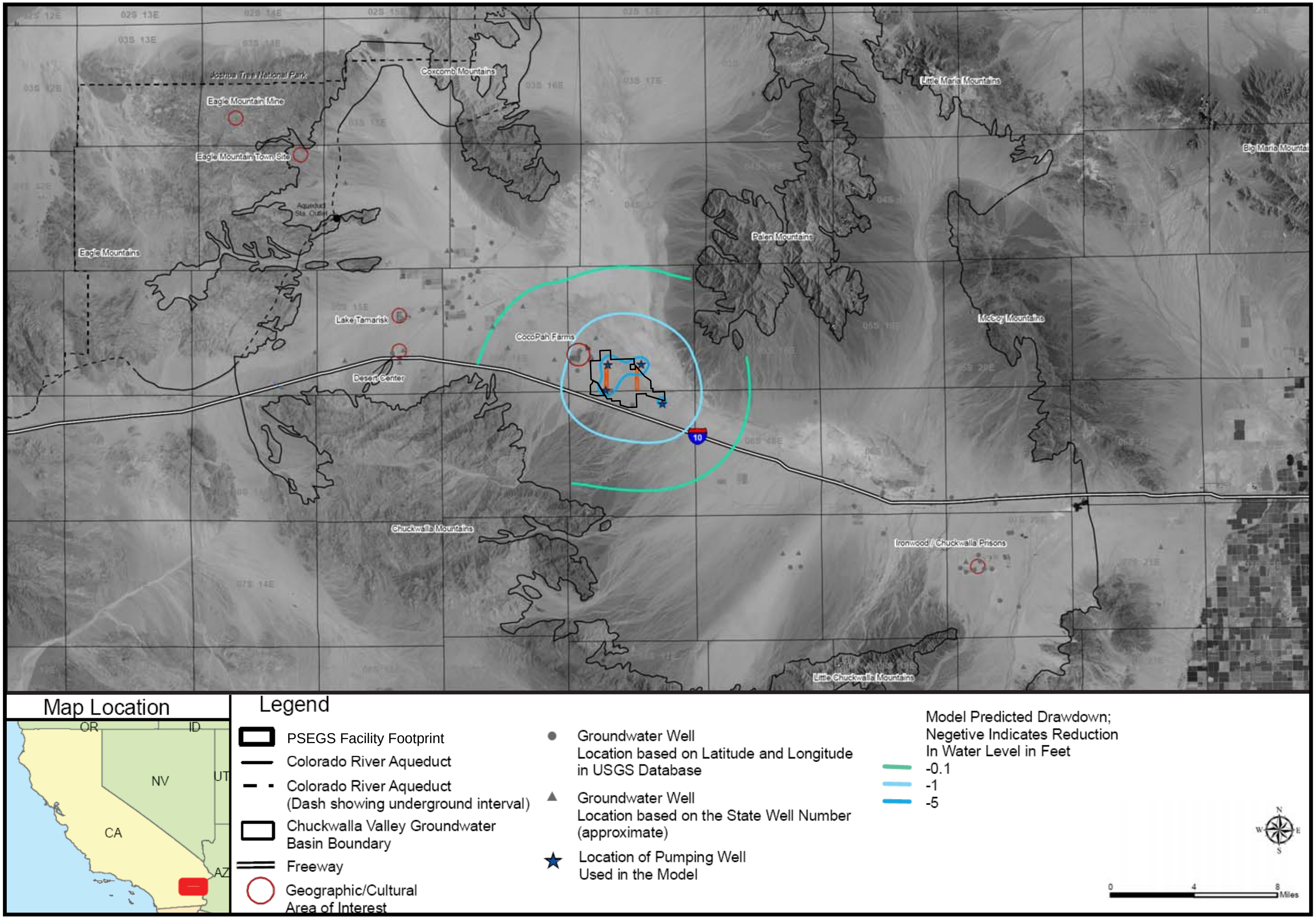


CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: Solar Millennium2010i, Solar Millenium (tn:55858). Responses to January CEC Workshop Queries (Groundwater), dated 3/11/2010

SOIL AND WATER RESOURCES - FIGURE 14

Palen Solar Electric Generating System - Chuckwalla Valley Groundwater Basin Impacts to Groundwater Levels, End of Operation

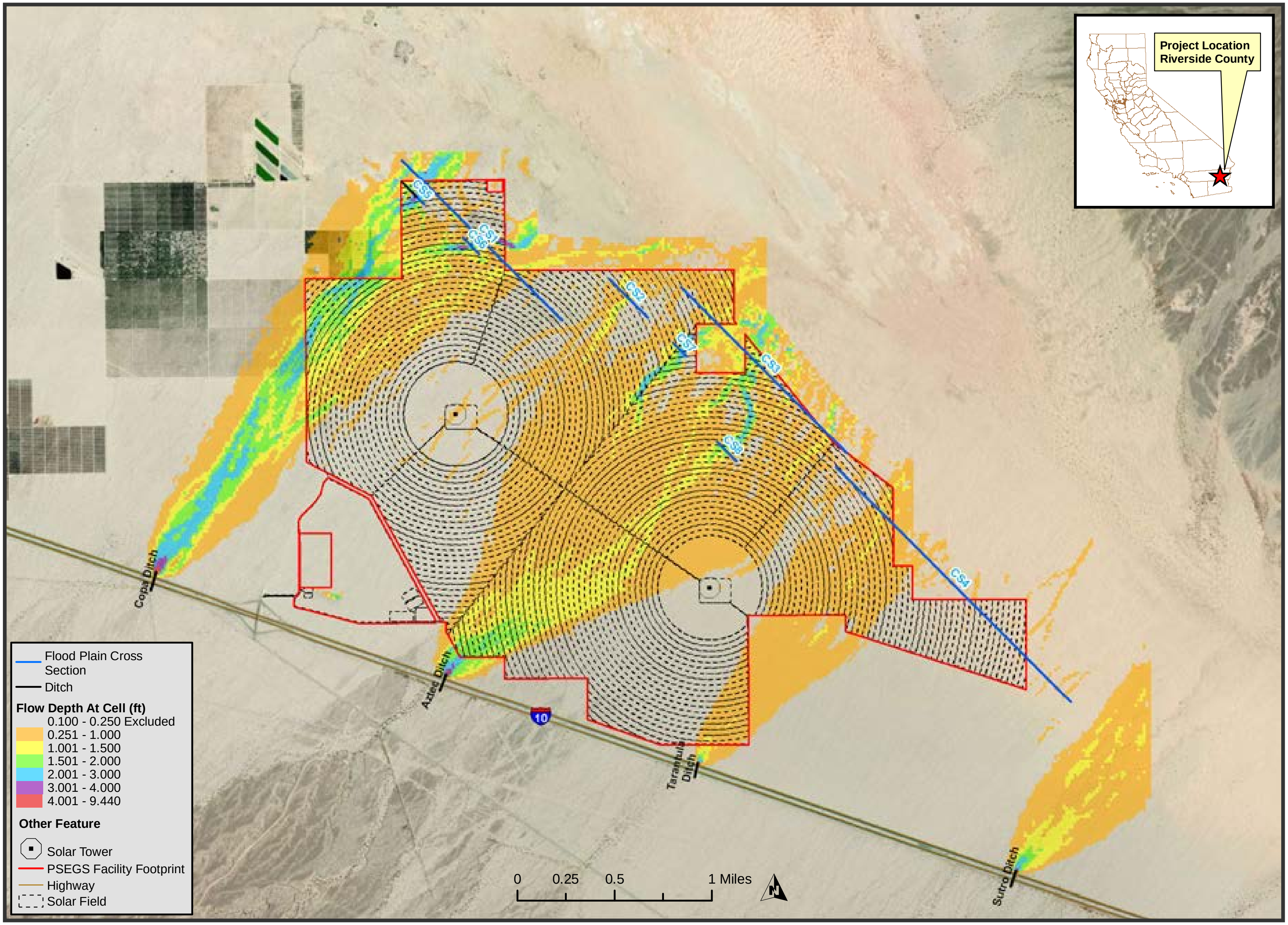


CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: Solar Millennium2010i, Solar Millenium (tn: 55858). Responses to January CEC Workshop Queries (Groundwater), dated 3/11/2010.

SOIL AND WATER RESOURCES - FIGURE 15

Palen Solar Electric Generating System - Post Construction Depth Map (24-hour 100-year storm)

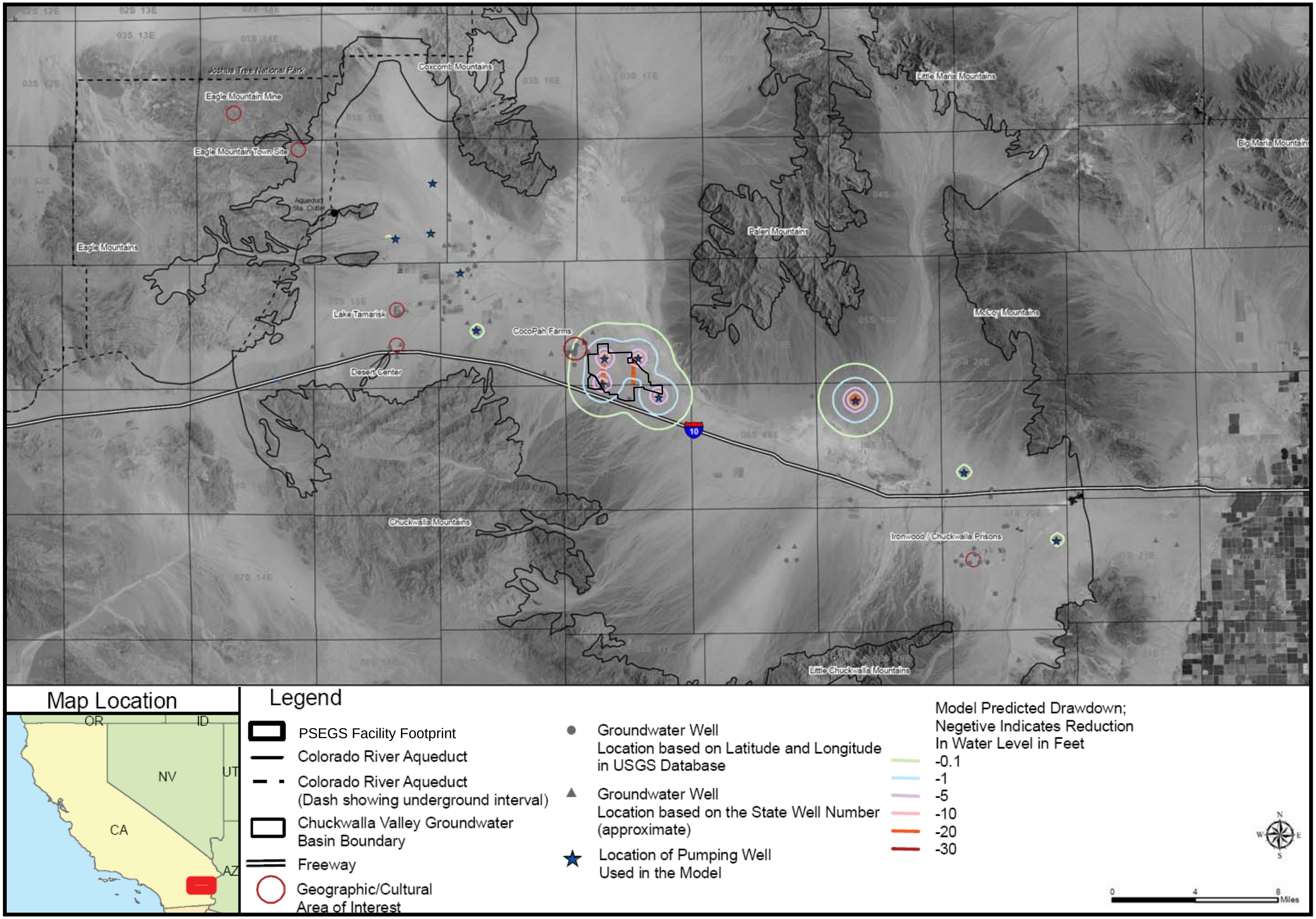


CALIFORNIA ENERGY COMMISSION, SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: BrightSource, Bing Aerial

SOIL AND WATER RESOURCES - FIGURE 16

Palen Solar Electric Generating System - Chuckwalla Valley Groundwater Basin Cumulative Impacts to Groundwater Levels, End of Construction

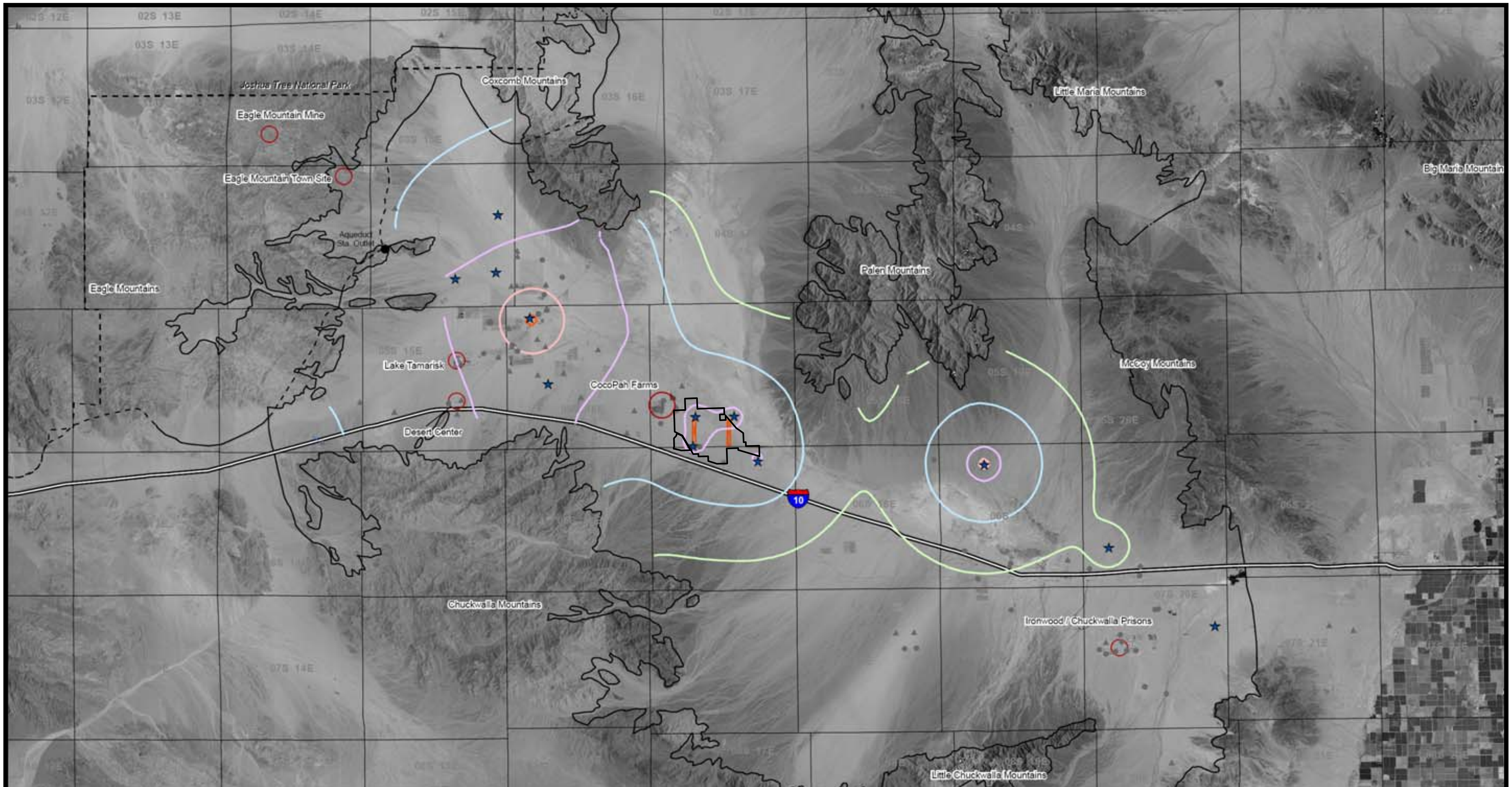


CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: AECOM 2010

SOIL AND WATER RESOURCES - FIGURE 17

Palen Solar Electric Generating System - Chuckwalla Valley Groundwater Basin Cumulative Impacts to Groundwater Levels, End of Operation



Map Location

Legend

- PSEGS Facility Footprint
- Colorado River Aqueduct
- Colorado River Aqueduct (Dash showing underground interval)
- Chuckwalla Valley Groundwater Basin Boundary
- Freeway
- Geographic/Cultural Area of Interest
- Groundwater Well Location based on Latitude and Longitude in USGS Database
- Groundwater Well Location based on the State Well Number (approximate)
- Location of Pumping Well Used in the Model

Model Predicted Drawdown; Negetive Indicates Reduction In Water Level in Feet

- -0.1
- -1
- -5
- -10
- -20

0 4 8 Miles

CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: AECOM 2010

TRAFFIC AND TRANSPORTATION

Andrea Koch and Gregg Irvin, Ph.D.

SUMMARY OF CONCLUSIONS

California Energy Commission (Energy Commission) staff has analyzed the information provided in the Petition for Amendment and acquired from other sources to determine the potential for the Palen Solar Electric Generating System (PSEGS) project to have significant traffic and transportation-related impacts. Staff has also assessed the potential for mitigation proposed by the project owner and conditions developed by staff to reduce any potential impacts to a less than significant level, as well as the feasibility and enforceability of those proposed mitigations and recommended conditions of certification.

At this time, Energy Commission staff (staff) needs additional information, requested in Data Request Set No. 1, #14, to determine whether the proposed PSEGS's construction traffic impacts would cause significant impacts to traffic level of service (LOS) on nearby roadways and intersections. However, staff has determined that PSEGS operations traffic would cause less than significant impacts to traffic LOS.

Staff also needed additional information, requested in Data Request Set No. 3, to fully determine potential glint and glare impacts to motorists and pilots from the project's heliostats and solar receiver steam generators (SRSGs). The project owner submitted this information on June 17th, too late for staff to analyze for inclusion in this Preliminary Staff Assessment (PSA). Staff will include discussion of this information in the Final Staff Assessment (FSA) and will conclude in the FSA whether the project would cause discomfort or disability glare to motorists or pilots. In this PSA, based on prior studies prepared for the Rio Mesa and Hidden Hills solar power tower projects, staff has only concluded that neither the heliostats nor the SRSGs would cause retinal damage to motorists or pilots.

In the Final Staff Assessment (FSA), once all data responses referenced earlier are provided to staff for review, staff will include a more thorough discussion of the potential construction traffic impacts and potential glint and glare impacts. At that time, staff will be able to reach a conclusion as to whether the PSEGS would comply with all applicable laws, ordinances, regulations, and standards (LORS) related to traffic and transportation.

INTRODUCTION

In the Traffic and Transportation analysis, Energy Commission staff focuses on (1) whether construction and operation of the Palen Solar Electric Generating System (PSEGS) would result in significant traffic and transportation impacts under the California Environmental Quality Act (CEQA); and (2) whether the project would comply with applicable laws, ordinances, regulations, and standards (LORS). The analysis includes discussion of potential impacts to surrounding transportation systems and roadways resulting from construction and operation of the PSEGS. Energy Commission staff proposes mitigation measures (conditions of certification) where necessary.

METHODOLOGY AND THRESHOLDS FOR DETERMINING ENVIRONMENTAL CONSEQUENCES

Significance criteria used in this document for evaluating environmental impacts are based on the CEQA Guidelines, the CEQA Environmental Checklist for Transportation/Traffic, and applicable LORS used by other governmental agencies. Specifically, staff analyzed whether the proposed project would:

1. cause an increase in traffic that is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume-to-capacity ratio on roads, or congestion at intersections);

2. conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit;

3. conflict with an applicable congestion management program, including, but not limited to, level of service standards (LOS) and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways;

4. substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment);

5. result in inadequate emergency access;

6. conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities;

7. result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks;

8. produce a thermal plume in an area where flight paths are expected to occur below 1,000 feet from the ground[1]; or

9. have individual environmental effects that, 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.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS (LORS)

[1] The FAA recommends that pilots avoid overflight of plume-generating industrial sites below 1,000 feet AGL (FAA 2006).

In addition to the LOS significance criteria discussed above in "Methodology and Thresholds for Determining Environmental Consequences", staff uses laws, ordinances, regulations, and standards (LORS) as significance criteria to determine if the proposed PSEGS would have a significant adverse impact on the environment. The federal, state, and local LORS that are applicable to the proposed PSEGS are listed below in **Traffic and Transportation Table 1**:

Traffic and Transportation Table 1
Laws, Ordinances, Regulations, and Standards (LORS)

Applicable LORS	Description
Federal	
Title 14, Code of Federal Regulations, Aeronautics and Space, part 77 - Objects Affecting Navigable Airspace (14 C.F.R. part 77)	These regulations establish standards for determining physical obstructions to navigable airspace; set noticing and hearing requirements; provide for aeronautical studies to determine the effect of physical obstructions on the safe and efficient use of airspace; and oversee the development of antenna farm areas.
Title 49, Code of Federal Regulations Subtitle B, parts 171-173, 177-178, 350-359, 397.9 and Appendices A-G	Addresses safety considerations for the transport of goods, materials, and substances. Governs the transportation of hazardous materials including types of materials and marking of the transportation vehicles.
State	
California Vehicle Code, sections 353; 2500-2505; 31303-31309; 32000-32053; 32100-32109; 31600-31620; California Health and Safety Code, sections 25160 et seq.	Regulates the highway transport of hazardous materials.
California Vehicle Code, sections 13369; 15275 and 15278	Addresses the licensing of drivers and the classification of licenses required for the operation of particular types of vehicles; also requires certificates permitting operation of vehicles transporting hazardous materials.
California Vehicle Code, sections 35100 et seq.; 35250 et seq.; 35400 et seq.	Specifies limits for vehicle width, height, and length.
California Vehicle Code, section 35780	Requires permits for any load exceeding Caltrans weight, length, or width standards on public roadways.
California Streets and Highways Code, sections 117, 660-672	Requires permits for any load exceeding Caltrans weight, length, or width standards on County roads.
California Streets and Highways Code, sections 117, 660-670, 1450, 1460 et seq., and 1480 et seq.	Regulates permits from Caltrans for any roadway encroachment from facilities that require construction, maintenance, or repairs on or across State highways and County roads.
Local	
Riverside County General Plan Circulation Element	Specifies long-term planning goals and procedures for transportation infrastructure system quality.
Riverside County General Plan Circulation Element	Specifies LOS standards used to assess the performance of a street or highway system and the capacity of a roadway.
Riverside County Municipal Code Title 10, Chapter 10.08, Sections 10.08.010-10.08.180	Specifies limits and permit requirements for oversize loads.
Riverside County Municipal Code Title 12, Chapter 12.08, Sections 12.08.010-12.08.100	Specifies requirements for encroachment permits.

PROPOSED MODIFIED PROJECT

The modified project would use BrightSource's solar power tower technology instead of the originally proposed parabolic trough solar collection system and associated heat transfer fluid. The modified project would consist of two solar fields, designated as Unit 1 and Unit 2, each comprised of 85,000 heliostats (elevated mirrors guided by a tracking system mounted on a pylon) and a 760-foot-high[2] tower. To produce electricity, the heliostats would focus the sun's rays on a solar receiver steam generator located atop each tower, creating steam to drive a turbine that would generate electricity. Each solar field would produce 250 MW of electricity for a combined nominal output of approximately 500 MW.

The two solar fields would share common facilities, including a common area containing an administration building, warehouse, evaporation ponds, maintenance complex, a meter/valve station for incoming natural gas service to the site, an on-site switchyard, and a 10-mile single-circuit 230-kV generation tie-line to deliver power to the newly constructed Red Bluff Substation immediately south of I-10. Other on-site facilities would include access and maintenance roads (either dirt, gravel, or paved), perimeter fencing, tortoise fencing, and other ancillary security facilities. During project construction, there would be an approximately 203-acre laydown area located in the southwestern portion of the site. This area would be used for laydown of materials, parking, staging of traffic to avoid congestion on the I-10/Corn Springs interchange, and possibly a temporary concrete batch plant.

As with the original project, site access would be from Corn Springs Road at the I-10 interchange. Corn Springs Road currently runs north-south across I-10 and terminates just north of the I-10 overpass. From this dead-end, a new 1,350 foot-long access road running east to the project site entrance would be constructed. The new access road would have a paved width of 24 feet and a 12-foot-wide gravel shoulder for truck staging.

If approved, the units would be constructed in phases, with the first phase of construction including the generation tie-line and Unit 1 and the second phase including Unit 2. The first phase of construction is scheduled to begin in the fourth quarter of 2013, according to the Petition to Amend. However, construction likely would not begin until spring 2014 to allow for desert tortoises to be cleared from the site. The second phase of construction would begin several months later. Commercial operation of both units would likely begin in late 2016, due to the delay for desert tortoise clearing.

SETTING AND EXISTING CONDITIONS

The proposed PSEGS site is located in eastern Riverside County about 10 miles east of the unincorporated community of Desert Center, 3 miles east of the southeastern end of Joshua Tree National Park, and about 0.5 mile north of U.S. Interstate 10. The site is located on approximately 3,794 acres of public land managed by the Bureau of Land Management (BLM) (Right-of-Way No. CACA-048810). See **Traffic and**

[2] The actual tower height would be 750 feet. However, including the lighting appurtenance affixed to the top, the total height of the tower would be 760 feet.

Transportation Figures 1 and 2 for views of the regional and local transportation network in the project vicinity.

LOCAL HIGHWAYS AND ROADS

The following describes the roadways in the vicinity of the PSEGS site:

U.S. INTERSTATE 10

Interstate 10 is an east-west regional arterial that crosses much of the southern United States. It runs from the L.A. area east to Phoenix, Arizona, where it turns south and continues to Tucson, Arizona, ultimately continuing east to Jacksonville, Florida. In the project area, the speed limit is 70 miles per hour and the road is fully improved to freeway status with two lanes in each direction. There are no bicycle or pedestrian facilities located on I-10 near the project site; however, bicycles are allowed on I-10 from Dillon Road, Coachella (west of the PSEGS site) to Mesa Drive, Blythe (east of the PSEGS site). The California Department of Transportation (Caltrans) allows bicycle use on state highways where no alternative route is available.

Corn Springs Road

Corn Springs Road is an exit off of I-10 accessed by a diamond-configured interchange. The interchange includes single-lane ramps with ramp junctures, where stop signs control traffic from I-10 before it enters Corn Springs Road. Corn Springs Road is a relatively short road that runs north toward the project site, as well as south, where it intersects with Chuckwalla Valley Road. Corn Springs Road has a curb and gutter, but no bicycle or pedestrian facilities.

Chuckwalla Valley Road

Chuckwalla Valley Road is a minor local access road running in an east-west direction just south of I-10 in the vicinity of the project site. It is a two-lane frontage road extending from the southern part of the Corn Springs Road interchange to the Ford Dry Lake Road interchange approximately 10 miles to the east. Stop signs on the Chuckwalla Valley Road approaches control the Corn Springs Road/Chuckwalla Valley Road intersection. Chuckwalla Valley Road has curb and gutter, but no bicycle or pedestrian facilities.

PUBLIC TRANSPORTATION

Public transportation consists of rail and bus service, bicycle and pedestrian facilities, and airports. Information about these forms of public transportation follows.

Rail and Bus Service

The nearest passenger rail service is an Amtrak station in Palm Springs to the west. With regard to freight rail, on January 13, 2010, the Surface Transportation Board ruled that the Arizona & California Railroad Company could abandon service in Riverside County. Therefore, no rail service exists in the area.

The nearest national bus service stations are the Indio and Blythe Greyhound stations. Local bus service near the project site is limited to the Red Route of the Desert Roadrunner bus service for Blythe, which provides service to the Ironwood/Chuckwalla Valley State Prison approximately 21 miles east of the project, and the Sunline Transit Agency, which provides bus service in the vicinity of Indio.

Bicycle and Pedestrian Facilities

Bicycle and pedestrian activity in the vicinity of the PSEGS site is minimal-to-none. Development is extremely low-density and spread over a large area, which is not conducive to biking or walking.

Aviation Activities

The nearest airport is the Center Airport, located approximately 6 miles northwest of the PSEGS site. It is a private airport with a pattern altitude of 1,559 feet above mean sea level (AMSL). The airport has one basic runway, Runway 5/23. For the 12-month period ending in December 2006, the most recent year for which data is available, the airport hosted 150 annual aircraft operations, with all operating aircraft classified as transient general aviation (AIRNAV 2013).

The Chocolate Mountain Aerial Gunnery Range (CMAGR) is approximately 15 miles south of the site. The U.S. Navy and Marines use this approximately 459,000-acre area for military aircrew training in air combat maneuvering and tactics, airborne laser system operations, gunnery, live fire aerial gunnery practice, aerial bombing, rocketry, and strafing (attacking ground targets). The Department of the Navy (DoN) owns approximately half of the CMAGR, while the Bureau of Land Management (BLM) manages the other half. The military’s right to use the BLM-managed land expires in 2014, so the DoN is requesting that Congress renew its use of the land and continue the military reservation for another 25 years (DON 2012).

The project site also lies within the vicinity of Department of Defense military training routes VR-296, VR-1265, VR-1268, and IR-218.

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

The direct and indirect impacts of the proposed PSEGS on the traffic and transportation system are discussed in this section. The assessment of transportation-related impacts is based on an analysis which compares the current traffic and transportation conditions to conditions that would exist during construction and operations of the PSEGS.

CONSTRUCTION PERIOD TRAFFIC IMPACTS AND MITIGATION

Construction of the PSEGS would occur over 33 months, with peak construction expected to occur during Month 22 (in the year 2015). The average daily workforce would be approximately 998 workers, with a peak daily workforce of approximately 2,311 workers. These workers would not all arrive at or depart from the project site at the same time, as construction workers would be spread out over two or three different shifts. Also, some of the construction workers would be working offsite on the transmission and gas lines, further reducing the number of workers that would simultaneously arrive at and depart from the project site.

Concentrating on the day shift, which would begin at 5 AM, the average number of daily day shift workers would be 790, and the peak number of daily day shift workers would be 1,700. This translates into 1,580 average daily one-way trips generated by day shift workers and 3,400 peak daily one-way trips generated by day shift workers. Assuming that carpooling would result in a 7.5% reduction[3] in construction vehicle trips, the average number of one-way trips generated by day shift construction workers would be approximately 1,461 average daily one-way trips and 3,145 peak daily one-way trips.

The PSEGS would generate more construction traffic than the originally proposed project. In Energy Commission staff's Data Request Set No. 1, #14, staff requested further information about construction traffic impacts to roadway and intersection level of service (LOS) during peak and daily construction. The project owner is currently working to provide this information. Once this information is received, staff can complete the analysis of the project's construction traffic impacts. At this point, the project's construction traffic impacts to traffic LOS on roadways and intersections is unknown.

Although the project's specific construction traffic impacts to LOS are unknown, staff assumes that peak construction for the amendment would, like the original project, cause a noticeable increase in traffic on I-10. Condition of Certification **TRANS-1** requires the project owner to prepare a traffic control plan to reduce traffic impacts through means such as staggered work shifts, off-peak work schedules, and an incentive program for carpooling. This condition is the same as that proposed for the original project. Once staff receives the traffic information requested in Data Request Set No. 1, #14, staff will make necessary modifications to **TRANS-1** to further reduce construction LOS impacts along I-10.

Oversized or overweight trucks with unlicensed drivers could be hazardous to the general public and/or damage roadways. Condition of Certification **TRANS-2** requires that the project owner comply with limits on vehicle sizes and weights and driver licensing regulations. Because construction traffic and trucks could also damage roadways, Condition of Certification **TRANS-3** requires that the owner restore all roads damaged by construction activities. Construction and/or construction repairs could require encroachment into public rights-of way. **TRANS-4** requires that the owner obtain necessary encroachment permits from Caltrans and any other relevant jurisdictions and comply with limitations for encroachment into public rights-of-way.

OPERATION S TRAFFIC IMPACTS AND MITIGATION

Analysis of the originally proposed project indicated that with 134 daily operations workers and approximately 6 truck trips per day, there would be no significant impacts to LOS at the studied road segments or intersections during project operations. As part of the original project, staff found that LOS on all roadways and intersections would

[3] This reduction is based on the assumption that 15% of workers would carpool. This assumption is based on the remote location of the project site and the high cost of gas. With an average of two people per vehicle, there would be a 7.5% reduction in construction vehicle trips.

continue to operate at LOS A, the pre-project LOS, which is better than the minimum LOS of C.

The modified project proposes 100 daily operations workers (40 during the day and 60 during the evening), a smaller number than the 134 daily operations workers proposed as part of the original project. The original project had no significant operational impacts to LOS, as reflected in the following tables from the original project analysis: **Traffic and Transportation Table 2**, Peak Hour Volumes and LOS on Study Roadways During Project Operation, and **Traffic and Transportation Table 3**, Peak Hour Delay and LOS on Study Intersections During Project Operation. Because the modified project would involve fewer operations workers than the original project, the modified project would also result in less than significant operational impacts to LOS.

Traffic and Transportation Table 2 (Original Palen Analysis)
Peak Hour Volumes and LOS on Study Roadways During Project Operation

Roadway Segment or Intersection	Standard Operations Year (2014) Volume with PSEGS	LOS
I-10: West of the project site	3,245	A
I-10: East of the project site	3,245	A
Corn Springs Road	125	A
Notes: Caltrans Year 2007 traffic volumes were expanded to Year 2014 using the same rate of expansion (3.74%/year) seen during 2004-2007.		

Traffic and Transportation Table 3 (Original Palen Analysis)
Peak Hour Delay and LOS on Study Intersections During Project Operation

Study Intersection	Standard Operations Year (2014) Volume with PSEGS			
	AM Peak		PM Peak	
	Delay	LOS	Delay	LOS
I-10 Westbound Ramps/Corn Springs Road	8.7	A	8.4	A
I-10 Eastbound Ramps/Corn Springs Road	9.2	A	9.4	A
Notes: Caltrans Year 2007 traffic volumes were expanded to Year 2014 using the same rate of expansion (3.74%/year) seen during 2004-2007.				

EMERGENCY SERVICES VEHICLE ACCESS

The project includes a proposed primary access from Corn Springs Road. The proposed primary access provides adequate site access for emergency vehicles traveling to the site from I-10 and exiting on Corn Springs Road.

Due to site constraints increasing the difficulty of providing a secondary access road, **Worker Safety and Fire Protection** staff is instead requiring at least two emergency access gates, one each on the north fence line and south fence line. These gates would not encroach on Caltrans' right-of-way. In the event of an emergency, if the main access road was blocked, all-terrain fire engines would be able to access the site through these gates. **Worker Safety and Fire Protection** staff is requiring that PSEGS "buy into" the

Riverside County Fire Department's all-terrain fire engines purchased by the Genesis Solar Energy Project by paying the Genesis project owners the PSEGS' fair share of the cost of the purchase and maintenance of the fire engines. See the **Worker Safety and Fire Protection** section of this PSA for more details. Traffic and Transportation staff finds these alternative emergency vehicle accesses adequate from a traffic and transportation perspective.

WATER, RAIL, BUS AND AIR TRAFFIC

The proposed PSEGS is not adjacent to a navigable body of water and therefore would not alter water-related transportation. The proposed modified project also would not alter rail or bus transportation. No rail tracks or bus services exist on or near the project site.

The project could potentially impact aviation activities. See the discussion below.

Aviation Activities

Height

The project site, with its proposed 760-foot-high solar towers, lies within the vicinity of Department of Defense military training routes VR-296, VR-1265, VR-1268, and IR-218. Michael A. Aimone, Executive Director of the Department of Defense (DoD) Siting Clearinghouse, submitted a letter to the Energy Commission stating that while DoD predicts that the project would impact these military training routes, DoD believes these impacts can be mitigated and is not opposed to construction of the project. DoD requested continued coordination on project micro-siting decisions. Staff will continue to coordinate with DoD to minimize the project's impacts to military training routes. More details will be provided in the FSA.

The PSEGS's 760-foot-high solar towers would exceed a height of 200 feet above ground level (AGL). Therefore, under Title 14, Part 77 of the Code of Federal Regulations, the towers would require review by the Federal Aviation Administration (FAA). Furthermore, construction cranes exceeding 200 feet AGL would be necessary for tower construction and would also require FAA review. In March 2013, the project owner submitted to the FAA for each solar tower a Form 7460-1 "Notice of Proposed Construction or Alteration" as required. The FAA has not yet responded to the submittal. The project owner has not yet submitted a Form 7460-1 for the construction cranes.

For project compliance with FAA regulations, staff is proposing Condition of Certification **TRANS-5** to require that the project owner notify the FAA of any construction cranes exceeding 200 feet in height. Staff is also proposing **TRANS-6,** which would require the project owner to install obstruction marking and lighting on the solar towers and any construction cranes with heights exceeding 200 feet AGL, in accordance with FAA Advisory Circular 70/7460-1 K Change 2. The **Biological Resources** section of this PSA states that obstruction lighting must consist only of flashing red lights. Staff will coordinate with the FAA to confirm that this form of lighting is acceptable for the project and will include more information in the FSA. With implementation of **Conditions of Certification TRANS-5 and TRANS-6**, the project would comply with FAA regulations, and the project structures would not create a significant impact on aviation.

Thermal Plumes

The PSEGS's wet surface air cooler, auxiliary boiler and nighttime boiler would produce thermal plumes, hot columns of gas discharged toward the sky. Thermal plume velocities would be greatest at the discharge points, with plume velocities decreasing with increasing altitude. Aircraft flying through parts of thermal plumes exceeding 4.3 meters/second (m/s) in vertical velocity may experience moderate to significant turbulence, which could compromise pilot control and aircraft stability.[4]

To determine whether the thermal plumes emitted from the PSEGS would exceed 4.3 m/s at altitudes where aircraft could fly, Energy Commission Air Quality staff (Jacquelyn Leyva Record) modeled plume velocities for the project's wet surface air cooler, auxiliary boiler, and nighttime boiler. Air Quality staff found that in each case, thermal plume vertical velocity exceeded 4.3 m/s at altitudes of approximately 200 feet above ground level (AGL) or below. At altitudes higher than approximately 200 feet AGL, thermal plume velocity was below the critical 4.3 m/s threshold for endangering aircraft. Aircraft would generally be flying at altitudes much higher than 200 feet AGL; therefore, the thermal plumes would have less than significant impacts to aviation.

GLINT AND GLARE IMPACTS ON MOTORISTS AND PILOTS

The proposed PSEGS's mirrored heliostats and solar receiver steam generator (SRSG) tower would generate glint and glare, which could cause impacts to both ground traffic and aviation if sufficient to compromise a driver's or pilot's ability to operate his/her vehicle or aircraft. PSEGS Unit 2 is especially close to I-10, at a distance of approximately 4,500 feet from the highway. Caltrans District 8 staff are concerned about potential glint and glare impacts to motorists on I-10, especially due to the high volume of truck traffic traversing the highway.

Staff provided detailed glint and glare data requests as part of Data Request Set No. 3 and received data responses from the project owner on June 17th, too late for analysis and inclusion in the PSA. Therefore, the glint and glare discussion as follows is preliminary, incomplete, and based on information staff received in time for inclusion in the PSA. Now that staff has received responses to Data Request Set No. 3, staff will continue to coordinate with Caltrans staff regarding their concerns and potential mitigation, if necessary. Staff will also contact the U.S. Department of Transportation to see if they have any concerns. Staff's conclusions in the FSA regarding glint and glare, which will be based on the recently received data responses, may be different than in the PSA.

Glint and Glare from the Heliostats

[4] This is based on staff's review of a 2004 safety circular (AC 139-05(0)), prepared by the Australian Government Civil Aviation Safety Authority, that noted "aviation authorities have established that an exhaust plume with a vertical velocity in excess of 4.3 meters per second (m/s) may cause damage to an aircraft airframe or upset an aircraft when flying at low levels" (CASA 2004). In their safety study on thermal plumes the FAA noted that they "do not necessarily approve/disapprove or warrant the data contained in the CASA AC 139-05." The safety team accepted "the information and data contained in AC 139-05 as a valid representation of hazardous exhaust velocities" (FAA 2006).

Glint and glare may cause a viewer to experience difficulty seeing. While glint is a temporary flash of brilliant light, glare is a more sustained bright light. Heliostats are sources of both glint and glare: glint from direct solar reflections and sustained glare from reflections of the sun and sky background. This glint and glare could potentially impact motorists on I-10. Until staff can analyze the project owner's responses to the glint and glare data requests in Data Request Set No. 3, staff cannot make a conclusion about the significance of heliostat glint and glare impacts to motorists. As indicated earlier, the FSA will consider the project owner's recent data responses and include staff's final conclusions regarding the impact of glint and glare from the heliostats during both construction and operation of the project. Staff will likely require slatted fencing around the project to partially block the heliostats and reduce any reflections onto I-10. Staff may also require that any mirror-washing at the project site occur at night in order to avoid any reflections onto I-10.

It should be noted that the Ivanpah Solar Electric Generating System, which uses solar power tower technology and was approved by the Energy Commission in 2010, has had to shut down testing of their facility each day approximately one hour earlier than planned due to glint and glare impacts to Interstate 15. The testing phase involves finding the precise optimal positioning of the heliostats, so there is a chance that glint and glare impacts might be reduced during operation of the project, once the heliostats are in their final positions.

Glint and glare from heliostats in the standby position, where the heliostats are facing skyward, could also cause impacts to pilots. While in the standby position, a heliostat's focal point would be slightly above the SRSG and would diverge beyond the standby ring. Thus, an aircraft passing through one or more heliostat 'beams' at altitude above or near the heliostat field would receive a divergent beam. The appearance of a divergent beam would not be like a direct solar reflection, seen as the specular (mirror-like) solar reflection off a lake or pond. Rather, the reflection would tend to be more diffuse and less bright, becoming increasingly diffuse and dim as a function of an aircraft's increasing altitude or distance above the project. Pilots experiencing these reflections would usually experience mild discomfort, defined as an instinctive desire to look away from the bright light source or difficulty seeing an object ahead. This mild discomfort would usually be temporary, as a heliostat exposure would generally be brief. However, rarely a flight path might receive successive heliostat exposures in rapid succession over an extended period of time. Under these circumstances, a pilot could experience significant discomfort. Staff does not anticipate that pilots would ever experience disability glare, which would cause the pilot to be unable to see objects ahead.

Improperly positioned or malfunctioning heliostats could potentially increase glint and glare impacts to both drivers and aircraft pilots. To minimize glint and glare and prevent impacts from being significant, staff will include a condition of certification to ensure that heliostats are positioned appropriately. This condition will be a modification of the existing Condition of Certification **TRANS-7** and will be included in the FSA, once staff analyzes the information from the project owner provided recently in response to Data Request Set No. 3.

Glare from the SRSGs

The SRSGs would produce unavoidable, unmitigable glare. At this point, staff is unable to determine the significance of this glare, as staff could not analyze the project owner's recent response to Data Request Set No. 3 in time for inclusion in the PSA. After staff analyzes this information, staff will be able to assess the significance of the SRSG glare impacts to motorists and pilots. At this point, staff thinks that SRSGs would likely be a source of discomfort glare, but not disability glare. The reasoning is that like with the sun, a person seeing glare from the SRSGs would avert their eyes from the glare source, just as a person averts their gaze from the sun. Unless a person was directly staring at the SRSGs for a period of time, glare would probably not cause disability effects (inability to see objects ahead) for motorists or pilots.

Staff has also concluded that neither motorists nor pilots would experience retinal damage from glint and glare from the heliostats or SRSGs. For a more thorough discussion of glint and glare, refer to **APPENDIX TT1 – GLINT AND GLARE IMPACT ASSESSMENT** (at the end of this section). See also the **VISUAL RESOURCES** section of this PSA.

DRIVER DISTRACTION

Motorists on I-10 could potentially experience glare distraction while viewing the project and attempting to discern the source of the unusual-looking glint and glare that the project would create. This could possibly increase the risk of accidents. To mitigate this impact, staff is coordinating with Caltrans staff to discuss the possibility of installing signs along I-10 warning motorists of the presence of the plant up ahead. Also, in the FSA, after staff is able to analyze the glint and glare information recently submitted by the project owner, staff will include a condition requiring fencing around the project to help block the heliostats from view of the motorists. Staff will include more details in the FSA.

TRANSPORTATION OF HAZARDOUS MATERIALS

Both the construction and operation of the proposed PSEGS would involve the transportation of hazardous materials to the site. The transport vehicles would be required to follow federal and state regulations governing proper containment vessels and vehicles, including appropriate identification of the nature of the contents.

In addition to the governing federal and state regulations, Condition of Certification **TRANS-8** requires that the project owner secure permits and/or licenses from the California Highway Patrol and Caltrans for the transportation of hazardous materials. See the **HAZARDOUS MATERIALS MANAGEMENT** section of the PSA for more information on hazardous materials. With implementation of Condition of Certification **TRANS-8**, the PSEGS would cause less than significant impacts to roadways and the traveling public from transportation of hazardous materials.

PARKING CAPACITY

Construction period parking demands would be accommodated by a construction laydown area of approximately 203 acres. This parking area would accommodate all construction workforce vehicles.

During operations, employees would park on-site at the common facilities area and at each power block. The project would provide 38 spaces at the common facilities area, 19 spaces at the Unit 1 power block, and 19 spaces at the Unit 2 power block for a total of 76 parking spaces. These parking areas would provide sufficient parking for all operations employees on-site simultaneously (40 workers during the day and 60 workers during the evening).

Because the PSEGS supplies an adequate amount of on-site parking, the project would not result in any parking spill-over to sensitive areas and would not create any adverse impacts.

PROJECT-RELATED FUTURE ACTIONS – TRANSPORTATION AND TRAFFIC

The original Palen analysis included a discussion of the SCE Red Bluff Substation as an associated reasonably foreseeable project. It also included an analysis of traffic generated by construction of the substation. Because construction of the SCE Red Bluff Substation is currently underway and anticipated to be completed before start of construction of the PSEGS, there is no need to analyze substation traffic impacts at this point.

CUMULATIVE IMPACTS AND MITIGATION

A project may result in a significant adverse cumulative impact when 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 (1) past projects; (2) other current projects; and (3) probable future projects (California Code Regulation, Title 14, section 15130).

The potential exists for substantial future development throughout the entire Southern California Desert Region as well as on the Interstate 10 (I-10) corridor in Eastern Riverside County. In this document, Energy Commission staff has limited the traffic and transportation analysis to the I-10 corridor of Eastern Riverside County within a range starting approximately 20 miles west of the project site and ending approximately 40 miles east of the project site near Blythe, CA. Staff selected this range because it encompasses many existing and proposed development projects, including many other energy projects, that could generate traffic traveling on I-10 near the PSEGS site. See **Traffic and Transportation Figure 3 – Traffic and Transportation Cumulative Projects** for a list of current, pending, and foreseeable development projects in this area.

Although I-10 currently operates at LOS A, the LOS on I-10 could degrade with the volume of construction traffic generated by the PSEGS in combination with traffic generated by the identified additional projects shown in **Traffic and Transportation Figure 3 – Traffic and Transportation Cumulative Projects**. Staff is currently unable to assess any cumulative impacts from PSEGS construction traffic, as staff is awaiting information from the project owner regarding direct project impacts, as requested in Energy Commission staff’s Data Request Set No. 1, #14. However, staff concludes that

PSEGS operations traffic would not contribute to cumulative impacts, as operations traffic would be minimal.

The PSEGS project would probably not combine with other nearby existing or proposed solar projects to cause significant cumulative glint and glare impacts to motorists. There are a couple of other nearby large-scale solar projects involving mirrors, such as the Genesis Solar Energy Project, which uses parabolic troughs and is under construction, and the Blythe Solar Power Project, approved by the Energy Commission to use parabolic trough technology, although an amendment petition was filed in June 2012 to use solar photovoltaic (PV) technology instead. However, these projects are sufficiently far from the PSEGS so that motorists on I-10 would not experience glint and glare impacts from either of these projects simultaneously with the most severe glint and glare impacts from the PSEGS. Genesis is approximately 15 miles east of the proposed PSEGS site and the Blythe Solar Power Project is approximately 30 miles east of the proposed PSEGS site. Furthermore, if the Blythe Solar Power Project is converted to PV technology, it would emit very little glint and glare, as PV panels are designed to absorb rather than reflect sunlight. Staff will make a final determination on cumulative glint and glare impacts to motorists after analyzing the glint and glare information requested from the project owner in Data Request Set No. 3.

The PSEGS project could potentially combine with other nearby existing and proposed solar projects to cause cumulative glint and glare impacts to pilots. Once staff reviews the glint and glare information requested from the project owner in Data Request Set No. 3, staff will analyze this possibility and include the analysis in the FSA.

COMPLIANCE WITH LORS

The PSEGS project as proposed and with conditions of certification as mitigation would comply with most federal, state, and local LORS. The exception to this is that staff has not yet determined the PSEGS's consistency with the Riverside County Circulation Element. Staff is awaiting traffic information requested as part of Data Request Set No. 1, #14, in order to determine consistency, which will be discussed further in the FSA. See **Traffic and Transportation Table 4**, below, for a summary of the PSEGS's conformance with all applicable LORS.

Traffic and Transportation Table 4
PSEGS Compliance with Adopted Traffic and Transportation LORS

Applicable LORS	Description
Federal	

Applicable LORS	Description
Title 14, Code of Federal Regulations, Aeronautics and Space, part 77 - Objects Affecting Navigable Airspace (14 C.F.R., part 77)	These regulations establish standards for determining physical obstructions to navigable airspace; set noticing and hearing requirements; provide for aeronautical studies to determine the effect of physical obstructions on the safe and efficient use of airspace; and oversee the development of antenna farm areas. Consistent: In March 2013, the project owner submitted to the FAA for each solar tower a Form 7460-1 "Notice of Proposed Construction or Alteration" as required by FAA regulations for structures exceeding 200 feet in height. The FAA has not yet responded. Staff will include the FAA's response in the FSA. For further project compliance with FAA regulations, staff is proposing Condition of Certification **TRANS-5** to require that the project owner notify the FAA of any construction cranes exceeding 200 feet in height. Staff is also proposing **TRANS-6,** which would require the project owner to install obstruction marking and lighting on the solar towers and any construction cranes with heights exceeding 200 feet AGL, in accordance with FAA Advisory Circular 70/7460-1 K Change 2. (Biological Resources staff states in the Biological Resources section of this PSA that obstruction lighting must consist only of flashing red lights. Traffic and Transportation staff will consult with the FAA to confirm that this is feasible and will include the details in the FSA.) With implementation of Conditions of Certification **TRANS-5** and **TRANS-6**, the project would comply with FAA regulations.
Title 49, Code of Federal Regulations Subtitle B, parts 171-173, 177-178, 350-359, 397.9 and Appendices A-G	Addresses safety considerations for the transport of goods, materials, and substances. Governs the transportation of hazardous materials including types of materials and marking of the transportation vehicles. Consistent: PSEGS construction and operation would involve transport of hazardous materials. Enforcement is conducted by state and local law enforcement agencies and through state agency licensing and ministerial permitting (e.g., California Department of Motor Vehicles licensing, Caltrans permits), and/or local agency permitting (e.g., County of Riverside). The project owner will adhere to all required regulations. This adherence is made part of the licensing process as Condition of Certification **TRANS-8**.
State	
California Vehicle Code, sections 353; 2500-2505; 31303-31309; 32000-32053; 32100-32109; 31600-31620; California Health and Safety Code, sections 25160 et seq.	Regulates the highway transport of hazardous materials. Consistent: The PSEGS will comply with these regulations. Enforcement is provided by state and local law enforcement agencies, and through ministerial state agency licensing and permitting and/or local agency permitting. Adherence is made part of the licensing process as Condition of Certification **TRANS-8**.
California Vehicle Code, sections 13369; 15275 and 15278	Addresses the licensing of drivers and the classification of licenses required for the operation of particular types of vehicles; also requires certificates permitting operation of vehicles transporting hazardous materials. Consistent: The PSEGS will comply with these regulations. Enforcement is provided by state and local law enforcement agencies, and through ministerial state agency licensing and permitting and/or local agency permitting. Adherence is made part of the licensing process as Conditions of Certification **TRANS-2** and **TRANS-8**.
California Vehicle Code, sections 35100 et seq.;	Specifies limits for vehicle width, height, and length.

Applicable LORS	Description
sections 35250 et seq.; and sections 35400 et seq.	<u>Consistent</u>: The PSEGS will comply with these regulations. Enforcement is provided by state and local law enforcement agencies, and through ministerial state agency licensing and permitting and/or local agency permitting. Adherence is made part of the licensing process as Condition of Certification **TRANS-2**.
California Vehicle Code, section 35780	Requires permits for any load exceeding Caltrans weight, length, or width standards for public roadways. <u>Consistent</u>: The PSEGS will comply with these regulations. Enforcement is provided by state and local law enforcement agencies, and through ministerial state agency licensing and permitting and/or local agency permitting. Adherence is made part of the licensing process as Condition of Certification **TRANS-2**.
California Streets and Highways Code, sections 117, 660-672	Requires permits for any load exceeding Caltrans weight, length, or width standards on County roads. <u>Consistent</u>: The PSEGS will comply with these regulations. Enforcement is provided by state and local law enforcement agencies, and through ministerial state agency licensing and permitting and/or local agency permitting. Adherence is made part of the licensing process as Condition of Certification **TRANS-2**.
California Streets and Highways Code, sections 117, 660-670, 1450, 1460 et seq., and 1480 et seq.	Regulates permits from Caltrans for any roadway encroachment for facilities that require construction, maintenance, or repairs on or across State highways and County roads. <u>Consistent</u>: The PSEGS will comply with these regulations. Enforcement is provided by state and local law enforcement agencies, and through ministerial state agency licensing and permitting and/or local agency permitting. Adherence is made part of the licensing process as Condition of Certification **TRANS-3** and **TRANS-4**.
Local	
Riverside County General Plan Circulation Element	Specifies long-term planning goals and procedures for transportation infrastructure system quality. <u>Consistency undetermined</u>: Consistency will be determined as part of the FSA, when staff receives the traffic information requested in Data Request Set No. 1, #14.
Riverside County General Plan Circulation Element	Specifies LOS standards to assess the performance of a street or highway system and the capacity of a roadway. <u>Consistency undetermined</u>: Consistency will be determined as part of the FSA, when staff receives the traffic information requested in Data Request Set No. 1, #14.
Riverside County Municipal Code Title 10, Chapter 10.08, Sections 10.08.010-10.08.180	Specifies limits and permit requirements for oversize loads. <u>Consistent</u>: The PSEGS will comply with these regulations. Riverside County will provide enforcement and any necessary permitting. Adherence is made part of the licensing process as Condition of Certification **TRANS-2**.
Riverside County Municipal Code Title 12, Chapter 12.08, Sections 12.08.010-12.08.100	Specifies permit requirements for encroachment permits. <u>Consistent</u>: The PSEGS will comply with these regulations. Riverside County will provide enforcement and any necessary permitting. Adherence is made part of the licensing process as Condition of Certification **TRANS-4**.

NOTEWORTHY PUBLIC BENEFITS

While the development of the proposed modified project is intended to address the requirements of federal and state mandates to develop renewable energy, it would not yield any noteworthy public benefits related to traffic and transportation.

RESPONSE TO AGENCY AND PUBLIC COMMENTS

The Department of Defense (DoD) submitted a comment letter, included in the Petition to Amend, stating that while the project would likely impact military training routes in the area, they believe those impacts can be mitigated. Staff will coordinate with the DoD regarding impacts to military training routes and will confirm that military aircraft would fly above the project or at higher altitudes, as planned for the similar Rio Mesa project.

Staff has also discussed potential glint and glare impacts with California Department of Transportation (Caltrans) District 8 staff. Caltrans staff is concerned about glint and glare impacts to I-10. Energy Commission staff will continue to coordinate with Caltrans now that the additional glint and glare information requested from the project owner as part of Data Request Set No. 3 has been received.

No other agencies or members of the public have submitted comments concerning traffic and transportation issues.

CONCLUSIONS

1. The PSEGS's construction traffic impacts are currently undetermined. In Energy Commission staff's Data Request Set No. 1, #14, staff requested further information about traffic impacts during peak and daily construction. Once this information is received, staff can complete the analysis of the project's construction traffic impacts.

2. The PSEGS's operational traffic impacts would be less than significant.

3. The PSEGS's primary emergency vehicle access is adequate. The PSEGS's alternative emergency access, which would be provided by all-terrain fire trucks and two access gates, as required by **Worker Safety and Fire Protection** staff, is also adequate.

4. Because of the PSEGS's distance from the nearest rail and bus service, the project would have no impact on these forms of transportation.

5. With implementation of Conditions of Certification **TRANS-5** and **TRANS-6**, the PSEGS would not pose significant obstruction hazards to aircraft. **TRANS-5** would require that the project owner notify the FAA of any construction cranes exceeding 200 feet in height. **TRANS-6** would require the project owner to install obstruction marking and lighting on the solar towers and any construction cranes with heights exceeding 200 feet AGL.

6. The PSEGS would not produce a high-velocity thermal plume impacting aircraft.

7. Heliostat glint and glare impacts to motorists are currently undetermined. In Data Request Set No. 3, staff requested glint and glare information which was provided by the project owner on June 17th, too late for analysis and inclusion in the PSA. Staff will review this information and include in the FSA a complete analysis of the project's heliostat glint and glare impacts to motorists.

8. The PSEGS's glint and glare impacts to pilots is undetermined at this time. Staff must review the project owner's recent submittal of information requested in Data Request Set No. 3 in order to make a determination. At this point, staff thinks that glint and glare from the heliostats could cause pilots to experience mild discomfort, and rarely, significant discomfort, which would not be a significant impact.

9. The SRSGs would produce unavoidable, unmitigable glare from a visual resources perspective. At this point, staff is unable to determine the significance of this glare from a traffic and transportation perspective. Staff must first review the project owner's recently submitted responses to Data Request Set No. 3. After reviewing this information, staff will include in the FSA a conclusion regarding the significance of SRSG glare to motorists and pilots. At this point, staff thinks that the SRSGs would likely be a source of discomfort glare, but not disability glare.

10. Neither motorists nor pilots would experience retinal damage from glint and glare from the heliostats or SRSGs.

11. With implementation of Condition of Certification **TRANS-8**, the PSEGS would cause less than significant impacts to roadways and the traveling public from transportation of hazardous materials. **TRANS-8** requires that the project owner secure permits and/or licenses from the California Highway Patrol and Caltrans for the transportation of hazardous materials.

12. The PSEGS supplies an adequate amount of on-site parking during both construction and operation and would not create any significant parking impacts.

13. Staff is currently unable to assess cumulative impacts from PSEGS construction traffic, as staff is awaiting information from the project owner regarding project traffic impacts, as requested in staff's Data Request Set No. 1, #14. However, staff concludes that PSEGS operations traffic would not contribute to cumulative impacts, as operations traffic would be minimal.

14. The PSEGS project would probably not combine with other nearby existing or proposed solar projects to cause cumulative glint and glare impacts to motorists. Staff will confirm this in the FSA following review of the glint and glare information requested from the project owner in Data Request Set No. 3.

15. The PSEGS project could potentially combine with other nearby existing and proposed solar projects to cause cumulative glint and glare impacts to pilots. Once staff reviews the glint and glare information requested from the project owner in Data Request Set No. 3, staff will analyze this possibility and include the analysis in the FSA.

16. The PSEGS project as proposed and with Conditions of Certification would comply with most applicable LORS related to traffic and transportation. The exception to this is that staff has not yet determined the PSEGS's consistency with the Riverside County Circulation Element. Staff is awaiting traffic information requested as part of Data Request Set No. 1, #14, in order to determine consistency, which will be discussed further in the FSA.

17. **TRANS-1** requires the owner to develop and implement a Traffic Control Plan (TCP). The TCP would include a plan for reducing peak construction traffic impacts This condition may be modified after the project owner submits traffic information as requested in Data Request Set No. 1, #14.

18. **TRANS-2** requires the owner to comply with limits on vehicle sizes and weights and driver licensing regulations.

19. **TRANS-3** requires the owner to restore all roads damaged by construction activities.

20. **TRANS-4** requires the owner to comply with limits on encroachment into public-rights-of-way and to obtain all of the necessary project permits.

21. As part of the amendment, staff is proposing a new condition of certification, **TRANS-5**, to require that the project owner notify the FAA of any construction cranes exceeding 200 feet in height.

22. As part of the amendment, staff is proposing a new condition of certification, **TRANS-6,** which would require the project owner to install obstruction marking and lighting on the solar towers and any construction cranes with heights exceeding 200 feet AGL, in accordance with FAA Advisory Circular 70/7460-1 K Change 2.

23. **TRANS-7** as included in the original project will be modified to require a detailed heliostat positioning and monitoring plan. Staff will include this condition in the FSA after reviewing the glint and glare information requested from the project owner in Data Request Set No. 3.

24. **TRANS-8** requires the owner to secure permits and licenses for the transport of hazardous materials.

Staff has reviewed Socioeconomics Figure 1, which shows that there is no minority population within a six-mile buffer of the proposed PSEGS. Therefore, construction and operation of the proposed project would not cause disproportionate direct or cumulative traffic and transportation impacts to an environmental justice population.

PROPOSED CONDITIONS OF CERTIFICATION

Staff has proposed modifications to the Traffic and Transportation Conditions of Certification as shown below. (**Note:** Deleted text is in ~~strikethrough~~, new text is <u>**bold and underlined.**</u>)

In summary, staff has added new conditions for the amendment (**TRANS-5** and **TRANS-6**) which made it necessary to renumber the existing conditions for the original project. Additional modifications to these conditions, especially to **TRANS-1** (**TRANS-4** in the original Palen Final Decision) and **TRANS-7 (TRANS-6** in the original Palen Final Decision), will likely be made in the FSA.

<u>TRANS-1</u>~~TRANS-4~~ Prior to the start of construction of the PSEGS, the project owner shall prepare and implement a Traffic Control Plan (TCP) for the PSEGS's construction and operations traffic. The TCP shall address the movement of workers, vehicles, and materials, including arrival and departure schedules and designated workforce and delivery routes.

The project owner shall consult with the County of Riverside and the California Department of Transportation (Caltrans) District 8 office in the preparation and implementation of the Traffic Control Plan (TCP). The project owner shall submit the proposed TCP to the County of Riverside and the Caltrans District 8 office in sufficient time for review and comment, and to the Energy Commission Compliance Project Manager (CPM) for review and approval prior to the proposed start of construction and implementation of the plan.

The CPM shall review and approve the TCP or identify any material deficiencies within thirty (30) days of receipt. The project owner shall provide a copy of any written comments from the County of Riverside and the Caltrans District 8 office and any changes to the TCP to the CPM prior to the proposed start of construction.

The Traffic Control Plan (TCP) shall include:

- A work schedule and end-of-shift departure plan designed to ensure that stacking does not occur at intersections necessary to enter and exit the project sites. The project owner shall consider using one or more of the following measures designed to prevent stacking: staggered work shifts, off-peak work schedules, and/or restricting travel to and departures from each project site to 10 or fewer vehicles every three minutes during peak travel hours on I-10.
- Provisions for an incentive program, such as employer-sponsored commuter checks, to encourage construction workers to carpool and/or use van or bus service.
- Limitation of truck deliveries at the project site to only off-peak hours.
- A heavy-haul plan addressing the transport and delivery of heavy and oversized loads requiring permits from the California Department of Transportation (Caltrans) or other state or federal agencies.
- Timing of heavy equipment and building material delivery to the sites
- Parking for workforce and construction vehicles.
- Emergency vehicle access to the project site.

- Provisions for redirection of construction traffic with a flag person as necessary to ensure traffic safety and minimize interruptions to non-construction related traffic flow.
- Placement of signage, lighting, and traffic control devices at the project construction site and laydown areas.
- Placement of signage along northbound Corn Springs Road and at the entrance of each of the I-10 westbound and eastbound off-ramps at Corn Springs Road notifying drivers of construction traffic throughout the duration of the construction period.
- Placement of signage to redirect traffic from Corn Springs Road during construction activities related to roadway realignments and pipeline installation in and across the Corn Springs Road right-of-way
- Temporary closing of travel lanes, if necessary.
- Access to adjacent residential and commercial property during the construction of all linears

Verification: At least 60 calendar days prior to the start of construction, including any grading or site remediation on the power plant site or its associated easements, the project owner shall submit the proposed TCP to the County of Riverside and the Caltrans District 8 office for review and comment and to the CPM for review and approval. The project owner shall also provide the CPM with a copy of the transmittal letter to the County of Riverside and the Caltrans District 8 office requesting review and comment.

At least 30 calendar days prior to the start of construction, the project owner shall provide copies of any comment letters received from either the County of Riverside and the Caltrans District 8 office, along with any changes to the proposed Traffic Control Plan, to the CPM for review and approval.

TRANS-2~~TRANS-1~~ The project owner shall comply with limitations imposed by Caltrans District 8 and other relevant jurisdictions, including the County of Riverside, on vehicle sizes and weights and driver licensing. In addition, the project owner or its contractor shall obtain necessary transportation permits from Caltrans and all relevant jurisdictions for roadway use.

Verification: In the Monthly Compliance Reports (MCRs), the project owner shall report permits received during that reporting period. In addition, the project owner shall retain copies of permits and supporting documentation on-site for Compliance Project Manager (CPM) inspection if requested.

TRANS-3 The project owner shall restore all public roads, easements, and rights-of-way that have been damaged due to project-related construction activities to original or near-original condition in a timely manner, as directed by the CPM. Repair and restoration of access roads may be required at any time during the construction phase of the project to assure safe ingress and egress.

Verification: At least 30 days prior to the start of mobilization, the project owner shall photograph or videotape all affected public roads, easements, and right-of-way segments and/or intersections and shall provide the CPM and the affected local jurisdictions and Caltrans (if applicable) with a copy of these images. The project owner shall rebuild, repair and maintain all public roads, easements, and rights-of-way in a usable condition throughout the construction phase of the project.

At least 30 days prior to the start of site mobilization, the project owner shall consult with the County of Riverside and Caltrans District 8 and notify them of the proposed schedule for project construction. The purpose of this notification is to request that the County of Riverside and Caltrans consider postponement of public right-of-way repair or improvement activities in areas affected by project construction until construction is completed and to coordinate with the project owner regarding any concurrent construction-related activities that are planned or in progress and cannot be postponed.

Within 60 calendar days after completion of construction, the project owner shall meet with the CPM, the County of Riverside, and Caltrans District 8 to identify sections of public right-of-way to be repaired. At that time, the project owner shall establish a schedule to complete the repairs and to receive approval for the action(s). Following completion of any public right-of-way repairs, the project owner shall provide to the CPM a letter signed by the County of Riverside and Caltrans District 8 stating their satisfaction with the repairs.

TRANS-4~~**TRANS-5**~~ The project owner or contractor shall comply with Caltrans' and other relevant jurisdictions' limitations for encroachment into public rights-of-way and shall obtain necessary encroachment permits from Caltrans and any other relevant jurisdictions.

Verification: In the MCRs, the project owner shall report permits received during that reporting period. In addition, for at least six months after the start of commercial operation, the project owner shall retain copies of permits and supporting documentation on-site for CPM inspection if requested.

TRANS-5 Federal Aviation Administration Notification of Construction Cranes

The project owner shall file a Form 7460-1 with the Federal Aviation Administration (FAA) regarding the use of any construction cranes exceeding 200 feet in height.

Verification: At least 90 days prior to ground disturbance, the project owner shall submit a copy of the FAA Determination of No Hazard to Navigable Airspace regarding the construction cranes to the CPM.

TRANS-6 Obstruction Marking and Lighting

The project owner shall install obstruction marking and lighting on the two solar power towers and any construction cranes exceeding 200 feet in height. Marking and lighting shall be consistent with FAA requirements, as expressed in the following documents:

- **FAA Advisory Circular 70/7460-1K (Change 2)**
- **FAA Safety Alert for Operators (SAFO) 09007.**

Temporary lighting must be installed once a tower reaches 200 feet in height during construction. Permanent lighting consistent with all requirements shall be installed and activated within 5 days of completion of construction and prior to the start of plant operation. Lighting shall be operational 24 hours a day, 7 days a week for the life of project operation. Upgrades to the required lighting configurations, types, location, or duration shall be implemented consistent with any changes to FAA obstruction marking and lighting requirements.

Verification: At least 60 days prior to the start of construction, the project owner shall submit to the CPM for approval final design plans for the two solar power towers that depict the required air traffic obstruction marking and lighting, including the temporary lighting.

Within 1 day of the tower heights reaching 200 feet in height, the project owner shall install temporary lighting consistent with FAA requirements and shall inform the CPM within writing (including a photo of the lighting) within 10 days of installation.

Within 5 days of completion of solar power tower construction and prior to the start of plant operation, the project owner shall install and activate permanent obstruction marking and lighting consistent with FAA requirements and shall inform the CPM in writing within 10 days of installation and activation. The lighting shall be inspected and approved by the CPM (or designated inspector) within 30 days of activation.

TRANS-7~~**TRANS-6**~~ To reduce glint and glare from the Project, the Project Owner shall implement the following measures during operation of any unit:

1. Ensure the mirrors are brought out of stowage before sunrise and are aligned to catch the first rays of the morning sun;

2. Ensure the mirrors are returned to stow position after sunset;

3. As soon as is feasible, redirect malfunctioning mirrors to the east in a manner so that there is no reflection from the sun as the sun continues west; and

4. Establish a toll-free number for the public to report complaints related to glint and glare and post such number in the same location as that required in Compliance-9. If the project owner receives a complaint regarding glint or glare it shall investigate to determine whether the complaint is legitimate and if the project is the source of such glint or glare. If it is determined that the project is the source of such glint or glare and the glint or glare is causing human health or safety hazards, the project owner shall take all feasible measures to reduce the glint or glare. Such measures may include localized screening. The project owner shall notify the CPM within 3 days of receiving a glint or glare complaint. As soon as the complaint has been resolved the project owner shall submit to the CPM a report in which the complaint(s) as well as the actions taken to

resolve the complaint are documented. The report shall include (a) a complaint summary, including the name and address of the complainant; and (b) a discussion of the steps taken to investigate the complaint, the reasons supporting a determination of whether or not the complaint is legitimate, and the steps taken to address the complaint and the final results of these efforts. In the monthly compliance report, the project owner shall describe any complaints it received that month that it determined not to be legitimate and shall explain the basis of its determination.

Verification: 90 days prior to the start of operation of any unit, the project owner shall prepare and submit to the CPM for review and approval a plan describing how the above measures will be implemented to reduce glint and glare. If a legitimate complaint is received concerning potential human health and safety hazards relating to glint or glare, the project owner shall notify the CPM within 3 days of receipt of the complaint and shall provide to the CPM within 10 days of the complaint the report detailing how the complaint has been addressed. . In the monthly compliance report, the project owner shall describe any complaints received that month that were determined not to be legitimate and shall explain the basis of that determination. If no legitimate complaints are received and/or if a legitimate complaint is received and the project owner has resolved the source of the complaint(s) within the first 12 months of project operation, project owner can request that the CPM release the project owner from the obligations under Section 4 of this condition after the 12th month of project operations.

TRANS-8~~**TRANS-2**~~ The project owner shall ensure that permits and/or licenses are secured from the California Highway Patrol and Caltrans for the transport of hazardous materials.

Verification: In the MCRs, the project owner shall report permits and/or licenses for hazardous substance transportation received during that reporting period. In addition, the project owner shall retain copies of permits, licenses, and supporting documentation on-site for CPM inspection if requested.

REFERENCES

AIRNAV 2013 – AirNav, http://www.airnav.com/airport/CN64, accessed June 2013.

DON 2012 – Department of the Navy, Chocolate Mountain Aerial Gunnery Range Proposed Land Withdrawal Renewal, http://www.chocolatemountainrenewal.com/index.html, accessed May 2012.

FAA 2006 – Federal Aviation Administration. FAA Safety Risk Analysis of Aircraft Overflight of Industrial Exhaust Plumes, dated January 2006.

APPENDIX TT1 – GLINT AND GLARE SAFETY IMPACT ASSESSMENT

Gregg Irvin, Ph.D.

This appendix provides an assessment of potential glint and glare impacts from the proposed Palen Solar Electric Generating System (PSEGS). Specifically, staff assessed the project's potential to cause retinal damage and temporary visual discomfort and disability to nearby viewers. This assessment is preliminary because as of the time of completion of this report, the project owner had not yet responded to staff's requests in Data Request Set No. 3 for more glint and glare information. On June 17th, after preparation of this report, the project owner provided the requested information. However, submittal was too late for review and analysis in the PSA. Conclusions based on the recently submitted information will be included in the FSA.

RETINAL DAMAGE

The ability of light to cause injury to the retina has been shown both clinically and experimentally. Light can result in retinal damage through photothermal, photomechanical, and photochemical mechanisms. For the current project both photothermal and photochemical mechanisms are relevant.

PHOTOTHERMAL RETINAL DAMAGE

Photothermal retinal damage occurs when the eye is exposed to sufficient light energy to heat the retina to a point where damage occurs resulting in a permanent blind spot. Since the eye is an optical focusing system the energy at the retinal surface is concentrated by as much as a factor of 100,000. The ocular impact on an observer from either the heliostats or the solar receiver steam generators (SRSGs) is calculated as the retinal irradiance (Er). The calculation of Er takes under consideration the size of the light emitting object (SRSG or heliostat), the intensity in W/m2 (irradiance) at the observer location, and the vulnerability of the human eye.

The level of exposure which is considered as the limit between safe and harmful is called Maximum Permissible Exposure (MPE) limit. The MPE that can be tolerated by the human eye is an industry standard and is defined by Sliney and Freasier & el. The MPE is defined for two exposure condition types: momentary exposure, correlated with the human blinking instinct, and continuous exposure.

- MPE for a momentary exposure (0.15 s) is 1 W/cm2 = 10,000 W/m2.
- MPE for continuous exposure is 0.1 W/cm2 = 1,000 W/m2.

Motorists

During normal operation, only the focal area of the SRSG, which is approximately 20 by 20 meters, will receive concentrations of solar radiation. Locations on the ground and areas surrounding the footprint of the plant will not receive solar radiation concentrations above that of direct sunlight. Therefore, in normal plant operation, there is no potential for any plant-sourced solar radiation exposure hazard to motorists outside the boundary of the project.

PSEGS's Unit 2 is closest to Interstate I-10, an east-west regional arterial with fully approved freeway status and a speed limit of 70 mph. The Unit 2 tower is approximately 1,368 meters (4,488 feet) from the highway. At this distance, there is no potential for retinal damage from the solar facility; unless an individual is near the focal point of the collector, there is no risk of permanent eye damage (retinal burn) for an exposure of 0.15 seconds, which is the typical blink reflex time.

This information is tentative as the project owner has yet to provide data supporting these estimates. However, current estimates under a worst-case scenario (no atmospheric attenuation) is that the irradiance to which an observer at 250 meters from the SRSG is exposed is not greater than roughly 50 W/m^2, and this value decreases over distance (i.e., at 400 m it is less than 20 W/m2.)

In conclusion, motorists outside the plant boundaries will not be exposed to retinal irradiance (Er) levels beyond the maximum permissible exposure (MPE) and will not experience photothermal retinal damage. The nearest public right of way is I-10, which is approximately 1,368 meters from the nearest SRSG at its closest point on the southern border of the solar facility.

Pilots

The heliostats are designed to reflect sunlight toward the SRSG at the top of the tower. For normal operation, the heliostats will orient themselves according to their position in the field, day of the year, and time of day, in order to reflect the sun's rays either on the SRSG ("tracking" orientation) or on an area nearby (standby orientation, when the heliostats are focused far enough from the tower and SRSG to free them from radiation but close enough to allow the heliostats to quickly enter tracking mode). In the standby position, the heliostats reflect sunlight back into the sky where the potential exists for the heliostat 'beam' to intercept aircraft.

The size of the PSEGS site as defined by Federal Aviation Administration (FAA) regulations is the volume that encompasses the perimeter of the site up to a height of 500 feet above the tower. This imaginary volumetric body is the control volume that the heliostat tracking system takes under consideration. Within this volume the heliostats are programmed to concentrate flux in certain positions that will cause the flux leaving the imaginary control volume to scatter to a level that will cause no retinal damage to pilots. The control system is designed so that solar flux will not exceed the momentary MPE (10 kW/m^2) outside and above this control volume.

Staff concludes that there is no risk for photothermal retinal damage to pilots.

PHOTOCHEMICAL RETINAL DAMAGE

Photochemical damage is associated with long-duration exposure times as well as lower-wavelength (higher-energy) light exposure. While retina pigment epithelium (RPE) and the neurosensory retina are protected from light-induced exposure by the absorption profile of the surrounding ocular structures (e.g., cornea, crystalline lens, macular pigments) and through retinal photoreceptor outer segment regeneration, photic injury is still possible due to photochemical retinal light toxicity mechanisms.

Photochemical injury is both dose-dependent and cumulative in nature. The cumulative time-dependent nature is that daily exposures can build up and can last many weeks. For example, it has been estimated that the half-life (1/e, when an exposure effect has decayed to approximately 37%) of the cumulative dose exposure effect is on the order of 30 days. This has significant implications for observers that spend a significant amount of time in proximity to the high luminance environment of a solar field in the presence of the additional high terrestrial ambient of the desert environment.

As retinal injury can be caused by exposure to otherwise innocuous visible light, there appears to be some critical dose or threshold at which exposure becomes injurious. The safe exposure times for common ophthalmic instruments (e.g., fundal photography) has been reported in the literature and supports the concept of a critical threshold dose necessary for injury.

The potential for photochemical retinal damage to motorists and pilots given the cumulative exposure effects of the combined terrestrial ambient and solar field/ tower exposure levels should be addressed in the project owner’s response to Data Request Set No. 3. Staff will review this recently submitted information prior to preparation of the FSA.

Staff currently estimates that the potential for photochemical damage to motorists and pilots is not significant, as most motorists and pilots outside of the facility will not experience long duration exposure and therefore should not be at risk for photochemical damage. At these nominal viewing distances, the level of retinal irradiance exposure is approximately less than 6 percent of the MPE for continuous exposure.

GLINT AND GLARE

Glare is considered as difficulty seeing in the presence of bright light, including direct or reflected sunlight or artificial light such as car headlamps at night. Glare is caused by a significant ratio of luminance between the task (that which is being looked at) and the glare source. Factors such as the angle between the task and the glare source and eye adaptation significantly influence the experience of glare. Glare can be generally divided into two types, discomfort glare and disability glare. Discomfort glare results in an instinctive desire to look away from a bright light source or difficulty in seeing a task. Disability glare renders the task impossible to view, such as when driving westward at sunset. Disability glare is often caused by the inter-reflection of light within the eyeball, a scattering effect, reducing the contrast between task and glare source to the point where the task cannot be resolved or distinguished.

Glint is difficulty seeing in the presence of a transient bright light source and is generally considered to be intermittent. A glint effect would be, for example, brief reflections of sky or sunlight from of the heliostats while driving by. A glare effect is more sustained, such as might be present from the sustained reflections from the tower SRSGs. Because the PSEGS project involves the use of mirrors to direct reflected sunlight at power tower receivers, the potential exists for glare or glint to be observed by nearby viewers, including motorists on adjacent roadways and aircraft pilots. The heliostats can be a source of glint for direct solar reflections and a source of sustained glare for reflections of the sun and sky background. The tower SRSGs are a sustained source of glare.

Glint and glare are measured both in terms of the potential for physiological effects and for psychological effects. Physiological effects involve the potential for light to adversely affect the retina of viewers and other parts of the eye through photothermal and photochemical damage. This potential is evaluated in units of watts or kilowatts per square meter (W/m2 or kW/m2) and is generally referred to as irradiance. (See the earlier discussion of photothermal and photochemical damage.) Psychological effects, referred to as glint, glare and perceived brightness, are considered in terms of luminance, evaluated in units of candelas per square meter (cd/m2).

Staff recognizes that definitive standards for the safety effects of glint and glare, from distraction to discomfort to disability, do not exist. Although a variety of organizations including the vision research community, academia, the National Highway Traffic Safety Administration (NHTSA) and the US Air Force have conducted research on various aspects of deleterious effects of glint and glare, there is currently no accepted standard for assessing, measuring, or limiting the distraction, discomfort, or disability effects of glint and glare. Essentially, there is no consensus in the research regarding thresholds for onset of glint and glare effects and there are no reliable metrics for determining the glint and glare thresholds for a significant impact to traffic and transportation.

GLINT AND GLARE FROM THE HELIOSTATS

The project owner has demonstrated through prior modeling for the Hidden Hills and Rio Mesa projects that heliostat retinal irradiance and beam intensity (under worst-case conditions) are eye safe. The heliostats are designed to reflect sunlight toward the SRSG at the top of the tower and are programmed such that reflectivity would rarely be directed toward ground-level viewers located outside of the project site.

Locations on the ground, areas surrounding the footprint of the plant, and the surrounding airspace will not receive solar radiation concentrations above that of direct sunlight. Significant precautionary measures are planned for incorporation into the anticipated heliostat control algorithms. These measures will also be required by Condition of Certification **TRANS-7 Heliostat Positioning and Monitoring Plan**, which will be modified as part of the Final Staff Assessment (FSA) to mitigate the amended project. (Before modifying **TRANS-7**, staff needs to review additional information on glint and glare impacts that the project owner recently submitted in response to Data Request Set No. 3.)

Safe operation of the heliostats, according to the project owner, will be achieved with the following actions:

1. Identify the heliostat movements and positions (including reasonably possible malfunctions) that could result in potential exposure of observers at various locations, including pilots, motorists, pedestrians and hikers in nearby wilderness areas, to reflected solar radiation from heliostats.

2. Describe within the Heliostat Positioning and Monitoring Plan (HPMP) how programmed heliostat operation would address potential human health and safety

hazards at locations of observers, and would limit or avoid potential for harm to birds.

3. Prepare a monitoring plan that would:

   a) obtain field measurements in candela per meters squared and watts per meter squared to validate that the Heliostat Positioning and Monitoring Plan would avoid potential for human health and safety hazards consistent with the methodologies detailed in the 2010 Sandia Lab document presented by Clifford Ho, et al, including those studies and materials related to ocular damage referenced within, and,

   b) provide requirements and procedures to document, investigate and resolve legitimate human health and safety hazard complaints prioritizing localized response (e.g., screening at location of complaint) regarding daytime intrusive light.

4. The monitoring plan should be made available to interested parties, including the California Department of Transportation (Caltrans), California Highway Patrol (CHP), Federal Aviation Administration (FAA), and the Department of Defense (DOD) Southwest Renewable Energy Work Group. The monitoring plan should be updated on an annual basis for the first 5 years and at 2-year intervals thereafter for the life of the project.

Staff agrees with the project owner's above proposed actions and recommends that they be incorporated into modified Condition of Certification **TRANS-7**, which will be included in the FSA. Staff also recommends that **TRANS-7** as written in the FSA require the HPMP to include details regarding positioning of the heliostats with regard to:

- *Safe orientation as default orientation* – Heliostats default to the safe orientation common to the whole field in all cases of malfunctions detected by the heliostat's controller, which ensures protection in most cases of malfunctions.
- *Safe path from any orientation to any other orientation* – A plan ensuring that when heliostats change their orientation, they choose a "path" which avoids reflected sunrays on all unintended and sensitive areas. This should include a plan for the removal of solar flux due to high winds and all non-normal known operational scenarios.
- *Excessive heliostat reflections on sensitive receptor areas* – Sensitive receptors in relatively close proximity to the solar field, e.g., motorists on I-10, could potentially receive a multitude of direct reflections of the sky (not the sun) from the array of heliostats at particular positions during daytime operations. The plan should address the severity of multiple heliostat sky reflections and include a plan for the mitigation of these effects. (Much of this information was requested in Data Request Set No. 3 so that staff may evaluate the adequacy of this mitigation as part of project review.)

The HPMP and resulting control algorithms should include any known sensitive receptors or receptor locations, such as a road or residence, on the list of forbidden areas within each heliostat's controller. This way, each heliostat individually will avoid aiming direct reflected sunrays at the sensitive area to ensure that there will be no concentration of solar radiation on it. With appropriate implementation of these procedures, which will be detailed in **TRANS-7** in the FSA, heliostat glint and glare impacts to motorists and residents should be maximally mitigated. Staff will assess the significance of mitigated glint and glare impacts in the FSA after reviewing the glint and glare information requested from the project owner in Data Request Set No. 3.

An additional glint and glare concern is for aircraft. Since the heliostats point skyward in their standby positions, there is a possibility (perhaps inevitable) for brief and intermittent direct exposure of aircraft to the heliostats' reflections of the sun. However, the effect of such exposures will diminish as a function of distance from the heliostat field. The heliostat mirrors, although planar (flat), are tensioned in their pylon mountings when installed to produce a slight concavity. This produces a slight focusing effect to increase the amount of solar energy received at the tower SRSG from each heliostat. The heliostats have an incremental design focal length based on the range of the heliostat to the tower SRSG (or, in other words, based on the distance between the heliostat and the SRSG). When in the standby position, a heliostat's focal point will be slightly above the SRSG (since the heliostat is slightly elevated relative to the SRSG aiming point) and will diverge beyond the standby ring. Thus, an aircraft passing through one or more heliostat 'beams' at altitude above or near the heliostat field will receive a divergent beam. The appearance of a divergent beam would not be like a direct solar reflection, seen as the specular (mirror-like) solar reflection off a lake or pond. Rather, the reflection would tend to be more diffuse and less bright, becoming increasingly diffuse and dim as a function of an aircraft's increasing altitude or distance above the project.

Thus, glint and/or glare from the heliostats experienced by pilots could be considered a discomfort-producing effect rather than a disability-producing effect. In the rare event of a flight path that received successive heliostat exposures in rapid succession over an extended period of time, a pilot may experience significant discomfort.

With currently available information, staff estimates that the glint and glare effects from the heliostats would cause mild discomfort to pilots, and under certain low probability conditions, potentially significant discomfort. However, definitive values for the luminance of heliostat reflections as a function of viewing distance have yet to be provided by the project owner for assessment. Staff requested this information as part of Data Request Set No. 3. Condition of Certification **TRANS-7** would enable a process for the reporting of such discomfort-producing events and the possibility of changes to the HPMP to achieve some level of improved mitigation.

Glare from the SRSGs

During operation, the tower SRSGs will produce a sustained bright source of reflected light from the heliostats. Because the SRSGs are 'circular' (wrapping around the tower 360 degrees) and near the peaks of the solar towers, they will be highly visible from most vantage points and for many miles. There is no doubt that the tower SRSGs will result in a prominent and sustained visual effect. The issue from a Traffic and Transportation perspective is: Will the SRSGs produce sufficient glare and/or excessive perceived brightness to result in discomfort glare, disability glare and/or compromised operator performance for motorists or pilots? This is an essential question because there are essentially no realistic mitigating procedures for the tower SRSG luminance levels.

Perceived brightness, as well as glint and glare effects, depends on a variety of factors, including the global ambient luminance, target size, and relationship between the luminance of the target and background. The global ambient luminance, or background luminance, sets the state of visual adaptation and hence the spatial and temporal processing characteristics of the human visual system. Within this context, perceived brightness depends critically on the luminance relationship and sizes of the target (SRGS) and background (sky). The irradiance of the sun is enormous, on the order of 80,000 W/m^2. As such, the luminance of the sun is also enormous and is on the order of $1.6x10^9$ cd/m^2 (clear sky at noon).

Staff's approach to the determination of the significance of glare from the tower SRSGs is to first establish the luminance of the SRSGs as a function of both viewing distance and compass heading (e.g., viewing Tower Unit 1 from the north-west as a function of viewing range). Staff requested this information from the project owner in Data Request Set No. 3 and recently received the project owner's response, but not with enough time for review and inclusion in this report. With this information, staff plans to develop an analysis in the FSA that includes the following parameters as a function of both viewing distance and compass direction: target (SRSG) luminance, target visual subtense (size in degrees arc), and the contrast of the SRSGs against the sky (and potentially against the ground for elevated remote observers in the viewshed). From this information, realistic estimates of perceived brightness can be derived based on known psychometric functions relating perceived brightness as a function of target contrast and size at the daytime state of visual adaptation. Perceived brightness, like visual spatial integration, is dependent on system spatial resolution. For target sizes in excess of the spatial integration limit (i.e., acuity) brightness remains relatively constant as a function of viewing distance. As the limits of acuity are approached (due to increasing viewing distance), brightness falls off and transitions to a relationship in which brightness is proportional to distance. It is staff's intention to determine if significant discomfort glare from the tower SRSGs exists and to provide a nominal estimate of the effective range. To aid in this determination, staff has scheduled a trip to observe the operations at the Ivanpah Solar Electric Generating facility and make an assessment of the visual impact of the 110 MW tower and heliostat arrays during normal operation.

Additionally, staff is currently considering that the tower SRSGs are *not* a source of disability glare from a practical and operational perspective. Arguably and clearly, the sun is a source of disability glare. If a person stares directly at the sun, visual function is severely degraded and visually-based performance is severely limited. However, one rarely hears complaints about the sun in this regard. The simple reason for this is that normally people do not fixate on or look at the sun directly for any length of time. In general, a single 100-150 msec fixation is sufficient for an aversion reflex to look elsewhere (and sufficient for a fairly prominent after-image). The limited times in which the sun can be a source of disability glare is under conditions when visual performance requires a gaze in close proximity to the sun's location. This would occur, for example, when driving west into the sunset when visual monitoring of the road requires viewing gazes near the sun's visual location.

Staff is currently considering that a similar situation exists for the tower SRSGs, albeit to a lesser extent given the significantly lower tower luminance. Due to their anticipated perceived brightness based on the luminance of the towers during nominal operations, it is anticipated that observers will not look directly at the tower SRSGs for more than a single fixation (or a few fixations at most due to tower novelty) before averting their gaze to an alternate location. As such, observers will tend to preserve their visual function (much as they do with the sun) and the tower SRSGs will not functionally be a source of disability glare.

Further, at the anticipated luminance levels, there would be some constant level of glare. However, the glare would be anticipated to be at a slight to medium discomfort level and, as discussed, insufficient to be considered as disability glare.

It should be noted that glare is generally considered as a scattering effect in the eye, although any optical interface can also add to perceived glare, such as glasses, automotive windshields and aircraft canopies. Scattering in the human eye increases as a function of age[2]. Glare related scatter effects remain nearly constant as a function of age until 40-45 years when scatter rises exponentially and triples by the age of 60. As such any glare effects produced by the SRSGs may be more pronounced in the aging population.

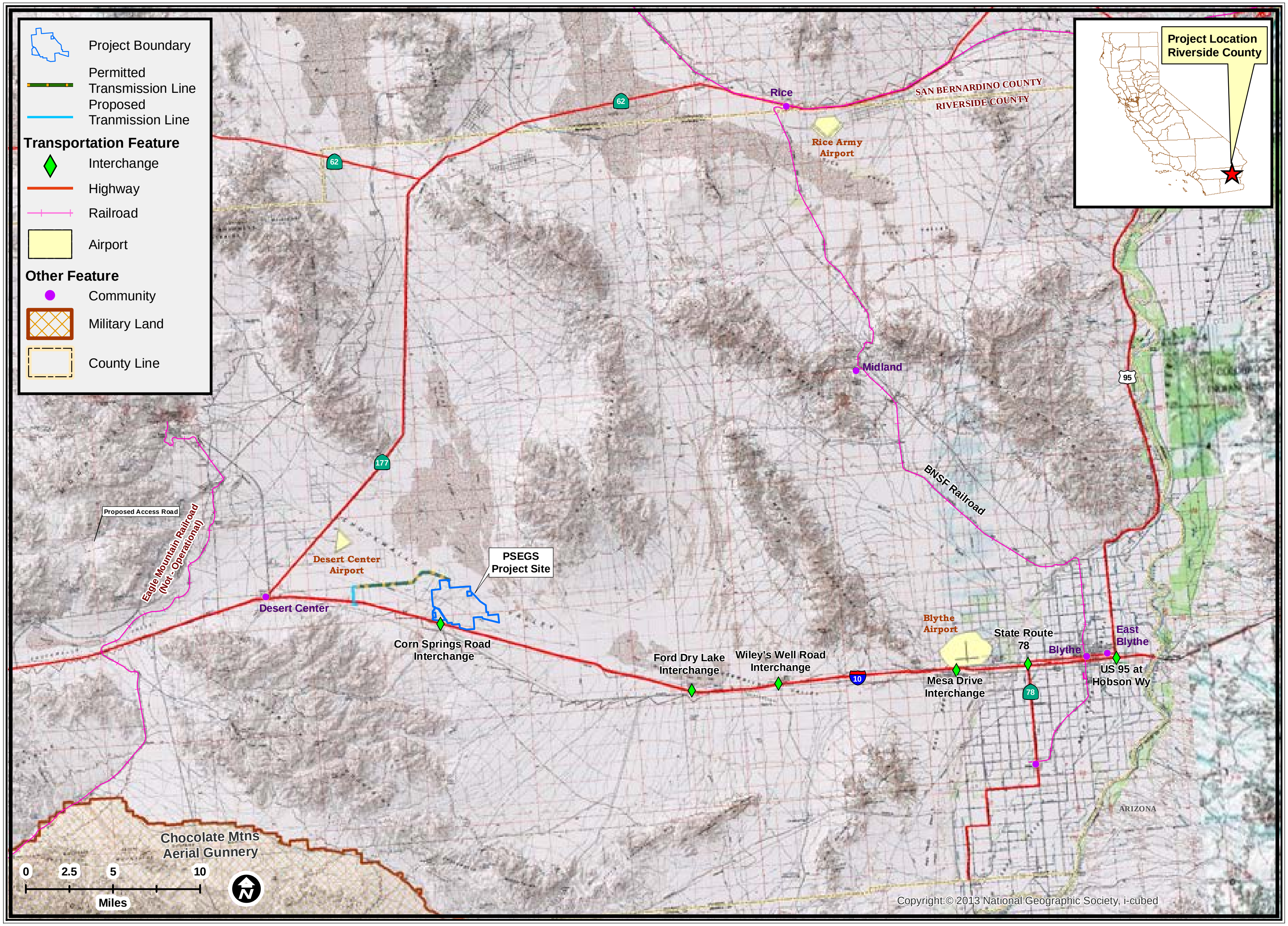
Staff is currently considering that the glare effects from the tower SRSG receivers are significant from a visual perspective and incapable of mitigation while maintaining effective plant operations. The brightness of the SRSGs will be clearly visible and prominent. The extent to which the visual signature (either from a brightness or glare perspective) will be distracting to the extent of producing a safety hazard from an operator control perspective (e.g., driving a vehicle, flying a plane) remains uncertain and awaits further information from the project owner.

REFERENCES.

Sliney, DH and Freasier, BC, Evaluation of Optical Radiation Hazards, Applied Optics, Vol. 12, 1-24, 1973.

TRAFFIC AND TRANSPORTATION - FIGURE 1

Palen Solar Electric Generating System - Regional Transportation Network

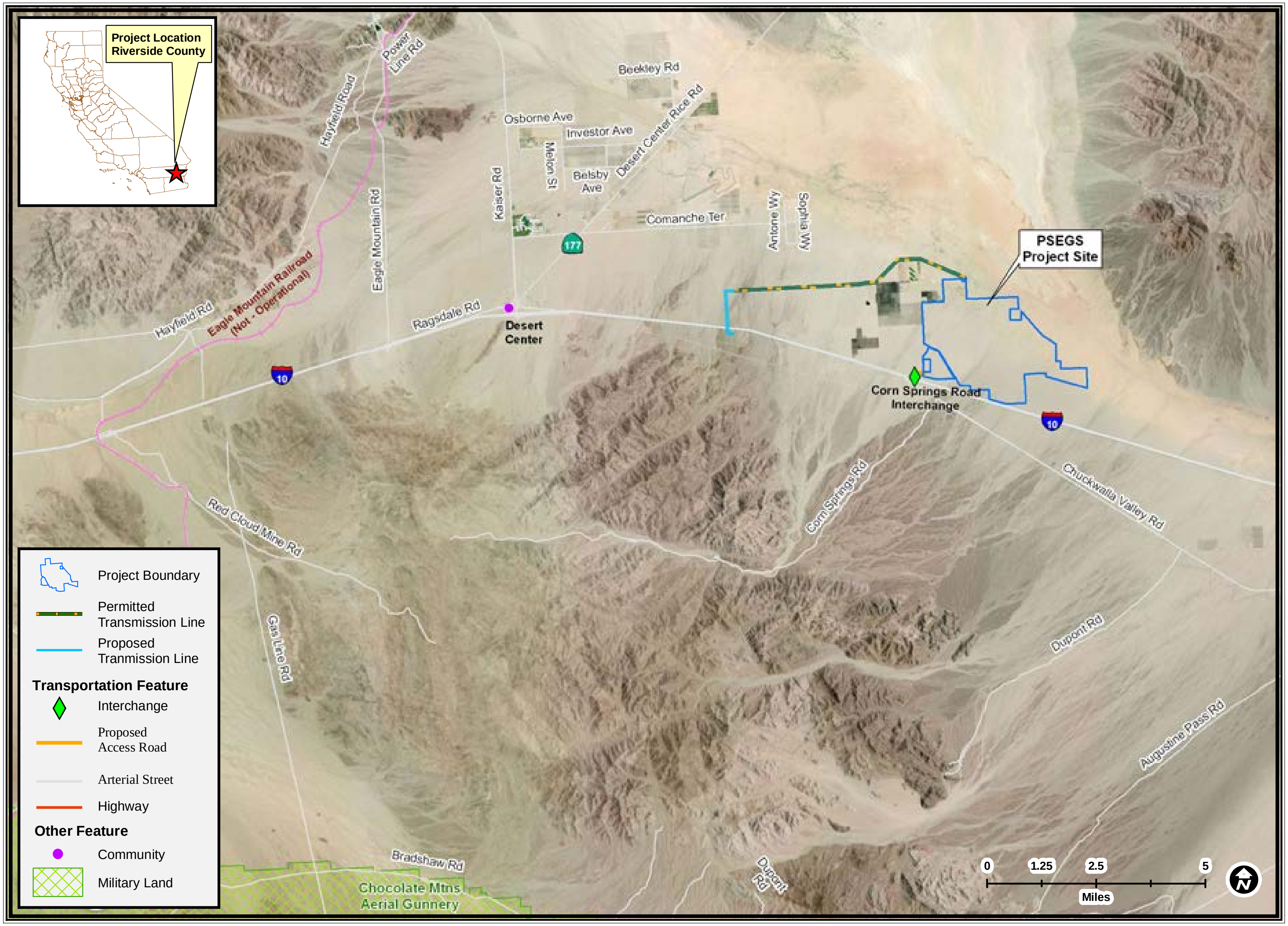


CALIFORNIA ENERGY COMMISSION - SITING,TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: California Energy Commission Statewide Power Plant Maps 2010 - Tele Atlas

TRAFFIC AND TRANSPORTATION - FIGURE 2

Palen Solar Electric Generating System - Local Transportation Network



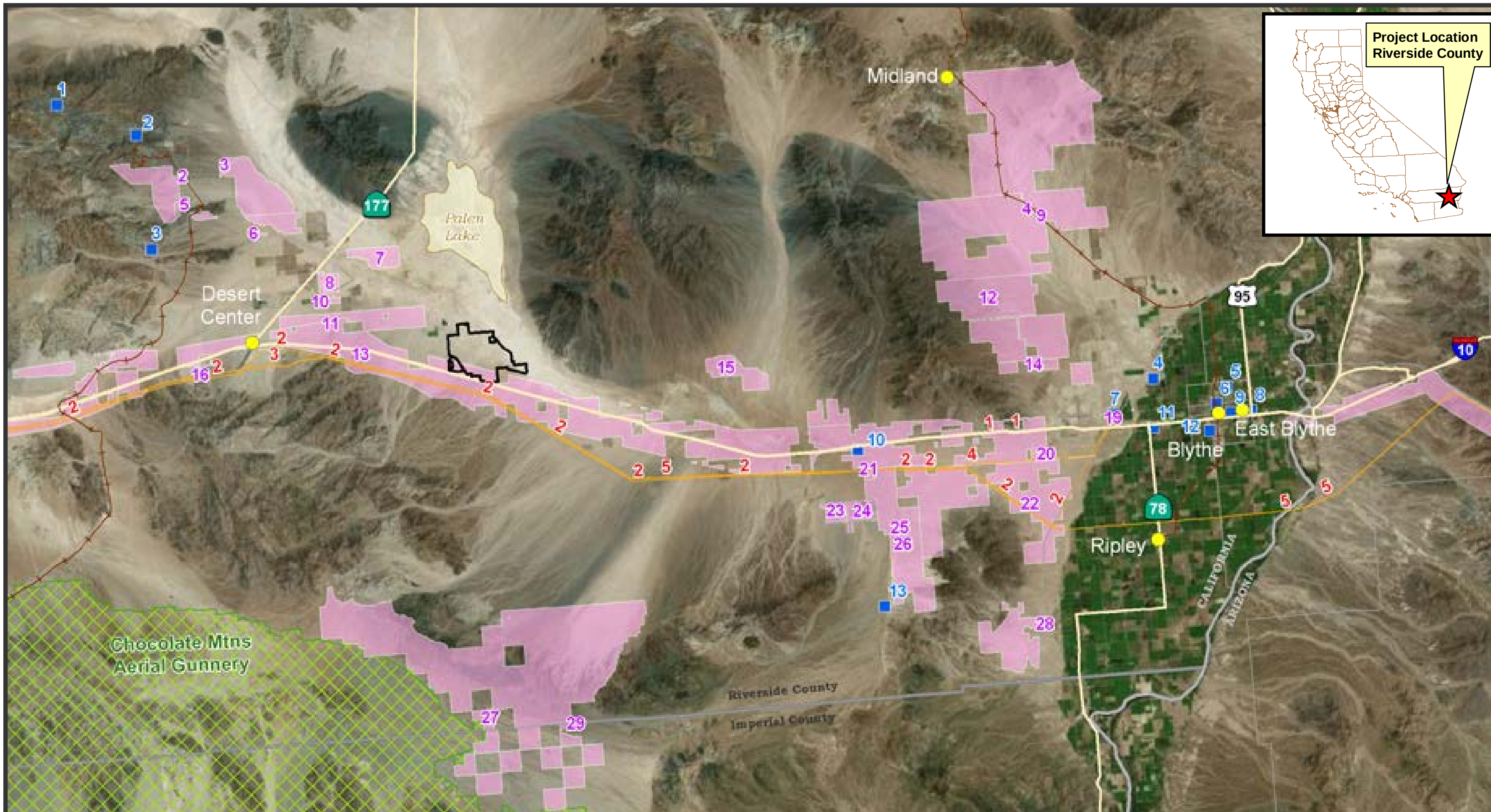
TRAFFIC & TRANSPORTATION

CALIFORNIA ENERGY COMMISSION - SITING,TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: California Energy Commission Statewide Power Plant Maps 2010 - Tele Atlas

TRAFFIC & TRANSPORTATION - FIGURE 3

Palen Solar Electric Generating System - Traffic and Transportation Cumulative Projects



POINT

LABEL	PROJECT	STATUS
1	Kaiser Mine	Existing
2	Eagle Mountain Pumping	Foreseeable
3	Eagle Mountain Landfill	Foreseeable
4	Blythe Solar Power Generation Station 1	Foreseeable
5	Twelve Residential Developments	Foreseeable
6	Colorado River Substation Expansion	Foreseeable
7	Blythe Energy Project	Existing
8	Intake Shell	Foreseeable
9	Four Commercial Projects	Foreseeable
10	Wileys Well Communication Tower	Foreseeable
11	Blythe Mesa Solar I	Foreseeable
12	Three Residential	Foreseeable
13	Recreational Opportunities	Existing

LINE

LABEL	PROJECT	STATUS
1	Interstate 10	Existing
2	Blythe Energy Project Transmission Line	Foreseeable
3	Green Energy Express Transmission Line Project	Foreseeable
4	Desert Southwest Tranmission Line Project	Foreseeable
5	Devers-Palo Verde No. 2 Transmission Line Project	Foreseeable

POLYGON

LABEL	PROJECT	STATUS
1	L.H. Renewables Riverside County Type II	Pending
2	Eagle Mountain Wind Project	Foreseeable
3	Desert Sunlight Project	Foreseeable
4	Big Maria Vista Solar	Foreseeable
5	Eagle Mountain Pumping Plant	Existing
6	Desert Harvest	Foreseeable
7	Desert Lily Soleil Project	Foreseeable
8	Chuckwalla Valley Raceway	Existing
9	McCoy Soleil Project	Foreseeable
10	Desert Center 50	Foreseeable
11	Power Partners SW - Chuckwalla Solar I	Foreseeable
12	NextEra (FPL) McCoy	Foreseeable
13	SCE Red Bluff Substation	Foreseeable
14	Blythe Solar Power Project	Foreseeable
15	Genesis Solar Energy Project	Foreseeable
16	West-wide Section 368 Energy Corridors	Existing
17	Blythe Airport Solar I Project	Foreseeable
18	EnXco	Foreseeable
19	Blythe Energy Project II	Foreseeable
20	Blythe PV Project	Existing
21	Sonoran West	Pending
22	Desert Quartzite	Foreseeable
23	Ironwood State Prison	Existing
24	Chuckwalla State Prison	Existing
25	Mule Mountain III	Pending
26	Mule Mountain Solar Project	Foreseeable
27	Graham Pass Wind Project	Pending
28	Palo Verde Mesa Solar Project	Pending
29	Milpitas Wash	Pending

Project Boundary

Cumulative Project

Point

Line

Polygon

Other Feature

Community

Major Road

Railroad

Military Land

Dry Lake

Waterbody

0 2.5 5 10 Miles

1:500,000

TRAFFIC & TRANSPORTATION

CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: Microsoft Bing Aerial, BrightSource, OpenStreetMap - May 2013, Bureau of Land Management - May 2013

TRANSMISSION LINE SAFETY AND NUISANCE

Obed Odoemelam, Ph.D.

SUMMARY OF CONCLUSIONS

The project owner, Palen Solar Holdings, LLC, (PSH) proposes to transmit the power from the proposed Palen Solar Electric Generating System (PSEGS) to the Southern California Edison (SCE) transmission grid through SCE's Red Bluff Substation currently under construction near the community of Desert Center. The project's tie-in line would be a single-circuit 230-kV overhead transmission line connecting the project's on-site 230-kV switchyard to the SCE Red Bluff Substation. When completed, this substation would be under the jurisdiction of the California Public Utilities Commission (CPUC) and the Bureau of Land management (BLM). Therefore, this staff analysis is for the tie-in project line as it stretches from the proposed on-site switchyard to the SCE substation. Since the proposed tie-in line would be located in the SCE service area, it would be constructed, operated, and maintained according to SCE's guidelines for line safety and field management which conform to applicable laws, ordinances, regulations and standards (LORS). The route for the proposed project line is undisturbed desert land with no nearby residents, eliminating the potential for residential electric and magnetic field exposures when the line is operating.

With the four proposed Transmission Line Safety and Nuisance Conditions of Certification, any safety and nuisance impacts from routing the proposed tie-in line from the project site to the area around the community of Desert Center would be less than significant. These Conditions of Certification are unchanged from those required for the approved project, Palen Solar Power Project (PSPP).

INTRODUCTION

The purpose of this staff assessment is to assess the proposed PSEGS's transmission line's design and operational plan to determine whether its related field and nonfield impacts would constitute a significant environmental hazard in the areas around the proposed route as it runs between the proposed site and the community of Desert Center approximately 10 miles to the west. PSEGS would consist of two generating units whose generated power would be transmitted to SCE's Red Bluff Substation using an overhead single-circuit 230-kilovolt (kV) line. This staff analysis is for the proposed PSEGS tie-in line and related on-site switchyard to be built and operated by the project owner. The potential impacts of concern are those to be encountered along the proposed corridor running between the project site and the SCE substation. All related health and safety laws, ordinances, regulations, and standards are currently aimed at minimizing such impacts. Staff's analysis focuses on the following issues taking into account both the physical presence of the line and the physical interactions of its electric and magnetic fields:

- aviation safety;
- interference with radio-frequency communication;
- audible noise;

- fire hazards;
- hazardous shocks;
- nuisance shocks; and
- electric and magnetic field (EMF) exposure.

Transmission Line Safety and Nuisance (TLSN) Table 1 below shows the federal, state, and local laws and policies that apply to the control of the field and nonfield impacts of electric power lines. Staff's analysis examines the project's compliance with these requirements.

METHODOLOGY AND THRESHOLDS FOR DETERMINING ENVIRONMENTAL CONSEQUENCES

The LORS and practices listed in **TLSN Table 1** have been established to maintain impacts below levels of potential significance. Thus, if staff determines that the project would comply with applicable LORS, we would conclude that any transmission line-related safety and nuisance impacts would be less than significant. The nature of these individual impacts is discussed below together with the potential for compliance with the LORS that apply.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS (LORS)

Transmission Line Safety and Nuisance Table 1
Laws, Ordinances, Regulations, and Standards (LORS)

Applicable LORS	Description
Aviation Safety	
Federal	
Title 14, Part 77 of the Code of Federal Regulations (CFR),"Objects Affecting the Navigable Air Space"	Describes the criteria used to determine the need for a Federal Aviation Administration (FAA) "Notice of Proposed Construction or Alteration" in cases of potential obstruction hazards.
FAA Advisory Circular No. 70/7460-1G, "Proposed Construction and/or Alteration of Objects that May Affect the Navigation Space"	Addresses the need to file the "Notice of Proposed Construction or Alteration" form (Form 7640) with the FAA in cases of potential for an obstruction hazard.
FAA Advisory Circular 70/460-1G, "Obstruction Marking and Lighting"	Describes the FAA standards for marking and lighting objects that may pose a navigation hazard as established using the criteria in Title 14, Part 77 of the CFR.
Interference with Radio Frequency Communication	
Federal	
Title 47, CFR, section 15.2524, Federal Communications Commission (FCC)	Prohibits operation of devices that can interfere with radio-frequency communication.
State	
California Public Utilities Commission (CPUC) General Order 52 (GO-52)	Governs the construction and operation of power and communications lines to prevent or mitigate interference.

Applicable LORS	Description
Audible Noise	
Local	
Riverside County General Plan, Noise Element	Establishes policies and programs to ensure that noise levels are appropriate to land uses.
Riverside County Noise Ordinance	Establishes performance standards for planned residential or other noise-sensitive land uses.
Hazardous and Nuisance Shocks	
State	
CPUC GO-95, "Rules for Overhead Electric Line Construction." CPUC GO-128. Rules for Construction of Underground Electric Supply and Communication Systems.	Governs clearance requirements to prevent hazardous shocks, grounding techniques to minimize nuisance shocks, and maintenance and inspection requirements. Establishes requirements and minimum standards for installing underground lines and communication circuits.
Title 8, California Code of Regulations (CCR) section 2700 et seq. "High Voltage Safety Orders"	Specifies requirements and minimum standards for safely installing, operating, working around, and maintaining electrical installations and equipment.
National Electrical Safety Code	Specifies grounding procedures to limit nuisance shocks. Also specifies minimum conductor ground clearances.
Industry Standards	
Institute of Electrical and Electronics Engineers (IEEE) 1119, "IEEE Guide for Fence Safety Clearances in Electric-Supply Stations"	Specifies the guidelines for grounding-related practices within the right-of-way and substations.
Electric and Magnetic Fields	
State	
GO-131-D, CPUC "Rules for Planning and Construction of Electric Generation Line and Substation Facilities in California"	Specifies application and noticing requirements for new line construction including EMF reduction.
CPUC Decision 93-11-013	Specifies CPUC requirements for reducing power frequency electric and magnetic fields.
Industry Standards	
American National Standards Institute (ANSI/IEEE) 644-1944 Standard Procedures for Measurement of Power Frequency Electric and Magnetic Fields from AC Power Lines	Specifies standard procedures for measuring electric and magnetic fields from an operating electric line.
Fire Hazards	
State	
14 CCR sections 1250-1258, "Fire Prevention Standards for Electric Utilities"	Provides specific exemptions from electric pole and tower firebreak and conductor clearance standards and specifies when and where standards apply.

PROPOSED MODIFIED PROJECT

The proposed PSEGS 230-kV tie-in line would consist of the following individual segments:

- A new, single-circuit 230-kV overhead transmission line extending the 10 miles from the on-site project switchyard to the SCE Red Bluff Substation under construction; and
- The project's on-site 230-kV switchyard from which the conductors would extend to the Red Bluff Substation.

The overhead conductors would be aluminum steel-reinforced cables supported on steel pole structures placed approximately 1,100 feet apart and with a maximum height of 120 feet as typical of similar SCE lines. The width of the right-of-way would be approximately 120 feet (Solar Millennium 2009a, p. 2-27). The PSPP project applicant (Solar Millennium 2009a, p. 5.14-11) provided the details of the proposed support structures as related to line safety, maintainability, and field reduction efficiency. About 38 of these poles would be required in addition to poles for supporting turning points (PSH, 2013)

Building the PSEGS would involve a slight re-routing of the generation tie-line near the western end of the route around the new Red Bluff Substation (PSH, 2013). Such realignment would not significantly affect the levels of the field and nonfield impacts from the proposed modified project as compared to the previously approved version. Another modification-related change would be the elimination of the proposal to relocate the 161-kV SCE line in the immediate project area. This would not significantly affect the levels of the assessed line impacts.

SETTING AND EXISTING CONDITIONS

The two units of the proposed PSEGS (Unit 1 and Unit 2) would occupy a total of 3,794 acres of federal land currently managed by the BLM. The site is presently vacant, undeveloped desert approximately 0.5 miles north of Interstate 10, and 10 miles east of the rural community of Desert Center in eastern Riverside County. The power generated by each of the proposed units would flow from the high-voltage side of each unit's transformer to a common switchyard located on the northern side of the site via underground copper cables, and from there, the generated power would be transmitted to the SCE power grid using a single-circuit overhead, 230-kV line.

As previously noted, the point of connection with the SCE grid would be SCE's Red Bluff Substation approximately 10 miles to the west and currently under construction with completion expected by the end of 2013. Since this SCE substation would be under the jurisdiction of the CPUC, it would be designed, built, and operated according to SCE guidelines in keeping with existing LORS.

The proposed project site is uninhabited, open desert land with no existing structures other than SCE's 161-kV Eagle Mountain-Blythe transmission that traverses the southwestern portion. There are only two residences within 2 miles of the project site and the transmission line. The closest is approximately 1,000 feet from the site boundary (Solar Millennium 2009, pp. 5.7-12 and 5.8-7). Since both buildings are currently unoccupied and there is very little local residential land use, there would not be the type of residential field exposures that have been of health concern in recent years over power line operation.

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

DIRECT IMPACTS AND MITIGATION METHODS

Aviation Safety

For the PSEGS, any potential hazard to area aircraft would relate to the potential for collision in the navigable airspace. The requirements listed on **TLSN Table 1** establish the standards for assessing the potential for obstruction hazards within the navigable space and establish the criteria for determining when to notify the Federal Aviation Administration (FAA) about such hazards. These regulations require FAA notification in cases of structures over 200 feet from the ground. Notification is also required if the structure is to be below 200 feet in height, but would be located within the restricted airspace in the approaches to public or military airports. For airports with runways longer than 3,200 feet, the restricted space is defined by the FAA as an area extending 20,000 feet from the runway. For airports with runways of 3,200 feet or less, the restricted airspace would be an area that extends 10,000 feet from this runway. For heliports, the restricted space is an area that extends 5,000 feet.

The closest operational airport of concern for the modified project is Blythe Airport, approximately 30 miles east of the project site and therefore too far away for the proposed line to pose an aviation hazard to utilizing aircraft. Also, the maximum height of 120 feet for the proposed line support structures (Solar Millennium 2009a, p. 2-27, and Figure 5.14-1) would be much less than the 200 feet that triggers the concern over aviation hazard according to FAA requirements.

Since (a) the physical dimensions of the proposed modified project’s line structures are less than normally associated with collision hazards and (b) the distances from area aviation centers would be less that related to same collision hazard, staff does not find it necessary to recommend any aviation-related Conditions of Certification.

Interference with Radio-Frequency Communication

Transmission line-related radio-frequency interference is one of the indirect effects of line operation and is produced by the physical interactions of line electric fields. Such interference is due to the radio noise produced by the action of the electric fields on the surface of the energized conductor. The process involved is known as *corona discharge*, but is referred to as *spark gap electric discharge* when it occurs within gaps between the conductor and insulators or metal fittings. When generated, such noise manifests itself as perceivable interference with radio or television signal reception or interference with other forms of radio communication. Since the level of interference depends on factors such as line voltage, distance from the line to the receiving device, orientation of the antenna, signal level, line configuration and weather conditions, maximum interference levels are not specified as design criteria for modern transmission lines. The level of any such interference usually depends on the magnitude of the electric fields involved and the distance from the line. The potential for such impacts is therefore minimized by reducing the line electric fields and locating the line away from inhabited areas.

The PSEGS's transmission line would be built and maintained in keeping with standard SCE practices that minimize surface irregularities and discontinuities. Moreover, the potential for such corona-related interference is usually of concern for lines of 345 kV and above, and not for 230-kV lines such as the proposed line. The line's proposed low-corona designs are used for all SCE lines of similar voltage rating to reduce surface-field strengths and the related potential for corona effects. Since the proposed line would traverse an uninhabited open space, staff does not expect any corona-related radio-frequency interference or related complaints and does not recommend any related condition of certification.

Audible Noise

The noise-reducing designs related to electric field intensity are not specifically mandated by federal or state regulations in terms of specific noise limits. As with radio noise, such noise is limited instead through design, construction, or maintenance practices established from industry research and experience as effective without significant impacts on line safety, efficiency, maintainability, and reliability. Audible noise usually results from the action of the electric field at the surface of the line conductor and could be perceived as a characteristic crackling, frying, or hissing sound or hum, especially in wet weather. Since the noise level depends on the strength of the line electric field, the potential for perception can be assessed from estimates of the field strengths expected during operation. Such noise is usually generated during rainfall, but mainly from overhead lines of 345 kV or higher. It is, therefore, not generally expected at significant levels from lines of less than 345 kV as proposed for PSEGS. Research by the Electric Power Research Institute (EPRI 1982) has validated this by showing the fair-weather audible noise from modern transmission lines to be generally indistinguishable from background noise at the edge of a right-of-way of 100 feet or more. Since the low-corona designs for the proposed modified project are also aimed at minimizing field strengths, staff does not expect the proposed line operation to add significantly to current background noise levels in the project area. For an assessment of the noise from the proposed line and related facilities, please refer to staff's analysis in the **NOISE** section.

Fire Hazards

The fire hazards addressed through the related LORS in **TLSN Table 1** are those that could be caused by sparks from conductors of overhead lines, or that could result from direct contact between the line and nearby trees and other combustible objects.

Standard fire prevention and suppression measures for similar SCE lines would be implemented by the project owner for the proposed modified project line (Solar Millennium 2009a, p. 5.14-10). Such measures are required under section 4292 of the Public Resources Code and section 1250 of Title 14 of the California Code of Regulations. The project owner's intention to comply with the clearance-related aspects of the California Public Utility Commission's General Order 95 (GO-95) would be an important part of this mitigation approach. Existing Condition of Certification **TLSN-3** is recommended to ensure compliance with all aspects of their intended fire prevention program.

Hazardous Shocks

Hazardous shocks are those that could result from direct or indirect contact between an individual and the energized line, whether overhead or underground. Such shocks are capable of serious physiological harm or death and remain a driving force in the design and operation of transmission and other high-voltage lines.

No design-specific federal regulations have been established to prevent hazardous shocks from overhead power lines. Safety is assured within the industry from compliance with the requirements specifying the minimum national safe operating clearances applicable in areas where the line might be accessible to the public.

Implementation of the GO-95- and GO-128-related measures against direct contact with the energized line would serve to minimize the risk of hazardous shocks for the proposed modified project. Existing Condition of Certification **TLSN-1** would be adequate to ensure implementation of the necessary mitigation measures.

Nuisance Shocks

Nuisance shocks are caused by current flow at levels generally incapable of causing significant physiological harm. They result mostly from direct contact with metal objects electrically charged by fields from the energized line. Such electric charges are induced in different ways by the line’s electric and magnetic fields.

There are no design-specific federal or state regulations to limit nuisance shocks in the transmission line environment. For modern overhead high-voltage lines, such shocks are effectively minimized through grounding procedures specified in the National Electrical Safety Code (NESC) and the joint guidelines of the American National Standards Institute (ANSI) and the Institute of Electrical and Electronics Engineers (IEEE). For the proposed modified project line, the project owner will be responsible in all cases for ensuring compliance with these grounding-related practices within the right-of-way.

The potential for nuisance shocks around the proposed line would be minimized through standard industry grounding practices. Existing Condition of Certification **TLSN-4** will ensure compliance with standard industry grounding practices.

Electric and Magnetic Field Exposure

The possibility of deleterious health effects from EMF exposure has increased public concern in recent years about living near high-voltage lines. Both electric and magnetic fields occur together whenever electricity flows, and exposure to them together is generally referred to as *EMF exposure*. The available evidence as evaluated by the CPUC, other regulatory agencies, and staff has not established that such fields pose a significant health hazard to exposed humans. There are no health-based federal regulations or industry codes specifying environmental limits on the strengths of fields from power lines. Most regulatory agencies believe, as staff does, that health-based limits are inappropriate at this time. They also believe that the present knowledge of the issue does not justify any retrofit of existing lines.

Staff considers it important, as does the CPUC, to note that while such a hazard has not been established from the available evidence, the same evidence does not serve as proof of a definite lack of a hazard. Staff therefore considers it appropriate, in light of present uncertainty, to recommend feasible reduction of such fields without affecting safety, efficiency, reliability, and maintainability.

While there is considerable uncertainty about EMF health effects, the following facts have been established from the available information and have been used to establish existing policies:

- Any exposure-related health risk to the exposed individual will likely be small.
- The most biologically significant types of exposures have not been established.
- Most health concerns are about the magnetic field.
- There are measures that can be employed for field reduction, but they can affect line safety, reliability, efficiency, and maintainability, depending on the type and extent of such measures.

State's Approach to Regulating Field Exposures

In California, the CPUC (which regulates the installation and operation of many high-voltage lines owned and operated by investor-owned utilities) has determined that only no-cost or low-cost measures are presently justified in any effort to reduce power line fields beyond levels existing before the present health concern arose. The CPUC has further determined that such reduction should be made only in connection with new or modified lines. It requires each utility within its jurisdiction to establish EMF-reducing measures and incorporate such measures into the designs for all new or upgraded power lines and related facilities within their respective service areas. The CPUC further established specific limits on the resources to be used in each case for field reduction. Such limitations were intended by the CPUC to apply to the cost of any redesign to reduce field strength or relocation to reduce exposure. Publicly owned utilities, which are not within the jurisdiction of the CPUC, voluntarily comply with these CPUC requirements. This CPUC policy resulted from assessments made to implement CPUC Decision 93-11-013.

In keeping with this CPUC policy, staff requires a showing that each proposed overhead line would be designed according to the EMF-reducing design guidelines applicable to the utility service area involved. These field-reducing measures can impact line operation if applied without appropriate regard for environmental and other local factors bearing on safety, reliability, efficiency, and maintainability. Therefore, it is up to each project owner to ensure that such measures are applied in ways that prevent significant impacts on line operation and safety. The extent of such applications would be reflected by ground-level field strengths as measured during operation. When estimated or measured for lines of similar voltage and current-carrying capacity, such field strength values can be used by staff and other regulatory agencies to assess the effectiveness of the applied reduction measures. These field strengths can be estimated for any given design using established procedures. Estimates are specified for a height of 1 meter above the ground, in units of kilovolts per meter (kV/m), for the electric field, and milligauss (mG) for the companion magnetic field. Their magnitude depends on line voltage (in the case of electric fields), the geometry of the support structures, degree of cancellation from nearby conductors, distance between conductors, and, in the case of magnetic fields, amount of current in the line.

Since the CPUC currently requires that most new lines in California be designed according to the EMF-reducing guidelines of the electric utility in the service area involved, their fields are required under this CPUC policy to be similar to fields from similar lines in that service area. Designing the proposed modified project line according to existing SCE field strength-reducing guidelines would constitute compliance with the CPUC requirements for line field management.

The CPUC has revisited the EMF management issue to assess the need for policy changes to reflect the available information on possible health impacts. The findings specified in Decision 06-01-042 of January 2006, did not point to a need for significant changes to existing field management policies. Since there are no residences in the immediate vicinity of the proposed modified project's realigned transmission line, there would as previously noted, not be the long-term residential EMF exposures mostly responsible for the health concern of recent years. The only project-related EMF exposures of potential significance would be the short-term exposures of plant workers, regulatory inspectors, maintenance personnel, visitors, or other individuals in the vicinity of the line. These types of exposures are short term and well understood as not significantly related to the health concern.

Industry's and Project owner's Approach to Reducing Field Exposures

The present focus is on the magnetic field because unlike electric fields, magnetic fields can penetrate the soil, buildings, and other materials to produce the types of human exposures at the root of the health concern of recent years. The industry seeks to reduce exposure, not by setting specific exposure limits, but through design guidelines that minimize exposure in each given case. As one focuses on the strong magnetic fields from the more visible high-voltage power lines, staff considers it important, for perspective, to note that an individual in a home could be exposed to much stronger fields while using some common household appliances than from high-voltage lines (National Institute of Environmental Health Services and the U.S. Department of Energy, 1998). The difference between these types of field exposures is that the higher-level, appliance-related exposures are short term, while the exposures from power lines are lower level, but long term. Scientists have not established which of these types of exposures would be more biologically meaningful in the individual. Staff notes such exposure differences only to show that high-level magnetic field exposures regularly occur in areas other than around high-voltage power lines.

As with similar SCE lines, specific field strength-reducing measures would be incorporated into the proposed line's design to ensure the field strength minimization currently required by the CPUC in light of the concern over EMF exposure and health.

The field reduction measures to be applied include the following:

1. increasing the distance between the conductors and the ground to an optimal level;
2. reducing the spacing between the conductors to an optimal level;
3. minimizing the current in the line; and
4. arranging current flow to maximize the cancellation effects from interacting of conductor fields.

Since the intended route of the proposed modified project line would have no residences in the immediate vicinity of the right-of-way, the long-term residential field exposures at the root of the health concern of recent years would not be a significant concern. The field strengths of most significance in this regard would be as encountered at the edge of the line's right-of-way. These field intensities would depend on the effectiveness of the applied field-reducing measures. The PSPP project owner (Solar Millennium 2009a, p. 5.14-8 and Figures 5.14-2 and 5.14-3) calculated the maximum electric and magnetic field intensities expected along the proposed route of the project line. Staff has verified the accuracy of the modeling approach used in the project owner's calculations with regard to parameters bearing on field strength dissipation and exposure assessment. The maximum electric field strength was calculated as 0.053 kV/m at the edge of the 150-foot right-of-way and is thus similar to those of SCE lines of the same voltage rating. The maximum magnetic field intensity of approximately 32.5 milligauss (mG) at the edge of this right-of-way is similar to that of SCE lines of the same current-carrying capacity (as required under current CPUC regulations) but is much less than the 200 mG currently specified by the few states with regulatory limits. The requirements in existing Condition of Certification **TLSN-2** for field strength measurements are intended to validate the project owner's assumed reduction efficiency.

CLOSURE AND DECOMMISSIONING IMPACTS AND MITIGATION

If the proposed PSEGS were to be closed and decommissioned, and all related structures are removed as described in the **PROJECT DESCRIPTION** section, the minimal area aviation risk and electric shocks and fire hazards from the physical presence of this tie-in line would be eliminated. Decommissioning and removal would also eliminate the transmission line's field impacts assessed in this analysis in terms of nuisance shocks, radio-frequency impacts, audible noise, and electric and magnetic field exposure. Since the line would be designed and operated according to existing SCE guidelines, these impacts would be as expected for SCE lines of the same voltage and current-carrying capacity and therefore, at levels reflecting compliance with existing health and safety LORS.

PROJECT-RELATED FUTURE ACTIONS

As previously noted, SCE is presently building the Red Bluff Substation, a new 230/500-kV substation southeast of Desert Center, in eastern Riverside County. The location is immediately north of and adjacent to the DPV1 transmission line where it will occupy approximately 90 acres when completed (First Solar, 2009). The construction of this substation is expected to be completed by the end of 2013.

The substation components will include a number of 230 kV and 500 kV transmission lines, 230/ 500 kV transformer banks, associated switch racks and a microwave tower (First Solar 2009). Other typical substation components include dead-end structures to allow the transmission line to enter the substation, and outdoor night lighting to illuminate the switch rack. Large substations like Red Bluff also require a mechanical-electrical equipment room that would house all the controls, protective equipment, and a telecommunications room. The tallest component of a 230/500 kV substation would likely be the terminating transmission tower or turning pole, which would range between 150 and 180 feet tall. The tallest component in the switch rack would likely be the dead-end pole, which would be approximately 130 feet tall. Other equipment would include disconnect switches, protective relays, metering and Supervisory Control and Data Acquisition (SCADA) system equipment. There would also likely be an emergency power generator, a fire prevention system (including hydrants, water tank, and walls between transformer phases), two single-story relay/control shelters, a single-story storage building, an oil containment system and a radio antenna tower to enhance communications. A permanent access road will provide vehicular access to the substation (First Solar 2009).

CUMULATIVE IMPACTS

The impacts from a specific project may, even at insignificant levels, combine with similarly low-level impacts from other nearby projects to produce the total effects that could be characterized as cumulatively considerable. For the proposed and similar projects, being, "cumulatively considerable" means that the incremental effects of an individual project would be significant when viewed in connection with the effects from past, existing or future projects (California Code Regulations, Title 14, Section 15130). NEPA for example thus states that cumulative effects can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR §1508.7).

When field intensities are measured or calculated for a specific location, they reflect the interactive, and therefore, cumulative effects of fields from all contributing conductors. Such interactions could be additive or subtractive depending on prevailing conditions.

The staff of the Energy Commission has identified the existing or future area sources of the field and nonfield impacts of concern in this analysis. The sources were identified in terms of source and distance from the proposed project line. Their respective intensities and contributions to cumulative impacts would diminish with distance from each source. These individual impacts would be reflected in the levels estimated for the proposed line at the points of maximum interest. Since the proposed project line would be designed, built, and operated according to applicable field-reducing SCE guidelines (as currently required by the CPUC for effective field management), any contribution to cumulative area fields should be at levels expected for SCE lines of similar voltage and current-carrying capacity. It is this similarity in intensity that constitutes compliance with current CPUC requirements for EMF management. The actual field strengths and contribution levels for the proposed line design would be assessed from the results of the field strength measurements specified in existing Condition of Certification **TLSN-2**.

COMPLIANCE WITH LORS

As previously noted, current CPUC policy on safe EMF management requires that any high-voltage line within a given area be designed to incorporate the field strength-reducing guidelines of the main area utility lines to be interconnected. The utility in this case is SCE. Since the proposed project 230-kV line and related switchyard would be designed according to the respective requirements of the LORS listed in **TLSN Table 1**, and operated and maintained according to current SCE guidelines on line safety and field strength management, staff considers the proposed design and operational plan to be in compliance with the health and safety requirements of concern in this analysis. The actual contribution to the area's field exposure levels would be assessed from results of the field strength measurements required in existing Condition of Certification **TLSN-2**.

NOTEWORTHY PUBLIC BENEFITS

Since the proposed PSEGS tie-in line would pose specific, although insignificant risks of the field and nonfield effects of concern in this analysis, its building and operation would not yield any public benefits regarding the effort to minimize any human risks from these impacts.

RESPONSE TO AGENCY AND PUBLIC COMMENTS

Staff will address public and agency comments in the Final Staff Assessment (FSA) regarding transmission line safety and nuisance.

CONCLUSIONS

Since staff does not expect the proposed 230-kV project transmission line to pose an aviation hazard according to current FAA criteria. We therefore do not consider it necessary to recommend specific location changes on the basis of a potential hazard to area aviation.

The potential for nuisance shocks would be minimized through grounding and other field-reducing measures that would be implemented in keeping with current SCE guidelines (reflecting standard industry practices). These field-reducing measures would maintain the generated fields within levels not associated with radio-frequency interference or audible noise.

The potential for hazardous shocks would be minimized through compliance with the height and clearance requirements of CPUC's General Order 95 and the placement requirements of GO-128 for the on-site underground segment. Compliance with Title 14, California Code of Regulations, section 1250, would minimize fire hazards while the use of a low-corona line design, together with appropriate corona-minimizing construction practices, would minimize the potential for overhead corona noise and its related interference with radio-frequency communication.

Since electric or magnetic field health effects have neither been established nor ruled out for the proposed PSEGS and similar transmission lines, the public health significance of any related field exposures cannot be characterized with certainty. The only conclusion to be reached with certainty is that the proposed line's design and operational plan would be adequate to ensure that the generated electric and magnetic fields are managed to an extent the CPUC considers appropriate in light of the available health effects and safety information. The long-term, mostly residential magnetic exposure of health concern in recent years would be insignificant for the proposed line given the general absence of residences in the immediate vicinity of the intended route. On-site worker or public exposure would be short term and at levels expected for SCE lines of similar design and current-carrying capacity. Such exposure is well understood and has not been established as posing a significant human health hazard.

Since the proposed modified project line would be operated to minimize the health, safety, and nuisance impacts of concern to staff and would be routed through an area with no residences in its immediate vicinity, staff considers the proposed design, maintenance, and construction plan as complying with the applicable LORS. With implementation of the four existing Conditions of Certification, any such impacts would be less than significant.

PROPOSED CONDITIONS OF CERTIFICATION

Staff does not propose any changes to the existing Conditions of Certification for the proposed PSEGS project. The existing conditions are presented below.

TLSN-1 The project owner shall construct the proposed project transmission line according to the requirements of: (a) California Public Utility Commission's GO-95, GO-52, GO-131-D, GO-128, Title 8, and Group 2; (b) the High Voltage Electrical Safety Orders, sections 2700 through 2974 of the California Code of Regulations; and (3) Southern California Edison's EMF reduction guidelines.

<u>Verification:</u> At least 30 days prior to start of construction of the transmission line or related structures and facilities, the project owner shall submit to the Compliance Project Manager (CPM) a letter signed by a California-registered electrical engineer affirming that the lines will be constructed according to the requirements stated in the condition.

TLSN-2 The project owner shall use a qualified individual to measure the strengths of the electric and magnetic fields from the line at the points of maximum intensity along the route for which the project owner provided specific estimates. The measurements shall be made before and after energization according to the American National Standard Institute/Institute of Electrical and Electronic Engineers (ANSI/IEEE) standard procedures. These measurements shall be completed no later than six months after the start of operations.

<u>Verification:</u> The project owner shall file copies of the pre-and post-energization measurements with the CPM within 60 days after completion of the measurements.

TLSN-3 The project owner shall as part of its intended fire prevention program ensure that the right-of-way of the transmission line is kept free of combustible material, as required under the provisions of section 4292 of the Public Resources Code and section 1250 of Title 14 of the California Code of Regulations.

Verification: During the first five years of plant operation, the project owner shall provide a summary of inspection results and any fire prevention activities carried out along the right-of-way and provide such summaries in the Annual Compliance Report on transmission line safety and nuisance-related requirements.

TLSN-4 The project owner shall ensure that all permanent metallic objects within the right-of-way of the project-related line are grounded according to industry standards regardless of ownership.

Verification: At least 30 days before the line is energized, the project owner shall transmit to the CPM a letter confirming compliance with this condition.

REFERENCES

EPRI (Electric Power Research Institute) 1982 – Transmission Line Reference Book: 345 kV and Above.

National Institute of Environmental Health Services 1998 – An Assessment of the Health Effects from Exposure to Power-Line Frequency Electric and Magnetic Fields. A Working Group Report, August 1998

Palen Solar Holdings 2013. Response to CEC Staff Data Requests, Sets 1 and 2. March 2013.

Solar Millennium 2009a (TN 52939) – Application for Certification for the Palen Solar Electric Generating System, Volumes I and II. Submitted to the California Energy Commission on September 24, 2009.

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VISUAL RESOURCES

William Kanemoto and Gregg Irvin Ph.D.

SUMMARY OF CONCLUSIONS

California Energy Commission staff (hereafter referred to as staff) has analyzed visual resource-related information pertaining to the proposed Palen Solar Electric Generating System (PSEGS) and concludes that the proposed amended project would result in a substantial adverse impact to existing scenic resource. Values as seen from several viewing areas and Key Observation Points in the project vicinity and Chuckwalla Valley area, including:

- Eastbound and westbound Interstate 10 (I-10), which is located immediately south of the project site and transmission line;
- State Route 177, to the west and northwest of the project site;
- Joshua Tree National Park to the west and northwest of the project site;
- Palen McCoy Wilderness to the northeast of the project site;
- Chuckwalla Mountains Wilderness to the south of the project site; and
- Corn Springs Road in the immediate vicinity of the project site.

Staff concludes that these visual impacts would be significant in terms of three of the four criteria of California Environmental Quality Act (CEQA) Appendix G, could not be mitigated to less than significant levels, and would thus result in significant and unavoidable impacts under CEQA. Staff also concludes that the project's contribution to significant cumulative visual effects would be cumulatively considerable when combined with the effects of other renewable and development projects along the I-10 corridor, within the Chuckwalla Valley, and within the California Desert Conservation Area as a whole.

In addition, staff concludes that the project would not be consistent with several applicable goals and policies of the Riverside County Integrated Plan.

If the Energy Commission approves the amended project, staff recommends that the conditions of certification from the Commission Decision for the originally certified Palen Solar Power Project (PSPP), as modified herein by staff, be adopted in order to minimize impacts to the greatest feasible extent.

INTRODUCTION

Visual resources are the natural and cultural features of the environment that can be viewed. This analysis focuses on whether the Palen Solar Electric Generating System (PSEGS) would cause significant adverse visual consequences and whether the project would be in compliance with applicable laws, ordinances, regulations, and standards (LORS). The California Environmental Quality Act (CEQA) requires the California Energy Commission to determine the potential for significant impacts to visual resources resulting from the proposed project. **Appendix VR-1** describes the visual resources methodology employed for the CEQA analysis (Energy Commission staff's methodology), and the “Method and Threshold for Determining Significance,” subsection below, describes the thresholds for determining environmental consequences (as discussed above in the “Summary of Conclusions” subsection). In accordance with staff’s procedure, conditions of certification are proposed as needed to reduce potentially significant impacts (under CEQA) to less than significant levels or to the extent possible, and to ensure LORS conformance, if feasible.

EXISTING PROJECT VISUAL SETTING

REGIONAL SETTING

The proposed project landscape is part of the Great Basin section of Fenneman’s Basin and Range physiographic province, a vast desert area of the western U.S. extending from eastern Oregon to western Texas, characterized by periodic north-south trending, highly eroded mountain ranges that rise sharply from and are separated by broad, flat desert valleys (Fenneman, 1931). The project region marks the transition zone between the high elevation Mojave Desert to the north and the arid, lower elevation Sonoran Desert to the south and east. The project site is located adjacent and to the north of I-10 in Chuckwalla Valley, approximately 9 miles east of Desert Center in eastern Riverside County. The Chuckwalla Valley is a broad, flat desert plain that includes scattered dry lakes and rolling sand dunes and is bordered by a number of rugged mountain ranges including the Eagle Mountains to the west and north, the Coxcomb and Granite Mountains to the north, the Palen Mountains to the northeast and the Chuckwalla Mountains to the south.

There are a number of sensitive land uses and protected areas within the expansive viewshed of the site including: to the north – Palen Dry Lake and Sand Dunes Area, and Desert Lily Sanctuary Area of Critical Environmental Concern (ACEC); to the northwest, Joshua Tree National Park; to the northeast – Palen McCoy Wilderness; to the east – Palen Dry Lake ACEC and Ford Dry Lake OHV Area; to the south – Chuckwalla Mountains Wilderness; and to the west – Alligator Rock ACEC and Desert Center. This portion of Chuckwalla Valley offers panoramic views of a desert plain landscape that appears relatively visually intact except for the presence of I-10 to the immediate south and two transmission lines. I-10 is the main travel corridor between Southern California and Phoenix, Arizona.

PROJECT SITE AND VICINITY

The project site is presently undeveloped and consists mainly of desert scrub (largely scattered Creosote Bush), lakebed, and dune landscapes and is predominantly intact on the broad, Chuckwalla Valley floor (elevation 150 feet). There are three desert washes, indicated primarily by associated vegetation (desert dry wash woodlands), traversing the site (AFC, Page 5.15-7). A wood-pole, H-frame 161 kV transmission line passes through the southwestern corner of the project site. Several BLM 4WD roads that provide recreational access to Palen Dry Lake, the Palen Sand Dunes Area, Palen Dry Lake ACEC, and the perimeter of the Palen McCoy Wilderness also cross the site. **Visual Resources Figure 1**, *Characteristic Landscape of the Project Site*, presents a view of the project site from the BLM recreational access road just off the Corn Springs Road/I-10 off-ramp. The view presented in Figure 1 reveals a primarily natural setting comprised of a mosaic of sparse, shrubby vegetation of darker greens and tans, low-growing grasses and light-colored soils, rocks and desert pavement openings. Views from the site are panoramic, encompassing the open Chuckwalla Valley and the various mountain ranges that define the valley. The rugged ridges, angular forms and bluish hue of the Palen Mountains to the immediate east of the project site provide a contrast of visual interest to the flat, light-colored horizontal landform of the Chuckwalla Valley floor and project site. The area surrounding the project site is very lightly populated. There are two residences within 3,500 feet of the PSEGS northern boundary, one of which reportedly is occupied only seasonally (AFC, Page 5.15-9).

PROJECT VIEWSHED

The *viewshed* or area of potential visual effect (the area within which the project could potentially be seen) is extensive and encompasses much of Chuckwalla Valley and the site facing slopes and ridgelines of the surrounding mountains as indicated by the yellow colored area in **Visual Resources Figure 2,** *Project Viewshed*. The computer-generated viewshed mapping is based on the height of the proposed towers. The mapping is accurate within the limits of error of the 10-meter resolution (horizontal) USGS digital elevation model (DEM). In this landscape, because of the general absence of tall land-cover that could alter the actual viewshed, the topographically generated viewshed mapping is considered generally accurate. A feature of this desert landscape is the potential for large projects to be seen over great distances where elevated viewpoints exist, due to the large open areas of level topography and absence of intervening landscape features.

ORIGINAL APPLICATION PROJECT DESCRIPTION

The original approved 2010 Palen Solar Power Project (PSPP) was proposed to occupy roughly the same site as the current PSEGS project, but on a somewhat different footprint. The PSPP proposed a 4.5 square-mile solar thermal generating facility utilizing solar trough technology, consisting of fields of long, linear rows of parabolic mirrors, as well as associated generation facilities. The parabolic mirrors concentrate sunlight on a heat-transfer receiving tube running along the focal point of the curved mirrors, a few feet from the mirror surface. Heat transfer fluid within the tubes is heated to 750 degrees F. and piped to steam-generation units to produce electricity. The maximum height of the mirror structures is approximately 25 feet. In addition, various structures such as steam generators, air-cooled condenser, and water-storage tanks would comprise the power generation block. The air-cooled condenser would be 150 feet tall. Other structures in the power block would vary in height but would be considerably shorter. The predominant visual profile of the solar trough power plant would thus be of a vast, level mirror field, relatively low in height (25 feet), with two taller; approximately 26-acre power blocks in the center of two mirror fields. Occasional bright 'glint ' reflections of the sun off the mirrors, perceptible to viewers on the ground under certain conditions and times of day, were noted as a potential concern in the review of the PSPP and other solar trough projects. These events are assumed occasional and transitory.

Overall, the visual analysis of the Revised Staff Assessment concluded that the PSPP would cause moderate-to-high levels of visual change for viewers in the Chuckwalla

Valley at foreground and middle-ground distances, particularly from Highway I-10; and moderate-to-high levels of visual change for higher elevation viewers in the mountains of the Palen-McCoy and Chuckwalla Mountains wilderness areas, to background distances (over 5 miles distance).

Based on these findings the Energy Commission concluded that proposed conditions of certification would not reduce the project's visual impacts to a less-than-significant level. The Commission also concluded that the PSPP would contribute to significant cumulative visual impacts in the I-10 corridor. The Commission approved the PSPP with a Statement of Overriding considerations.

AMENDED PROJECT VISUAL DESCRIPTION

As the prior approved project the proposed amended project would convert a vast area of naturally appearing desert plain to an industrial facility characterized by complex, geometric forms and lines and industrial surfaces that are dissimilar to the surrounding natural landscape character. The overall area of the amended project would be 572 acres smaller than the approved PSPP. Much of the developed area would be covered with the arrays of heliostats (elevated mirrors) that would be used to collect heat energy from the sun. Like the PSPP, these mirror-fields would be relatively low in height (assumed to be under 20 feet maximum height). The amended project would however include two 750-foot-tall solar towers topped by 130-foot-tall solar receivers (SRSGs) that would concentrate the sunlight reflected by the field of heliostats to create steam, as well as reflect sunlight outward. For context, the towers would be the fifth tallest structures in California. The super-heated SRSGs would act as extremely bright sources of light. Similar to the PSPP, the amended project would also include various power-generation structures and a power transmission line from the project site extending westward to the Red Bluff substation, under construction south of I-10 between the project site and Desert Center. The greatest potential for public views of the transmission line would be from I-10 immediately to the south, and State Highway 177 roughly 9 miles to the west. The project's transmission line route traverses Colorado Desert Creosote Bush Scrub community shrubs and grasses. **Attachments 1A through 1D** in the Appendix present typical heliostat (1A), solar tower (1B), project layout (1C), and transmission line route (1D). **Visual Resources Table 1** provides a list of the major project features that would contribute to the apparent visual change of the landscape. A more detailed discussion of the proposed project is presented in the **PROJECT DESCRIPTION** section of this document. In addition to the features listed in Table 1 below, the proposed project would also include the installation of chain link fencing and desert tortoise fencing around the perimeter of the site for security and protection of sensitive biological resources.

Visual Resources Table 1
Key Project Components

Component	Dimensions (LxWxH) (Feet) / Capacity	Footprint (square feet)
Common Area		
Administration Building	180 x 80 x 34	14,400
Maintenance and Electrical Shops and Warehouse	90 x 120 x 48	10,800
Fire Water Storage Tank	25 (diameter) 15 (height)	NA
Fire Water Pump House	12 x 36 x 10	432
Emergency Diesel Generator Enclosure	12 x 18 x 10	216
Power Block #1		
Solar Tower including Solar Receiver Steam Generators	75 (diameter) 750 (height)	NA
Steam Turbine Generator Enclosure	34 x 46 x 52	1,564
Air Cooled Condenser	220 x 300 x 120	NA
Steam Turbine Enclosure	40 x 56 x 52	2,240
Steam Turbine Generator Lube Oil Enclosure	22 x 38 x 18	836
Deaerator/Feedwater Heater Structure	56 x 66 x 80	NA
Emergency Diesel Generator Enclosure	12 x 32 x 12	384
Plant Service Building	56 x 100 x 16	5,600
ACC Power Distribution Center – North	14 x 50 x 16	700
ACC Power Distribution Center – South	14 x 50 x 16	700
Fire Water Pump House	36 x 12 x 12	432
Demineralized Water Storage Tank	26 (diameter) 26 (height)	NA
Service/ Firewater Storage Tank	40 (diameter) 30 (height)	NA
Mirror Wash Water Storage Tank	25 (diameter) 21 (height)	NA
Boiler Pump Power Distribution Center	50 x 14 x 16	700
Waste Water Storage Tank	25 (diameter) 23 (height)	NA
Water Treatment Power Distribution Center	30 x 14 x 16	420
Night Preservation Auxiliary Boiler	10 x 12 x 12	NA
Start-up Auxiliary Boiler	14 x 56 x 16	NA
Mirror Wash Vehicle Refueling and Storage Area Canopy	74 x 116 x 24	NA
Mirror Wash Vehicle Storage Area Canopy	40 x 184 x 20	NA
Wet Surface Air Cooler (WSAC)	48 x 36 x 26	NA
Thermal Evaporation Unit	34 x 18 x 64	NA
Residue Tank	12 (diameter) 13 (height)	NA
Water Treatment Building	66 x 90 x 26	5,940
Generator Step-up Transformer	12 x 26 x 22	NA
Drains Tank	12 (diameter) 13 (height)	NA
Power Block #2		
Solar Tower including Solar Receiver Steam Generators	75 (diameter) 750 (height)	NA
Steam Turbine Generator Enclosure	34 x 46 x 52	1,564
Air Cooled Condenser	220 x 300 x 120	NA
Steam Turbine Enclosure	40 x 56 x 52	2,240
Steam Turbine Generator Lube Oil Enclosure	22 x 38 x 18	836
Deaerator/Feedwater Heater Structure	56 x 66 x 80	NA
Emergency Diesel Generator Enclosure	12 x 32 x 12	384
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Water Treatment Power Distribution Center	30 x 14 x 16	420
Night Preservation Auxiliary Boiler	10 x 12 x 12	NA
Start-up Auxiliary Boiler	14 x 56 x 16	NA
Mirror Wash Vehicle Refueling and Storage Area Canopy	74 x 116 x 24	NA
Mirror Wash Vehicle Storage Area Canopy	40 x 184 x 20	NA
Wet Surface Air Cooler (WSAC)	48 x 36 x 26	NA
Thermal Evaporation Unit	34 x 18 x 64	NA
Residue Tank	12 (diameter) 13 (height)	NA
Water Treatment Building	66 x 90 x 26	5,940
Generator Step-up Transformer	12 x 26 x 22	NA
Drains Tank	12 (diameter) 13 (height)	NA

Source: Palen 2012a, Appendix 2-A.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

Staff also evaluates the project to determine compliance with federal, state and local laws, ordinances, regulations and standards (LORS). **Visual Resources Table 3** lists relevant LORS pertaining to aesthetics or the preservation and protection of sensitive visual resources, and presents a discussion of project conformance with them. **Visual Resources Table 3** may be found at the end of the section, following the discussion of project impacts and mitigation under CEQA, under “Compliance with Applicable LORS.”

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

This section includes information about the following:

1. Method and threshold for determining significance

2. Direct/indirect/induced impacts and mitigation

3. Cumulative impacts and mitigation

METHOD AND THRESHOLD FOR DETERMINING SIGNIFICANCE

CEQA Criteria of Significance

The following regulatory criteria were considered in determining whether a visual impact would be significant under CEQA.

The CEQA *Guidelines* define a “significant effect” on the environment to mean a “substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project including...objects of historic or aesthetic significance.” (Cal. Code Regs., tit.14, §15382.) Appendix G of the *Guidelines*, under

Aesthetics, lists the following four questions to be addressed regarding whether the potential impacts of a project are significant:

1. Would the project have a substantial adverse effect on a scenic vista?

2. Would the project substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?

3. Would the project substantially degrade the existing visual character or quality of the site and its surroundings?

4. Would the project create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?

Key Observation Points (KOPs)

The visual resources approach is based on detailed analysis from representative Key Observation Points (KOPs). KOPs are generally selected to be representative of the most critical locations from which the project would be seen. KOPs are selected based on their usefulness in evaluating existing landscapes and potential impacts on visual resources with various levels of sensitivity, in different landscape types and terrain, and from various vantage points. Typical KOP locations for the proposed project and alternatives include (1) along major or significant travel corridors (I-10); (2) along recreational access 4WD roads and trails; (3) at key vista points; (4) from publicly accessible vantage points within designated Wilderness or other protected areas; and (5) at locations that provide good examples of the existing landscape context and viewing conditions.

At each KOP, the existing landscape was characterized. Photographs were obtained to indicate existing conditions without the project and then were modified to include a simulation of the project. Consequently, staff has a visual representation of the viewshed before and after a project is introduced to assist in the analysis.

Energy Commission staff evaluated the visual setting and proposed project in detail from several viewing areas represented by existing and simulated views of the following six key observation points, provided by the project owner and shown in **Visual Resources Figure 3,** *Key Observation Points (KOPs).* The project owner's simulations were taken from two submittals with different KOP numbering systems. To minimize confusion, a new KOP numbering system is adopted for this report, as described below and depicted in Figure 3. For each KOP, the equivalent KOP number from the relevant document is also provided in parentheses.

- **KOP 1** (VRA 3) – State Route 177, approximately 7 miles northwest of the project site, and approximately 8 miles northwest of the nearest solar tower, looking to the southeast. This KOP is representative of views from the SR 177 corridor. It also represents the nearest viewpoint within Joshua Tree National Park (JTNP, background distance).

- **KOP 2** (VRA 7) – Northwest of Desert Center, approximately 13 miles northwest of the project site, and approximately 14 miles northwest of the nearest solar tower, looking southeast. This viewpoint is the second nearest viewpoint to the project within JTNP (background distance).

- **KOP 3** (AFC 8B) – Eastbound Interstate 10 (I-10), approximately 0.5 mile west of the western boundary of the project site, and approximately 1.5 miles southwest of the nearest solar tower, looking to the east. This KOP represents the experience of I-10 motorists (eastbound, middleground distance).
- **KOP 4** (VRA 13) – Westbound Interstate 10 (I-10), approximately 6.4 miles southeast of the southeast corner of the project site, and approximately 5.7 miles southeast of the nearest solar tower, looking to the northwest. This KOP represents the experience of I-10 motorists (westbound, background distance).
- **KOP 5** (VRA 12) – Chuckwalla Mountains Wilderness, approximately 5 miles southwest of the project site, and approximately 6 miles southwest of the nearest solar tower, looking to the northeast. This KOP represents elevated views within the Chuckwalla Mountains Wilderness at background distance.
- **KOP 6** (VRA 15) – Palen McCoy Wilderness, approximately 3.5 miles northeast of the project site, and approximately 4.5 miles northeast of the nearest solar tower, looking to the southwest. This KOP represents elevated views within the Palen McCoy Wilderness at middle-ground-distance.

Each of these six key observation points is shown on **Visual Resources Figure 3**. At each KOP a visual analysis was conducted and a discussion of the visual setting for each KOP is presented in the subsection entitled “C. Visual Character or Quality,” below, and summarized in tabular form in **Visual Resources Table 2**. Existing conditions photographs are presented in **Visual Resources Appendix VR-2** along with visual simulations.

DIRECT/INDIRECT IMPACTS AND MITIGATION

This analysis considered the potential impacts of the proposed project in relation to the four significance criteria for visual resource impacts listed in Appendix G of the CEQA Guidelines, under Aesthetics, specified above.

A. Scenic Vistas

”Would the project have a substantial adverse effect on a scenic vista?”

For the purposes of this analysis, a *scenic vista* is defined as a designated scenic vista (identified in public planning documents); a view of high scenic quality perceived through and along a corridor or opening; or a view from a designated scenic area. While not the sole criterion for designation of wilderness areas, preservation of scenic values is a key concern underlying the Wilderness Act (P.L. 88-577 (16 U.S. C. 1131-1136)).

Yes. Although no designated scenic vistas were identified in the study area, panoramic and highly scenic vistas are available to backcountry recreationists that access the southern ridges of the Palen McCoy Wilderness and the northeastern ridges of the Chuckwalla Mountains Wilderness. Both areas overlook the expansive Chuckwalla Valley ringed by distinguishable mountain ranges. The extreme brightness of glare from the project's two solar receivers would be seen from the two Wilderness Areas at distances of as little as 4.5 miles. At this distance, based on available information, staff has determined that the solar receiver steam generators (SRSGs) would appear to viewers as very bright and prominent. While not physically dangerous, this level of brightness would strongly impair the recreational use of the Wilderness Areas (WAs) within the viewshed of the SRSGs, making viewing in the direction of the towers uncomfortable. Viewers within the WAs would experience substantial adverse glare effects. As shown in **Visual Resources Figures 8B and 9B**, the project would be prominently visible from both wilderness areas and the introduction of glare, industrial character and structural visual contrast would result in substantial adverse effects on these vistas. These effects are discussed under KOPs 5 and 6, below. In addition, based on available information, the SRSGs could potentially have substantial adverse glare effects on certain viewpoints in the easternmost portions of the JTNP as depicted in **Visual Resources Figures 4B and5B**. These effects are discussed under KOPs 1 and 2, below.

B. <u>Scenic Resources</u>

"Would the project substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?"

For the purpose of this analysis, *scenic resources* include a unique water feature (waterfall, transitional water, part of a stream or river, estuary); a unique physical geological terrain feature (rock masses, outcroppings, layers or spires); a tree having a unique/historical importance to a community (a tree linked to a famous event or person, an ancient, old growth tree); historic building; or other scenically important physical features, particularly if located within a designated federal scenic byway or state scenic corridor.

No. The Chuckwalla Valley floor consists primarily of desert scrub vegetation. The project site is located adjacent and to the north of I-10, which is not listed as an eligible State Scenic Highway, and there are no notable scenic features or historic structures located within the site. Therefore, the project would not substantially damage scenic resources such as trees, rock outcroppings, or historic buildings within a state scenic highway.

C. <u>Visual Character or Quality</u>

"Would the project substantially degrade the existing visual character or quality of the site and its surroundings?"

Criterion C is typically determined by staff's visual sensitivity/visual change assessment methodology, applied through analysis of representative KOPs throughout the project viewshed. However, due to the unusual character of the proposed project, visual impact conclusions under Criterion C revolve primarily around predicted effects of glare from the SRSGs, whose effects would be much stronger and extend much farther than those from visual change and contrast from project structures themselves. The reader should thus also refer to the discussion of Criterion D, Light and Glare, and to the discussion in **APPENDIX TT1 – GLINT AND**

GLARE SAFETY IMPACT ASSESSMENT in the **TRAFFIC AND TRANSPORTATION** section of this document.

Yes. The proposed project would introduce prominent structures with industrial character into the foreground to background views from SR 177 and the Desert Center area (see KOPs 1 and 2), I-10, Corn Springs Road (see KOPs 3, 4 and 5), nearby wilderness areas (see KOPs 6 and 7), Joshua Tree National Park (see KOPs 1 and 2), and a few nearby residences. The resulting visual change would range from moderate to high among these KOPs and, overall, result in a substantial degradation of the existing visual character or quality of the site and its surroundings.

The visual aspects evaluated according to Criterion C are organized into two categories: 1) construction impacts and 2) operational impacts.

Construction Impacts and Mitigation

Construction of the proposed project would cause temporary visual impacts due to the presence of equipment, materials, and workforce. These impacts would occur at the proposed solar power plant site and along the transmission line route. Construction would involve the use of cranes, heavy construction equipment, temporary storage and office facilities, and temporary laydown/staging areas. Construction would include site clearing and grading, construction of the actual facilities, and site cleanup and restoration. Visible traffic would also increase along I-10 and the BLM recreational access road during construction and grading activities would generate large dust clouds, which can be visually distracting if not controlled properly. Construction activities would be visible from I-10 (the primary travel corridor in the region), nearby BLM recreational access roads, the few residences in the area, SR 177, Palen McCoy Wilderness, and Chuckwalla Mountains Wilderness. Throughout the extensive construction period of approximately 33 months, the industrial character of the activities would constitute adverse and significant visual impacts. However, the vast majority of the area disturbed by construction would eventually be occupied by project facilities (see the “Operational Impacts and Mitigation” subsection below) though some areas of disturbed soil surfaces (characterized by high color, line and texture contrasts) would remain and would be visible from the various viewing vantage points. These areas of residual disturbance would require successful restoration. Proper implementation of Condition of Certification **VIS-2** would ensure that the visual impacts of residual disturbed areas associated with project construction remain less than significant. It is also anticipated that construction activity will take place at night. Implementation of Condition of Certification **VIS-3**, presented later in this analysis, would ensure that significant construction lighting impacts do not occur.

Operational Impacts and Mitigation

An analysis of operation impacts was conducted for the view areas represented by the key viewpoints selected for in-depth visual analysis. The results of the operation impact analysis are discussed below by KOP and presented in **Visual Resources Table 2**. The visual impacts of night lighting are discussed in a separate section of this analysis. For each KOP, an evaluation of visual contrast, project dominance, and view blockage is presented with a concluding assessment of the overall degree of visual change caused by the proposed project. Visual change is then considered within the context of the landscape's visual sensitivity to arrive at a determination of visual impact significance.

The analysis that follows is based in part on visual simulations provided by the project owner and reproduced at the end of this section. It should be noted that judgments of visual contrast and dominance should be based on reproductions of the simulations at 'life-sized' scale (i.e., at a scale that reproduces the viewing conditions as seen by the naked eye at the site of the KOP). Based on camera lens information provided to staff, this implies figure reproduction at approximately ledger-size, viewed at normal reading distance. It is also noted that brightness of glare sources such as the SRSGs cannot be reproduced in a printed (or projected) image.

KOP 1 – State Route 177 Corridor/Coxcomb Mountain (JTNP)

KOP 1 was selected to characterize the visual impact to residents, park visitors, and motorists on and around State Route (SR) 177, in the area northwest of the proposed project. KOP 1 is located near southbound SR 177, approximately 7 miles northwest of the project site and 8.7 miles to the nearest solar tower (background distance). The view is to the southeast and is depicted in **Visual Resources Figure 4A**. The existing landscape within the SR 177 corridor varies in character, quality, and sensitivity. Much of the corridor between Desert Center and the KOP is typified by disturbance from human activity in the foreground. From the vicinity of the KOP northward, views are intact and natural in appearance. In addition, a range of high-sensitivity viewers is present in this portion of the viewshed, including national park visitors and residents.

Visual Quality: Moderately low. The foreground to middleground views from SR 177 encompass a broad, open and predominantly undeveloped landscape, punctuated however by various signs of human habitation in the highway foreground, including rural residences, jojoba and palm farming, and an auto wrecking yard. From the vicinity of the KOP northward, views are intact and undisturbed by human uses. The KOP is also within the easternmost portion of the JTNP, where the park boundary adjoins SR 177. The landscape in this portion of the viewshed consists of a relatively non-descript, flat, grass- and shrub-covered plain, back-dropped by the angular forms of the Palen and Chuckwalla Mountains to the east and southeast, and the Granite and Coxcomb Mountains to the north. The mountain ranges add visual interest and contribute to the low-to-moderate rating for visual quality.

Viewer Concern: High. Viewer concern is considered particularly high at this KOP due to its location within the JTNP. Similarly, the Desert Lily ACEC is located a short distance from the KOP. In addition, residential viewers in the general SR 177 corridor, including homes along SR 177 and the Lake Tamarisk neighborhood to its west, would have high viewer concern. Viewers at commercial operations, such as farms, auto wrecking yard and the Chuckwalla Valley Raceway would have moderately low or low viewer concern. Viewer concern of motorists in this segment of SR 177 is considered moderate. Motorists' expectations would be moderated by the existing intrusion of visual disturbances, although some proportion of motorists would be en route to or from JTNP. Overall however, due to the high sensitivity of a national park, ACEC, and residential viewers, viewer concern in the SR 177 corridor is considered high.

Viewer Exposure: Moderately high. Site visibility is high in that the view of the site from KOP 1 is largely unobstructed. Although the site is at background distance from the KOP, the very tall and extremely bright towers would exert strong visual influence over an unusually large range, extending well into background distances. Based on available information, the SRSGs would be highly prominent from the SR 177 corridor, due particularly to glare. The number of viewers within the SR 177 corridor is moderate. The view duration for residents is high. For motorists view duration would be extended, with uninterrupted sightlines to the site for many miles of travel distance. The high visibility, moderate number of viewers, and extended duration of view would result in moderately high viewer exposure.

Overall Visual Sensitivity: Moderately high. For viewers at KOP 1 and along SR 177, the low-to-moderate visual quality combined with high viewer concern and moderately high viewer exposure result in an overall moderate-to-high visual sensitivity of the visual setting and viewing characteristics.

Visual Resources Figure 4B presents a visual simulation of the proposed project and illustrates the visibility of the project area as viewed from KOP 1.

Visual Contrast: High. As indicated in the simulation, the solar towers and taller features of the power block would remain visible even at this distance, presenting moderate form contrast even at background distances due to their vertical form against the horizontal ground plain. Form and texture contrast would be moderate. One of the two towers would penetrate the ridgeline of the mountains in the background. As depicted in the simulations, the heliostat fields would also be partly visible, and exhibit some diffuse reflection of the sky ('glint') under some conditions, presenting color and texture contrast somewhat similar to a lake surface. However, as discussed in detail farther below, form and color contrast would tend to be rendered irrelevant in comparison to the brightness of the glare of the solar receivers. Based on currently available information, staff concluded that at the range of distances characteristic of the SR 177 corridor (very roughly 8 - 10 miles to the nearest solar receiver), viewers would be within the range of strong, significant glare impacts and, potentially, within the range of discomfort glare. The illumination from the SRSGs at the tops of the two solar towers would be clearly visible from KOP 1 and throughout the SR 177 corridor, causing visual distraction and strongly exacerbating the contrast associated with the project facilities. The resulting visual contrast of this combination of strong glare and form contrast would be high (see the **Visual Resources Table 2**).

Project Dominance*:* Dominant. As described previously, staff concluded that viewers at KOP 1 and the SR 177 corridor would be within the range of significant glare impacts.

The brightness of the receivers would dominate attention, could not be ignored, and could cause discomfort in views toward the project. The proposed project also would appear prominent given the location of the two solar towers within (a) the center of Chuckwalla Valley (north to south) and (b) the center of a primary field of view toward the Palen and Chuckwalla Mountains across the valley. Overall, project dominance would be high.

View Blockage: Moderate. Glare from the solar receivers would make views toward those portions of the Palen and Chuckwalla Mountains near the solar receivers uncomfortable. The receivers would thus effectively block views of the Chuckwalla and Palen Mountains in those portions of the view in which the receivers are seen. The resulting view blockage would be moderate.

Overall Visual Change: Moderately high. Based on available information, from KOP 1, the values for visual contrast, project dominance, and view blockage, when taken together, constitutes a high level of overall visual change.

Visual Impact Significance: Adverse and significant. When considered within the context of the overall moderate-to-high visual sensitivity of the existing landscape and viewing characteristics, the moderately high visual change that would be perceived from KOP 1 would cause an adverse and significant visual impact.

Mitigation: Given the large scale of the impact area and the height and glare of the solar towers, no available mitigation measures were identified that would be adequate to mitigate the significant visual impacts to less than significant levels. However, if the amended project is approved, Energy Commission staff recommends the following conditions of certification to minimize structure contrast and lighting and glare impacts to the extent possible: **VIS-1**, Surface Color Treatment of Structures; **VIS-2**, Revegetation of Disturbed Soil Areas; **VIS-3**, Temporary and Permanent Exterior Lighting. Conditions **VIS-1**, **VIS-2**, and **VIS-3** are from the Commission Decision.

Residual Impact Significance After Mitigation. No mitigation measures were identified by Energy Commission staff to fully address impacts. Impacts would remain significant and unavoidable.

KOP 2 – Northwest of Desert Center/Big Wash (JTNP)

KOP 2 was selected to characterize the visual impact to recreationists accessing the Joshua Tree National Park, and is the second nearest location to the project within the JTNP after KOP 1. KOP 2 is located at the eastern edge of the hills west of Desert Center and SR 177, approximately 13 miles northeast of the project site and approximately 15 miles from the nearest SRSG. The view is across the Chuckwalla Valley to the southeast and is depicted in **Visual Resources Figure 5A**. This location provides an open and unobstructed view of the site that would be experienced by recreationists seeking an off-road and back-country recreational experience. The foreground to middleground terrain is flat and supports sparse desert scrub vegetation. The existing landscape appears predominantly natural in appearance and is absent any built features. Visible in the background are the angular forms of the Palen and Chuckwalla Mountains.

Visual Quality: Moderate. The foreground to middleground views encompass a broad, open and undeveloped landscape consisting of a relatively non-descript, flat, grass- and shrub-covered plain, back-dropped by the angular forms of the Palen Mountains (adjacent and to the east of the site). As depicted in the KOP, visual disturbance from human activity is relatively minimal in views toward the site from this portion of the viewshed (JTNP), which is visually isolated by terrain from the Eagle Mine and Hayfield pumping station to the north. The mountain range adds visual interest and contributes to the moderate rating for visual quality.

Viewer Concern: High. Viewers within the JTNP are considered by definition to have high viewer concern, and undisturbed scenery is a primary expectation of such viewers. In general, as the landscapes along the I-10 corridor and within the Chuckwalla Valley become more and more industrialized with the addition of built features with industrial character, opportunities for recreational experiences that offer expansive views of intact and natural appearing desert landscapes are rapidly diminishing. Thus, the off-road, back-country recreationists seeking unspoiled landscapes and a respite from the highly urbanized areas of Southern California to the west would be highly sensitive to the introduction of industrial character to this naturally appearing landscape, and would perceive such as an adverse visual change. Therefore, overall viewer concern is rated high.

Viewer Exposure: Moderately high. Site visibility is high in that the view of the site from KOP 2 is unobstructed. As described under KOP 1, although the site is quite distant from KOP 2, the brightness of glare from the SRSGs is expected to greatly accentuate the prominence, dominance and contrast of the project, even at such background distances. Although the precise level of brightness at this distance is not yet known, based on the information currently available, the SRSGs are anticipated to remain prominent at this viewing distance (15 miles). While the number of viewers would be low, the view duration would be extended, with uninterrupted views to the site from KOP 2 and its vicinity occurring for substantial distances at low travel speeds. The high visibility, low numbers of viewers and extended duration of view would result in moderate-to-high viewer exposure.

Overall Visual Sensitivity: Moderately high. For viewers at KOP 2 and along nearby access roads, the low-to-moderate visual quality combined with high viewer concern and moderate-to-high viewer exposure result in an overall moderate-to-high visual sensitivity of the visual setting and viewing characteristics.

Visual Resources Figure 5B presents a visual simulation of the proposed project site and illustrates the visibility of the project area.

Visual Contrast: Moderate. From this KOP, form contrast of the towers would be low. Their vertical form would contrast with the predominantly horizontal lines of the setting and would penetrate the ridgeline of background mountains, drawing the eye, but their magnitude in the overall field of view would be subordinate to other features in the view. Taller power block features, including the air-cooling condensers, would also be visible but present subordinate levels of form contrast. If the concern were the project structures alone, project contrast at this distance would be moderately low or low. However, as described previously in KOP 1, the brightness of the solar receivers would be sufficiently intense as to render other aspects of visual contrast largely irrelevant. Based on currently available information, this KOP, at a distance of approximately 14 miles from the nearest solar tower, is expected to lie outside the range of significant glare impact identified by staff. However, contrast from glare at this KOP is anticipated to remain moderate.

Project Dominance: Co-dominant. Based on currently available information, KOP 2 is believed by staff to be outside of the range of significant glare impacts from the SRSGs. However, they would remain evident as very bright, although small, points of light, which would contrast with the visual background and attract attention. The mirror fields would appear relatively inconspicuous at this distance, unless bright glint reflections occurred under certain conditions. These conditions would be transitory however, and would be considerably less bright than the SRSGs. Overall project dominance would be co-dominant. Staff considers that SRSG brightness could remain at least moderate and co-dominant up to the distance where the SRSGs subtend a visual angle of 5 arc minutes (occupy 5 arc minutes of the viewer's visual field). (One arc minute equals 1/60th of a degree of angle). That radius of effect is not currently known, but it is assumed that the needed information will be available by the time of publication of the Final Staff Assessment (FSA). (The reader is referred to **APPENDIX TT1 GLINT AND GLARE SAFETY IMPACT ASSESSMENT** in the **TRAFFIC AND TRANSPORTATION** section of this document.)

View Blockage: Moderate to low. At these distances, glare from the solar receivers could cause some level of discomfort to viewers looking toward the Palen and Chuckwalla Mountains. However, at this distance the proportion of the field of view affected by the project in its entirety remains quite small, as depicted in the simulation. From the vicinity of KOP 2, the solar towers would not block large portions of the Chuckwalla Valley floor, the background Palen and Chuckwalla Mountains, or the sky from view, but the towers would be higher and more prominent than the mountains in the nearby background, and their reflected sunlight would be apparent in views in the direction of the towers. Overall, the resulting view blockage from the effect of glare would be considered moderate to low.

Overall Visual Change: Moderate. Based on available information, the values for visual contrast, project dominance, and view blockage, when taken together, constitute a moderate level of overall visual change.

Visual Impact Significance: Adverse and significant. Particularly due to the location within JTNP, and based on currently available information, when considered within the context of the overall moderately high visual sensitivity of the existing landscape and viewing characteristics, the moderate visual change that would be perceived from KOP 2 would cause an adverse and significant visual impact.

Mitigation: Given the large scale of the impact area, no available mitigation measures were identified that would be adequate to mitigate the potentially significant visual impacts to a less than significant level. However, if the amended project is approved, Energy Commission staff recommends the following conditions of certification to minimize structure contrast and lighting and glare impacts to the extent possible: **VIS-1**, Surface Color Treatment of Structures; **VIS-2**, Revegetation of Disturbed Soil Areas; **VIS-3**, Temporary and Permanent Exterior Lighting.

Residual Impact Significance After Mitigation: No measures were identified by Energy Commission staff to fully address impacts. Impacts would remain potentially significant and unavoidable.

KOP 3 – Eastbound Interstate 10

KOP 3 was selected to characterize the visual impact to motorists on I-10 in the immediate vicinity of the proposed project. KOP 3 is located on eastbound I-10, just east of the Corn Springs Road/I-10 eastbound on-ramp, approximately 0.5 mile west of the project site. The view is to the east as depicted in **Visual Resources Figure 6A.** Views from I-10 in the vicinity of the project provide an open and unobstructed view of the site. The foreground to middleground terrain is flat and supports sparse desert scrub vegetation. The existing landscape appears absent any built features and is natural in appearance. The project would be visible in the foreground. To the north and east of the site (background mountains in the image) are the Palen Mountains and Palen McCoy Wilderness. To the north and north-northwest of the site (beyond the frame of the image) are the Granite and southern end of the Coxcomb Mountains, and Joshua Tree National Park.

Visual Quality: Moderate. The foreground to middleground views from I-10 encompass a broad, open and predominantly undeveloped landscape consisting of a relatively non-descript, flat, grass- and shrub-covered plain, backdropped by the striking angular forms of the Palen Mountains and the more distant Granite and Coxcomb Mountains to the north. The mountain ranges add visual interest and contribute to the moderate rating for visual quality. Existing visual disturbances in the highway corridor include existing transmission lines, commercial uses of Desert Center, and the Red Bluff substation, under construction roughly 3.9 miles west of the project site.

Viewer Concern: Moderately high. Typically, viewer concern of highway motorists is considered moderate. However, as the landscapes along the I-10 corridor become more and more industrialized with the addition of built features with industrial character, opportunities for expansive views of natural appearing desert landscapes are rapidly diminishing. Combined with the high volume of travelers on I-10 (the primary travel corridor between Southern California and Phoenix) and viewer expectations of observing higher quality landscape features while traveling through a designated conservation area (CDCA), travelers would be highly sensitive to the introduction of industrial character to this naturally appearing landscape, which would be perceived as an adverse visual change. Therefore, overall viewer concern is rated moderately high.

Viewer Exposure: High. Site visibility is high in that the view of the site from KOP 3 is unobstructed at foreground viewing distances. The number of viewers is high and the view duration for motorists on I-10 would be extended with uninterrupted sightlines to the site from I-10 extending out many miles of travel. The high visibility and number of viewers and extended duration of view would result in high viewer exposure.

Overall Visual Sensitivity: Moderately high. For viewers at KOP 3 and along I-10, the moderate visual quality combined with moderately high viewer concern and high viewer exposure result in an overall moderate-to-high visual sensitivity of the visual setting and viewing characteristics.

Visual Resources Figure KOP 6B presents a visual simulation of the proposed project as viewed from KOP 3.

Visual Contrast: High. The proposed project would add prominent industrial features to the foreground landscape, including the prominent vertical forms of the solar towers, air-cooled condensers, heliostat fields, and nearby segment of the transmission line to the Red Bluff substation.

As depicted in the simulation of KOP 3 (**Visual Resources Figures 6B)**, form contrast of the towers alone would be very strong at this distance, their vertical form contrasting strongly with the predominantly horizontal lines of the existing valley floor landscape, and breaking the ridgeline of the Palen Mountains in the background. The 750-foot-tall towers would appear massive at this distance (approximately 1.5 mile to the nearest tower). For purposes of comparison, the solar towers would be the third-tallest structures in San Francisco, with a luminous receiver area of approximately 12 stories in height. From the vicinity of I-10, lower project features such as the air-cooling unit, transmission towers, and the heliostat fields would also be prominent, adding a further highly industrial character to views.

However, as described previously, form and color contrast of the towers would be rendered less relevant due to the extreme brightness of the solar receivers, which at this distance would be so bright that viewers would avoid looking directly at the towers. As discussed below under the “Criterion D, Light and Glare” subsection, at this distance (approximately 1.5 mile from the nearest tower) the receivers would appear roughly as large in magnitude within the viewer’s field of vision (subtended visual angle) as the sun, and would be so bright that viewers would avert their gaze. At this distance, the visual effect could thus be subjectively similar to two additional suns in the sky. Although the level of brightness would not cause physical harm to viewers’ vision, it would cause substantial discomfort, would cause viewers to avert their gaze, and would strongly disrupt the experience of the landscape. The resulting level of visual contrast due to glare would be very high. In addition, high levels of diffuse glare off the heliostats are anticipated during certain hours of the day.

Project Dominance: Dominant. At this distance, the solar receiver towers would exert strong scale dominance, as the only comparable vertical element within the immediate field of view in a setting characterized by flat, horizontal topography. The brightness of the solar receivers, however, would be the dominating visual element of the landscape, exerting strong dominance and strongly attracting attention. They could not be ignored and would cause discomfort in views toward the project. Overall project dominance would be high.

View Blockage: High. From the vicinity of KOP 4, glare from the solar receivers would make views in the direction of the Palen Mountains distinctly uncomfortable. In effect, the receivers would thus effectively block views of the Palen Mountains from this general area by causing viewers to avert their gaze. View blockage is thus considered high.

Overall Visual Change: High. From KOP 4, the values for visual contrast, project dominance, and view blockage, when taken together, constitutes a high level of overall visual change.

Visual Impact Significance: Adverse and significant. When considered within the context of the overall moderate-to-high visual sensitivity of the existing landscape and viewing characteristics, the high visual change that would be perceived from KOP 4 would cause an adverse and significant visual impact.

Mitigation: Given the large scale of the impact area, no available mitigation measures were identified that would be adequate to mitigate the significant visual impacts to levels that would be less than significant. However, if the amended project is approved, Energy Commission staff recommends the following conditions of certification to minimize structure contrast and lighting and glare impacts to the extent possible: **VIS-1**, Surface Color Treatment of Structures; **VIS-2**, Off-Site Landscape Screening; **VIS-3**, Revegetation of Disturbed Soil Areas; **VIS-4**, Temporary and Permanent Exterior Lighting.

Residual Impact Significance After Mitigation: No measures were identified by Energy Commission staff to fully address impacts. Impacts would remain significant and unavoidable.

KOP 4 – Westbound Interstate 10

Like KOP 3, KOP 4 represents the experience of motorists on I-10 in the immediate vicinity of the proposed project. For purposes of comparison to KOP 3, which is at middleground distance, KOP 4 is located on westbound I-10, approximately 6.4 miles southeast of the project site, at background distance. The view is to the northwest as depicted in **Visual Resources Figure 7A**. Viewing conditions are as described previously under KOP 3.

Visual Quality, Viewer Concern, and Viewer Exposure: Visual quality, viewer concern, and viewer concern from I-10 in the vicinity of the project site were described above under KOP 3.

Overall Visual Sensitivity: Moderately high. As under KOP 3, for viewers at KOP 4 and along I-10, the moderate visual quality combined with moderately high viewer concern and high viewer exposure result in an overall moderate-to-high visual sensitivity of the visual setting and viewing characteristics.

Visual Resources Figure 7B presents a visual simulation of the proposed project as viewed from KOP 4.

Visual Contrast: High. As described under KOP 3, the proposed project would add prominent industrial features to the landscape of I-10, including the prominent vertical forms of the solar towers, air-cooled condensers, heliostat fields, and nearby segment of the transmission line to the Red Bluff substation. From background distances such as KOP 4, the form contrast of the project features would be moderate. However, based on available information, even at this distance (6.4 miles from project), SRSG glare is anticipated to be strong, potentially representing a discomfort level of glare and causing viewers to avert their gaze. This strong level of glare would represent a high degree of contrast. In addition, high levels of bright, diffuse glare off the heliostats are anticipated during certain hours of the day.

Project Dominance: Dominant. Dominance of project features alone would be moderate. However, even at this background distance the level of glare from the SRSGs would strongly attract attention and could not be ignored.

View Blockage: High. From the vicinity of KOP 4, glare from the solar receivers would make views in the direction of the Eagle and Coxcomb Mountains distinctly uncomfortable. In effect, the receivers would thus effectively block views of the Eagle and Coxcomb Mountains from this general area by causing viewers to avert their gaze. View blockage is thus considered high.

Overall Visual Change: High. From KOP 4, the values for visual contrast, project dominance, and view blockage, when taken together, constitutes a high level of overall visual change.

Visual Impact Significance: Adverse and significant. When considered within the context of the overall moderate-to-high visual sensitivity of the existing landscape and viewing characteristics, the high visual change perceived from KOP 4 would cause an adverse and significant visual impact.

Mitigation: Given the large scale of the impact area, no available mitigation measures were identified that would be adequate to mitigate the significant visual impacts to levels that would be less than significant. However, if the amended project is approved, Energy Commission staff recommends the following conditions of certification to minimize structure contrast and lighting and glare impacts to the extent possible: **VIS-1**, Surface Color Treatment of Structures; **VIS-2**, Revegetation of Disturbed Soil Areas; **VIS-3**, Temporary and Permanent Exterior Lighting.

Residual Impact Significance After Mitigation: No measures were identified by Energy Commission staff to fully address impacts. Impacts would remain significant and unavoidable.

KOP 5 – Corn Springs Road/Chuckwalla Mountains Wilderness

KOP 5, **Visual Resources Figure 8A,** depicts the view from Corn Springs Road, within the Chuckwalla Mountains Wilderness. Corn Springs Road provides access to the wilderness area, and to the BLM Corn Springs Campground, a popular recreational destination located, atypically, within the wilderness area. The campground, noted for a palm oasis and exceptional archaeological features, lies outside of the viewshed of the PSEGS, visually isolated by intervening mountains. KOP 5 is located in the northeast portion of the wilderness area, approximately 3.5 miles southwest of the project site, and roughly 4.7 miles from the nearest solar tower (middleground distance). Open and unobstructed views of the site would be experienced both by recreationists seeking the backcountry recreational wilderness experience and by visitors to the Corn Springs Campground. Views in the WA are characterized by panoramic vistas of the project site, Chuckwalla Valley and beyond, seen from an elevated position. The middleground to background view encompasses the flat valley floor, backdropped by the rugged and vivid forms of the Palen, Granite and Coxcomb Mountains. From this vantage point, the existing landscape appears predominantly natural in appearance and is absent any noticeable built features except for the thin linear form of I-10 that passes through the valley.

Visual Quality: Moderately high. As depicted in **Visual Resources Figure 8A**,the middleground to background panoramic vistas from even the lower north-facing foothills of the Chuckwalla Mountains Wilderness encompass broad expanses of the low-lying Chuckwalla Valley, dry lake bed, and bajadas ringed by rugged, angular mountain ranges that appear to rise abruptly from the flat valley floor. Visual integrity of the dramatic desert landscape is relatively high. The Sunrise Powerlink transmission lines, development of Desert Center and the thin line of I-10 are visible in the distance but remain very subordinate within the view. The elevated perspective from KOP 5 thus provides a panoramic overview of the relatively intact valley landscape over vast distances. Overall visual quality is moderate-to-high.

Viewer Concern: High. Backcountry recreationists seeking the desert wilderness experience would expect to find viewing opportunities that offer expansive views of intact and natural appearing desert landscapes with minimal if any industrial character. These backcountry and wilderness visitors would be highly sensitive to the introduction of industrial character to this naturally appearing landscape, and would perceive such additions as an adverse visual change. Therefore, overall viewer concern is rated high.

Viewer Exposure: Moderately high. Viewer exposure is high in that the view toward the project site from KOP 5 is both unobstructed and elevated. From this elevated position, expansive, panoramic views of the surface of the valley floor and project site are visible in the distance below. The large scale of the project would render the project highly prominent in the field of view to the north, even at a 5-mile viewing distance. While the number of viewers would be low, the view duration would be extended from throughout the northeastern portion of the Chuckwalla Mountains Wilderness. Viewer numbers would be somewhat higher than typical in wilderness areas due to use of the campground and accessibility provided by Corn Springs Road. The high visibility, low numbers of viewers and extended duration of view would result in moderate-to-high viewer exposure.

Overall Visual Sensitivity: Moderately high. For viewers at KOP 5 and other nearby viewing areas within the Chuckwalla Mountains Wilderness, the moderate-to-high visual quality combined with high viewer concern and moderate-to-high viewer exposure result in an overall moderate-to-high visual sensitivity of the visual setting and viewing characteristics.

Visual Resources Figure 8B presents a visual simulation of the proposed project form KOP 5.

Visual Contrast: High. The proposed project would convert a substantial portion of the existing, natural-appearing desert valley landscape to an industrial facility that would be characterized (at a five-mile viewing distance) by geometric forms and prominent horizontal and vertical lines and industrial colors and surface textures. The project, occupying 5.9 square miles of the valley floor, would dominate a large portion of the northward field of view. Because of the elevated perspective, a majority of the facility would be visible including both towers, the power blocks, heliostat field, and transmission line, though at this viewing distance (approximately five miles) many structural details would not be discernible. As suggested in the simulation, the heliostat fields, viewed from an elevated position, would display large areas of diffuse reflection somewhat like a lake surface, which would vary with hour and season. Overall the introduced industrial characteristics are highly contrastive with the existing landscape.

However as discussed previously, the brightness of the solar receivers would be sufficiently intense as to render other aspects of visual contrast less relevant. The receivers, visible in this KOP at middleground to background distance, would be perceived as extremely bright light sources demanding attention and causing visual discomfort when in the field of view. As such, visual contrast of the project from KOP 5 is considered high due to glare.

Project Dominance: Dominant. The proposed project would appear prominent given the spatial prominence of the proposed facility within (a) the center of Chuckwalla Valley (north to south) and (b) the center of a primary field of view toward the Coxcomb, Granite, and Palen Mountains across the valley. The proposed project would dominate views of the broad valley floor surface and strongly intrude into views of the background mountains. Overall, the solar receivers would dominate the visual environment, could not be ignored, and would cause discomfort in views in the direction of the towers over a broad area. Overall project dominance would be high.

View Blockage: Moderately high. Glare from the solar receivers would tend to render views northward largely unviewable within a broad area of the northeastern Chuckwalla Mountains Wilderness, because within the range of discomfort glare, viewers would instinctively avert their gaze from the very bright light sources. Although the exact extent of the range of discomfort glare is not yet known, it is anticipated to extend for several miles from the solar towers. From the vicinity of KOP 5, the heliostat fields would also block from view a noticeable and central portion of the Chuckwalla Valley floor. The resulting view blockage would be moderately high.

Overall Visual Change: High. The project would demand attention, could not be overlooked, and would be dominant in the landscape. From KOP 5, the values for visual contrast, project dominance, and view blockage, when taken together, would constitute a high level of overall visual change.

Visual Impact Significance: Adverse and significant. When considered within the context of the overall moderate-to-high visual sensitivity of the existing landscape and viewing characteristics, the high visual change that would be perceived from KOP 5 would cause a significant and unavoidable visual impact.

Mitigation: Given the large scale of the impact area, no available mitigation measures were identified that would be adequate to mitigate the significant visual impacts to levels that would be less than significant. However, if the amended project is approved, Energy Commission staff recommends the following conditions of certification to minimize structure contrast and lighting and glare impacts to the extent possible: **VIS-1**, Surface Color Treatment of Structures; **VIS-2**, Revegetation of Disturbed Soil Areas; **VIS-3**, Temporary and Permanent Exterior Lighting.

Residual Impact Significance After Mitigation: No measures were identified by Energy Commission staff to fully address impacts. Impacts would remain significant and unavoidable.

KOP 6 – Palen McCoy Wilderness

KOP 6 represents the visual impact to recreationists in the Palen McCoy Wilderness. KOP 6 is located on a ridge in the southwestern portion of the wilderness area. The elevated view to the southwest is depicted in **Visual Resources Figure 9A**. This location provides an open and unobstructed elevated view of the site that would be experienced by recreationists seeking the backcountry recreational wilderness experience, with panoramic vista views of the Chuckwalla Valley and beyond. The middleground to background view encompasses the flat valley floor, backdropped by the rugged, angular forms of the Chuckwalla Mountains. From this elevated vantage point, the existing landscape appears predominantly natural in appearance and is absent any noticeable built features except for the thin linear form of I-10 that passes through the valley, and some rectilinear fields of irrigated agriculture whose green color contrasts with the surrounding area.

Visual Quality: Moderately high. The middleground to background panoramic vista views from the ridges along the southern flanks of the Palen McCoy Wilderness, encompass the broad expanses of the Chuckwalla Valley, ringed by rugged, angular mountain ranges that appear to rise abruptly from the flat valley floor. Visual integrity of the fairly dramatic desert landscape is high with minimal intrusions of visually discordant built features. The elevated perspective of KOP 6 enables views of considerable visual interest, and overall visual quality is rated moderate-to-high.

Viewer Concern: High. Backcountry recreationists seeking the desert wilderness experience would expect to find viewing opportunities that offer expansive views of intact and natural appearing desert landscapes with minimal if any industrial character, particularly within the California Desert Conservation Area. These backcountry and wilderness visitors would be highly sensitive to the introduction of industrial character to this naturally appearing landscape, and would perceive such additions as an adverse visual change. Therefore, overall viewer concern is rated high.

Viewer Exposure: Moderate. Site visibility is high in that the view of the site from KOP 6 is unobstructed at a middleground viewing distance and the site is central to the field of view. While the number of viewers would be very low, the view duration would be extended from the vista viewpoints along the southern ridges of the Palen McCoy Wilderness. The high visibility, very low numbers of viewers and extended duration of view would result in moderate-to-high viewer exposure.

Visual Sensitivity: Moderately high. For viewers at KOP 6 and other nearby viewing areas within the Palen McCoy Wilderness, the moderate-to-high visual quality combined with high viewer concern and moderate viewer exposure result in an overall moderate-to-high visual sensitivity of the visual setting and viewing characteristics.

Visual Resources Figure 9B presents a visual simulation of the proposed project from KOP 6.

Visual Contrast: High. The proposed project would convert a substantial portion of the existing, natural-appearing landscape to an industrial facility that would be characterized by geometric forms with strong horizontal and vertical lines and industrial and reflective surfaces. Because of the elevated perspective, the entire facility would be visible including both towers, the power blocks, heliostat field, and transmission line. The introduced industrial characteristics are not found in the existing landscape.

As described previously, the brightness of the solar receivers would be sufficiently intense as to render other aspects of visual contrast less relevant. From this typical KOP, the solar receivers would be visible at a distance of between 5 and 6 miles and would be perceived as extremely bright light sources demanding attention and causing visual discomfort when in the field of view. As such, visual contrast of the project from KOP 6 is considered high due to glare.

Project Dominance: Dominant. The proposed project would appear highly prominent given the great spatial extent of the proposed facility within (a) the center of Chuckwalla Valley (north to south) and (b) the center of a primary field of view toward the southwest and the Chuckwalla Mountains across the valley. The proposed project would occupy a large proportion of the valley floor as seen from south- and west-facing slopes in the southernmost area of the Palen McCoy Wilderness. Most significantly, the glare of the solar receivers would dominate the visual environment over a substantial portion of both lowlands and highlands in the south- and west-facing areas of the wilderness. The glare of the SRSGs could not be ignored, and would cause discomfort in views in the direction of the towers. Overall project dominance would be high.

View Blockage: Moderately high. Glare from the solar receivers would render views in the direction of the project largely unviewable within a large area of the wilderness. In addition, from elevated viewpoints such as KOP 6, the project facilities would block from view a substantial and central portion of the Chuckwalla Valley floor. The resulting view blockage would be moderately high.

Overall Visual Change: High. The project would demand attention, could not be overlooked, and would be dominant in the landscape. From KOP 6, the values for visual contrast, project dominance, and view blockage, when taken together, would constitute a high level of overall visual change.

Visual Impact Significance: Adverse and significant. When considered within the context of the overall moderate-to-high visual sensitivity of the existing landscape and viewing characteristics, the high visual change that would be perceived from KOP 6 would cause an adverse and significant visual impact.

Mitigation: Given the large scale of the impact area, no available mitigation measures were identified that would be adequate to mitigate the significant visual impacts to levels that would be less than significant. However, if the amended project is approved, Energy Commission staff recommends the following conditions of certification to minimize structure contrast and lighting and glare impacts to the extent possible: **VIS-1**, Surface Color Treatment of Structures; **VIS-2**, Revegetation of Disturbed Soil Areas; **VIS-3**, Temporary and Permanent Exterior Lighting.

Residual Impact Significance After Mitigation: No measures were identified by Energy Commission staff to fully address impacts. Impacts would remain significant and unavoidable.

Visual Resources Table 2
KOP Ratings: Visual Sensitivity/Visual Change and Impact Significance under CEQA Criterion C

KOP No.	VISUAL SENSITIVITY (Existing Condition)						
			Viewer Exposure				
	Visual Quality	Viewer Concern	Visibility	No. of Viewers	Duration of View	Overall Viewer Exposure	Overall Visual Sensitivity
1 SR 177 Corridor/ Coxcomb Mt. (JTNP)	Moderately low	High	High	Moderate	High	Moderately high	Moderately high
2 Northwest of Desert Center/ Big Wash (JTNP)	Moderate	High	High	Low	High	Moderate to High	Moderately high
3 Eastbound I-10	Moderate	Moderately high	High	High	High	High	Moderately high
4 Westbound I-10	Moderate	Moderately high	High	High	High	High	Moderately high
5 Corn Springs Road/ Chuckwalla Mountains Wilderness	Moderately high	High	High	Low	High	Moderately high	Moderately high
6 Palen McCoy Wilderness	Moderate high	High	High	Very Low	High	Moderate	Moderately high

KOP No.	VISUAL CHANGE (Project Effect)			
	Contrast	Dominance	View Blockage	Overall Visual Change
1 SR 177 Corridor/ Coxcomb Mt. (JTNP)	High	Dominant	Moderate	Moderately high
2 Northwest of Desert Center/ Big Wash (JTNP)	Moderate	Co-Dominant	Moderately low	Moderate
3 Eastbound I-10	High	Dominant	High	High
4 Westbound I-10	High	Dominant	High	High
5 Corn	High	Dominant	Moderately high	High

Springs Road/ Chuckwalla Mountains Wilderness				
6 Palen McCoy Wilderness	High	Dominant	Moderately high	High

KOP No.	**KOP VISUAL IMPACT SIGNIFICANCE DETERMINATION – (CEQA Criterion C)**			
	Overall Visual Sensitivity	**Overall Visual Change**	**Visual Impact Significance**	**Mitigation (See Staff Proposed KOP Visual Mitigation Measures)**
1 SR 177 Corridor/ Coxcomb Mt. (JTNP)	Moderately high	High	Significant	VIS-1, -2, -3, -4 Significant and unavoidable
2 Northwest of Desert Center/ Big Wash (JTNP)	Moderately high	Moderate	Significant	VIS-1, -2, -3, -4 Significant and unavoidable
3 Eastbound I-10	Moderately high	High	Significant	VIS-1, -2, -3, -4 Significant and unavoidable
4 Westbound I-10	Moderately high	High	Significant	VIS-1, -2, -3, -4 Significant and unavoidable
5 Corn Springs Road/ Chuckwalla Mountains Wilderness	Moderately high	High	Significant	VIS-1, -2, -3, -4 Significant and unavoidable
6 Palen McCoy Wilderness	Moderately high	High	Significant	VIS-1, -2, -3, -4 Significant and unavoidable

Project Closure and Decommissioning

After the end of the project's useful life, it would require decommissioning. However, no Draft or Decommissioning Plan has been prepared. However, even the complete removal of the facility would leave a very prominent visual impact over the entire site due to the strong color contrast created between graded, disturbed soil areas and undisturbed soil areas in the vicinity of the project site. In addition, revegetation of areas in this desert region are difficult and generally of limited success. Thus, visual recovery from land disturbance of closure and decommissioning would likely occur only over a very long period of time.

D. <u>Light And Glare</u>

"Would the project create a new source of substantial light or glare that would adversely affect daytime or nighttime views in the area?"

For purposes of this analysis, the potential for significant glare impacts have relied on past detailed technical studies of the anticipated luminance properties of the solar receivers, conducted by staff for other projects. The data needed by staff to analyze the luminance of the PSEGS was requested in Data Request Set 3; however, the project owner's responses were received June 17th, too late for staff to analyze for inclusion in the Preliminary Staff Assessment (PSA). Staff will include discussion of this information in the Final Staff Assessment (FSA) and will conclude in the FSA whether the project would cause discomfort glare to motorists and other sensitive visual receptors. A discussion of glare effects is found in the **TRAFFIC AND TRANSPORTATION** section, **APPENDIX TT1 – GLINT AND GLARE SAFETY IMPACT ASSESSMENT**. Staff therefore relied on an analysis based upon best available data to arrive at the conclusions found in this section. More definitive analyses will be provided in the FSA. Glare is considered as the difficulty in seeing in the presence of bright light such as direct or reflected sunlight or artificial light such as car headlamps at night. Glare is caused by a significant ratio of luminance between the task (that which is being looked at) and the glare source. Glare can be generally divided into two types, **discomfort** glare and **disability** glare. Discomfort glare results in an instinctive desire to look away from a bright light source or difficulty in seeing a task. Disability glare renders the task impossible to view, such as when driving westward at sunset. For purposes of this PSA, staff, based on available data, estimated that the range of discomfort glare could extend to a distance of between 8 and 10 miles. Pending review of additional data, SRSG glare was assumed to represent a significant visual impact within that range. This glare would not be disability glare, and therefore would not significantly affect drivers' and pilots' abilities to operate their vehicles and planes.

Facility Surfaces:

No. Surfaces of the facilities of the PSEGS project (excluding the solar receivers and the mirrored surfaces of the heliostats, which are discussed below) have the potential to introduce reflected glare into the visual environment. With the effective implementation of Condition of Certification **VIS-1** from the PSPP Commission Decision, the project would use colors and finishes on surfaces that do not cause excessive glare and would be in harmony with the project's desert environment (with the exception of the heliostat mirrors and SRGSs, discussed below).

Heliostats:

Under Study. Staff is currently investigating the feasibility of preparing a condition of certification to ensure that glint impacts from solar reflection off the heliostats would be less than significant. Glint effects, that is, inadvertent, very bright reflections of the sun's image off the heliostats under certain conditions (season, time of day, location of viewers, etc.) could be intrusive and uncomfortable for motorists and other viewers, and could represent a significant glare impact due to their potential intensity. These effects are generally understood to be occasional and transitory, but potentially of high intensity. This condition would require the project owner to avoid such glint impacts by preparing a Heliostat Operations Positioning and Monitoring Plan (HPMP) to minimize glint exposure to aircraft and other potential receptors, such as motorists, through strategic heliostat positioning during both operation and heliostat washing, avoidance of malfunctions, and procedures for investigating and resolving any complaints from the public, as discussed in the **TRAFFIC AND TRANSPORTATION** section of this Staff Assessment.

Solar Power Towers/SRSGs:

Yes. Energy Commission staff has determined that the visual impact of glare from the SRSGs will have a significant and unavoidable impact.

The principal anticipated project visual impact would result from glare of the SRSGs. As discussed above, insufficient data had been received at the time of this PSA to calculate the SRSG luminance and thus, resulting level and extent of glare that would result. However, based upon previous experience on similar projects with similar technology and design, staff anticipates that discomfort glare would extend to a radius of between 8 and 10 miles from the solar towers. That such levels of discomfort glare will extend well into the middleground distance zone from the solar towers is considered by staff to be a near certainty. The precise parameters of these effects will be determined based on data provided in response to Data Request Set 3.

Night Lighting and FAA Safety Lighting:

No, with recommended conditions. Nighttime light pollution could result from project operational lighting, and from FAA warning lighting required on the solar towers. With effective implementation of light trespass mitigation measures as described in Condition of Certification **VIS-4** (VIS-3 from the Commission Decision), the project's off-site operation-related lighting impacts, excluding FAA safety lighting, would be less than significant. Condition of Certification **VIS-4** requires a comprehensive lighting plan be submitted to Riverside County for review and comment and to the Energy Commission compliance project manager (CPM) for review and approval. Staff recommends Condition of Certification **VIS-4** to ensure full compliance and verification of night lighting measures.

The addition of the aviation safety lighting would alter the nighttime appearance of the project area and would be visible in the night sky due to the height of the towers and the number of lights required by the towers' size. The brightest FAA-required lighting, of medium- or high-intensity white flashing lights, would apply during the day and twilight. At night, these would be replaced by less bright, non-flashing red safety lighting. Due to the height of the towers, FAA could require either high-intensity flashing white lights or non-luminous marking in addition to medium-intensity flashing white lights for daytime and twilight use. Staff observes that during daytime operation, both high-intensity FAA lighting *and* non-luminous marking would tend to be visually obscured by the much greater brightness of SRSG glare. Since views in the direction of the solar towers during daytime would tend to cause viewers to avert their gaze, both the safety lighting and tower marking would be of less importance than the brighter SRSG glare.

Nighttime light pollution impacts would be of particular concern to visitors to the Palen/McCoy WA, the Chuckwalla Mountains WA, and the JTNP. The pristine, completely unlit night sky is part of the attraction of virtually all WAs within the California desert, and is often cited as a valued attraction of the desert for campers

(IDSA, 2010). However, staff concluded that night light pollution effects of the project, including night-time FAA lighting, with appropriate mitigation measures as described in Condition of Certification **VIS-4**, would not be substantial beyond background distances of very roughly 4 or 5 miles. The project would be visible from the portions of Palen/McCoy and Chuckwalla Mountains WAs that lie within this estimated radius of substantial night lighting effect. Camping is permitted throughout the WAs and it is assumed that camping may occur at undesignated sites within 4 miles of the project site. The Corn Springs Campground is located on Corn Springs Road approximately five miles southwest of the project site, in an east-west canyon that screens views of the project site from the campground. Therefore, campers at the Corn Springs Campground would not be affected by project night lighting. Project lighting effects would potentially be more pronounced to WA visitors within 4 miles of the project. With Condition of Certification **VIS-4**, off-site effects of bright operational lighting of the power block would be mitigated to a less-than-significant level. Therefore, the primary nighttime lighting effect to such WA visitors would result from required red FAA nighttime safety lighting. This would be visible in campers' night sky views, which would no longer have a pristine, unlit character and become more urban. The safety lighting would not, however, represent a very bright or highly distracting light source. It was assumed that campers with concern for pristine, completely unlit night skies would seek that experience in more remote locations of the WAs. This, together with the fact that the number of visitors to the WAs is believed to be low, leads staff to the conclusion that night lighting impacts to visitors in the WAs would be less-than-significant.

CUMULATIVE IMPACTS AND MITIGATION

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 (Cal. Code Regs., tit. 14, § 15130).

Cumulative impacts to visual resources would occur where project facilities occupy the same field of view as other built facilities or impacted landscapes, and an adverse change in the visible landscape character is perceived. In some cases, a cumulative impact could also occur if a viewer perceives that the general visual quality or landscape character of a localized area (Chuckwalla Valley or I-10 corridor) or larger region (California Desert District) is diminished by the proliferation of visible structures or construction effects, even if the changes are not within the same field of view as existing (or future) structures or facilities. The result is a perceived "industrialization" of the existing landscape character.

There is the potential for substantial future development in the Chuckwalla Valley area, along the I-10 corridor and throughout the California Desert District. As stated in the Application for Certification for the previously approved Solar Millennium Palen Solar Power Project at the project site (AFC, Page 5.15-20): *"If all the [cumulative projects] were to be implemented, the projects would convert many thousands of acres along the I-10 corridor between roughly Desert Center and Blythe from undeveloped desert* *viewshed to a more industrialized appearance."* Analysis of cumulative impacts is based on data provided in the Cumulative Scenario section and includes:

- Cumulative Impacts Figure **1,** I-10 Corridor Existing and Future/Foreseeable Projects along the I-10 Corridor (Eastern Riverside County) **Executive Summary-Tables 1, 2, 3 and 4**
- **Executive Summary Table 1**, Existing Projects along the I-10 Corridor (Eastern Riverside County)

The analysis in this section first defines the geographic area over which cumulative impacts to visual resources could occur. The cumulative impact analysis then describes the potential for cumulative impacts to occur as a result of implementation of the proposed project along with the listed local and regional projects.

Cumulative impacts could occur if implementation of the PSEGS would combine with those of other local or regional projects. PSEGS is potentially associated with two types of cumulative impact:

1. Cumulative impacts within the project viewshed (local projects within the viewshed of PSEGS as defined by staff), essentially comprising existing and foreseeable future projects in the Chuckwalla Valley and the nearby stretches of I-10 and SR 177; and
2. Cumulative impacts of foreseeable future solar, renewable and other energy and development projects within the I-10 Corridor (beyond the local viewshed), and other broad basin of the project's affected landscape type, or the California Desert District as a whole (regional projects).

CUMULATIVE VISUAL IMPACTS WITHIN THE PROJECT VIEWSHED

The following discussion of cumulative impacts will address PSEGS's contribution to cumulative impacts within the context of the existing cumulative conditions and within the context of future foreseeable projects.

There has been minimal development and/or industrialization of the project landscape within PSEGS's viewshed. Four existing projects fall within the viewshed of PSEGS including Interstate 10, the West-wide Section 368 Energy Corridor, the Eagle Mountain/Hayfield Pumping Plant, and the Kaiser (Eagle) Mine (see **Executive Summary Table 1** and **Executive Summary Figure 1** in the Cumulative Scenario section). Interstate 10 is visible as a linear, horizontal feature in the landscape but does not possess industrial character (complex forms or lines) on the scale of an energy facility such as PSEGS. The West-wide Section 368 Energy Corridor is a designation that implies the possibility of future linear projects within the corridor. However, the actual corridor designation does not impart any visual impact that could be considered in a cumulative context. The Eagle Mountain/Hayfield Pumping Plant, while potentially visible within the field of view of PSEGS (at a distance of slightly over 14 miles), is minimally noticeable at the distant margin of the viewshed limit. Views of much of the inactive open-pit Kaiser/Eagle Mine are screened from the project site by intervening hills. The remainder of the Kaiser Mine, located approximately 15 miles east of the project site, is minimally noticeable at the distant margin of the viewshed limit. Therefore, given the relative lack of perceptible industrial development (or development with characteristics similar to that of the proposed project) that has occurred within the PSEGS viewshed, PSEGS would not cause a cumulatively significant effect within the context of existing cumulative conditions.

The cumulative contribution of PSEGS must also be considered within the context of future foreseeable projects, including future projects within the project area and future projects within the larger contexts of the I-10 corridor and the California desert as a whole.

Executive Summary Table 2 and **Executive Summary Figure 1** in the Cumulative Scenario section list 37 future foreseeable projects that would be located with PSEGS's viewshed including:

- Devers-Palo Verde 2 Transmission Line Project
- Desert Southwest Transmission Line
- Green Energy Express Transmission Line Project
- Blythe Energy Project Transmission Line
- Eagle Mountain Pumped Storage Project
- Eagle Mountain Landfill
- Eagle Mountain Wind Project
- Graham Pass Wind Project
- Genesis Solar Energy Project
- Chuckwalla Solar I
- Desert Sunlight
- Desert Lily Soleil
- Desert Center 50
- Sol Orchard
- Silverado Power I, II, III
- Desert Harvest
- LH Renewables Riverside County Type II
- EnXco
- Blythe Energy Project II
- Blythe Solar Power Generation Station 1
- Blythe Mesa Solar I
- Milpitas Wash
- Sonoran West
- Mule Mountain Solar

- Mule Mountain III
- Desert Quartzite
- Nextlight Quartzite
- Palo Verde Mesa Solar Project
- La Posa Solar Thermal
- Three Residential (Blythe)
- 12 Residential Developments (Blythe)
- Four Commercial Projects (Blythe)
- Intake Shell
- Chuckwalla Valley Raceway
- Red Bluff Substation
- Colorado River Substation Expansion
- Wileys Well Communication Tower

While most of these projects are energy projects that would share similar visual characteristics with PSEGS, all 37 projects would contribute to the conversion of natural desert landscapes to landscapes with prominent industrial character (complex industrial forms and lines and surface textures and colors not found in natural desert landscapes). Therefore, there would be a significant cumulative impact to visual resources from the combination of PSEGS and the 37 foreseeable projects listed above, both individually (each project plus PSEGS) and collectively (all 37 projects plus PSEGS).

REGIONAL CUMULATIVE VISUAL IMPACTS

Table 3 and Figure 2 in the Cumulative Scenario section also identify an additional nine future foreseeable energy projects along the I-10 corridor that would also contribute to the sense of industrialization of the desert landscape as one drives between Blythe and Desert Center or Los Angeles and Phoenix in a broader context. In a regional context, Table 1A and Figure 1 in the Cumulative Scenario section of the PSPP RSA (CEC 2010b) identified 125 renewable energy projects scattered throughout the California Desert Conservation Area. The number of projects shown in RSA Figure 1 is so great that there would not be a single major travel corridor through the Southern California desert that will not experience at least some visible “industrialization” due to the presence of nearby energy projects. As a result, travelers will encounter numerous industrial landscapes en-route to regionally and nationally significant desert destinations such as Anza-Borrego Desert State Park, the Salton Sea, Joshua Tree National Park, Mojave National Preserve, Death Valley National Park, and the Colorado River. These landscapes would include the proposed Rio Mesa Solar Electric Generating Facility (Rio Mesa SEGF), located approximately 40 miles southeast of the PSEGS site, which would use the same technology as the PSEGS and contribute to cumulative glare impacts of the type described above for PSEGS. Therefore, as a result of this collective industrialization of the conservation area landscapes, PSEGS would contribute a significant cumulative visual impact to visual resources in combination with foreseeable renewable projects in the California desert.

OVERALL CUMULATIVE IMPACT CONCLUSION

PSEGS would not result in a cumulative visual impact in the context of existing cumulative conditions. However, PSEGS's contribution to the visible industrialization of the desert landscape would be cumulatively considerable and constitute a significant visual impact when considered with future foreseeable projects, both within the project viewshed and in a broader context that encompasses the whole of the California Desert Conservation Area.

COMPLIANCE WITH APPLICABLE LORS

The proposed project would be subject to the laws, ordinances, regulations, and standards (LORS) of the U.S. Government (Bureau of Land Management – BLM), State of California and Riverside County. Compliance with these LORS is summarized in the following paragraphs and presented in more detail in **Visual Resources Table 3**.

COMPLIANCE WITH FEDERAL LORS

The project was found to be in compliance with the impact disclosure requirements of the California Desert Conservation Area (CDCA) Plan (through the visual impact analysis presented here).

COMPLIANCE WITH STATE LORS

The proposed project was found to be in compliance with the State Scenic Highway Program as pertains to compliance with scenic highway management objectives (the adjacent Interstate 10 is neither an eligible or designated scenic highway under the state program).

COMPLIANCE WITH LOCAL LORS

Staff concludes that the project would not be in compliance with several County of Riverside requirements pertaining to protection/preservation of: natural features, the visual character of the existing landscape and scenic corridors. These requirements are found in LU 13.1 (preservation of scenic vistas), LU 13.3 (compatible appearance with surrounding environment), LU 20.1 (environmental character), LU 20.2 (avoid unnatural appearance) and LU 20.4 (open space and rural character). Staff also concludes that the project would not be in compliance with several landscaping requirements and pedestrian access requirements because landscaping is not proposed and pedestrians would not be allowed within the facility. However, given the arid conditions and remote location, this is understandable and not considered nonconforming with the applicable LORS. These requirements are found in LU 4.1(c), LU 4.1(d), LU 4.1(m), LU 4.1(n), and LU 4.1(p). and are considered not applicable to the present project.

Visual Resources Table 3
Laws, Ordinances, Regulations and Standards

Applicable LORS	Description	Consistency (assumes implementation of staff-recommended conditions of certification)
Federal		
California Desert Conservation Area (CDCA) Plan	PSEGS is located within the California Desert Conservation Area Plan, which is the BLM Resource Management Plan applicable to the project site (USDOI, 1980, as amended). The CDCA Plan did not include Visual Resource Management (VRM) inventory or management classes. However, a BLM-approved Visual Resource Inventory (VRI) was conducted in 2005 for the Devers-Palo Verde 2 Transmission Line Project EIS/EIR, which covers the project site. The PSEGS site is classified in the CDCA Plan as Multiple-Use Class (MUC) M (Moderate Use). Management of MUC M lands 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, live- stock 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. The CDCA Plan includes a table (Table 1), which illustrates the types of allowable land uses by MUC Class. The table specifically includes Electrical Power Generation Facilities including Wind/Solar facilities. Guidance provided under this section allows for the authorization of such facilities within MUC M lands in compliance with National Environmental Policy Act (NEPA) requirements. New major electric transmission facilities may be allowed only within designated utility corridors. Existing facilities within designated utility corridors may be maintained and upgraded or improved in accordance with existing rights-of-way or amendments to right-of- way grants.	**Consistent**. Solar electrical generation plants are specifically allowed for under the Multiple Use Class (MUC) Class M Guidelines if NEPA requirements are met.

Applicable LORS	Description	Consistency (assumes implementation of staff-recommended conditions of certification)
State		
State Scenic Highway Program	The California State Department of Transportation (Caltrans) identifies a state system of eligible and designated scenic highways, which, if designated, are subject to various controls intended to preserve their scenic quality (California Streets and Highways Code, sections 260 through 263).	**Consistent**. Highway I-10 within the project viewshed is not an eligible or designated State scenic highway.
Local		
Riverside County Integrated Plan LU-4 Relating to Project Design	LU 4.1 Requires that new developments be located and designed to visually enhance, not degrade the character of the surrounding area through consideration of the following concepts: c. Require that an appropriate landscape plan be submitted and implemented for development projects subject to discretionary review.	**Consistent.** The project owner does not propose to landscape the project site, and therefore would not submit a landscape plan for the project area. However, given the location of the project and the potential impacts to water and biological resources resulting from landscaping this location, staff concludes that this approach is appropriate.
	d. Require that new development utilize drought- tolerant landscaping and incorporate adequate drought-conscious irrigation systems.	**Consistent.** The project ownert does not propose any landscaping, and therefore will not require irrigation or unnecessarily use water in the desert.
	l. Mitigate noise, odor, lighting, and other impacts on surrounding properties.	**Consistent.** All outdoor lighting at the project site will be the minimum required to meet safety and security standards and all light fixtures will be hooded to eliminate any potential for glare effects and to prevent light from spilling off the site or up into the sky. In addition, the light fixtures will have sensors and switches to permit the lighting to be turned off at times when it is not required. Condition of Certification **VIS-4** ensures compliance.
	m. Provide and maintain landscaping in open spaces and parking lots.	**Consistent.** The project footprint, as proposed, includes no open space, and parking facilities would be minimal. Planting and maintaining landscaping in the parking area of PSEGS, which would be inaccessible to the public, would require that water be used unnecessarily.
	n. Include extensive landscaping.	**Consistent.** Including extensive landscaping would not serve the project or surrounding viewers, and would require that water be used unnecessarily.

Applicable LORS	Description	Consistency (assumes implementation of staff-recommended conditions of certification)
	o. Preserve natural features, such as unique natural terrain, drainage ways, and native vegetation, wherever possible, particularly where they provide continuity with more extensive regional systems.	**Consistent.** Required grading for the amended project would be substantially reduced compared to the PSPP.
	p. Require that new development be designed to provide adequate space for pedestrian connectivity and access, recreational trails, vehicular access and parking, supporting functions, open space, and other pertinent elements.	**Not Consistent.** The project would not be accessible by pedestrians, recreationists, or general vehicular travel.
	LU 4.2 Require property owners to maintain structures and landscaping to a high standard of design, health, and safety through the following: c. Promote and support community and neighborhood based efforts for the maintenance, upkeep, and renovation of structures and sites.	**Consistent**. The project owner would maintain the appearance of the project and ensure proper maintenance practices.
County Scenic Corridors	LU 13.1 Preserve and protect outstanding scenic vistas and visual features for the enjoyment of the traveling public.	**Not Consistent.** The project would not preserve or protect scenic vistas of of the southern ridges of the Joshua Tree National Park and Palen McCoy Wilderness and the northeastern ridges of the Chuckwalla Mountains Wilderness, but would significantly impact them.
	LU 13.3 Ensure that the design and appearance of new landscaping, structures, equipment, signs, or grading within Designated and Eligible State and County scenic highway corridors are compatible with the surrounding scenic setting or environment.	**Not Consistent.** The project is not compatible in design and appearance with scenic highway corridors. Riverside County has requested that Interstate 10 (I-10) be designated a State Scenic Highway, but Caltrans has not designated I-10 as either an Eligible or Officially Designated Scenic Highway. Therefore, Riverside County has designated I-10 to be a County Scenic Highway from SR-62 near Palm Springs to the California-Arizona border.
	LU 13.7 Require that the size, height, and type of on-premise signs visible from Designated and Eligible State and County Scenic Highways be the minimum necessary for identification. The design, materials, color, and location of the signs shall blend with the environment, utilizing natural materials where possible.	**Consistent.** The project would include simple identification signage at the facility gate. Such signage would be visible from I-10, a Designated County Scenic Highway.
	LU 13.8 Avoid the blocking of public views by solid walls.	**Consistent.** No solid walls are proposed. However, the high density of project structures would essentially form the appearance of a solid wall of steel and glass that would block views of the

Applicable LORS	Description	Consistency (assumes implementation of staff-recommended conditions of certification)
		surrounding landscape from I-10 and nearby BLM recreational access roads.
The following policies apply to properties designated as Open Space-Rural on the area plan land use maps.	LU 20.1 Require that structures be designed to maintain the environmental character in which they are located.	**Not Consistent.** The industrial design and character of the project facilities would not maintain the existing landscape character of a desert valley floor, presently absent such industrial features.
	LU 20.2 Require that development be designed to blend with undeveloped natural contours of the site and avoid an unvaried, unnatural, or manufactured appearance.	**Not Consistent.** The industrial appearance of the project structures and vertical components would not blend with the existing natural-appearing desert valley landscape.
	LU 20.4 Ensure that development does not adversely impact the open space and rural character of the surrounding area.	**Not Consistent.** Although the project has been intentionally located away from populated areas and sensitive viewers, the project would significantly impact the natural desert landscape and rural character of the site and surroundings.

NOTEWORTHY PUBLIC BENEFITS

While the development of the amended project is intended to address the requirements of federal and state mandates to develop renewable energy, it would not yield any noteworthy public benefits related to visual resources.

RESPONSE TO AGENCY AND PUBLIC COMMENTS

No agency or public comments related directly to visual resources were received at the time of preparation of the PSA. I

CONCLUSIONS

Energy Commission staff concludes that the Palen Solar Electric Generating System project would result in a substantial adverse impact to existing scenic resource values as seen from several Key Observation Points in the Chuckwalla Valley and Coxcomb, Granite, Palen and Chuckwalla Mountains, including:

- Both westbound and eastbound Interstate 10;
- State Route 177, to the west and northwest of the project site;
- Joshua Tree National Park to the west and northwest of the project site;
- Palen McCoy Wilderness to the northeast of the project site;
- Chuckwalla Mountains Wilderness to the south of the project site.

Staff concludes that these visual impacts would be significant in terms of three of the four criteria of CEQA Appendix G, (the project would have a substantial adverse effect on scenic vistas, the project would substantially degrade the existing visual character or quality of the site and its surroundings, and the project would create a new source of substantial light or glare that would adversely affect daytime or nighttime views in the area). Also, staff concludes that these visual impacts would be significant in terms of the context and intensity of the effects in general. Specifically, the context of the project is one of a broad open desert valley with panoramic vista views of the surrounding rugged mountain ranges and designated wilderness areas including Palen McCoy (to the northeast) and Chuckwalla (to the south), and Joshua Tree National Park (to the north-northwest). Also to the northwest is the Desert Lily Sanctuary Area of Critical Environmental Concern (ACEC). The Palen Dry Lake and Sand Dunes area immediately north of the project site is a popular desert recreation destination area. To the west of the project site is Desert Center and Alligator Rock ACEC. The landscape of the project vicinity is generally undeveloped and appears mostly natural in character. The panoramic vista views are largely unobstructed and encompass wide-open desert spaces. The proposed project would introduce a densely developed and geographically extensive industrial feature into a landscape presently absent similar features. Most importantly, the project would introduce prominent discomfort glare from the solar receiver steam generators (SRSGs) over a large area. Energy Commission staff also concludes that the project's contribution to significant cumulative visual effects would be cumulatively considerable when combined with the effects of other renewable and development projects along the I-10 corridor, within the Chuckwalla Valley, and within the California Desert Conservation Area as a whole.

Energy Commission staff has concluded that the potentially significant visual impacts cited above could not be mitigated to less than significant levels and would thus result in significant and unavoidable impacts under CEQA.

Also, Energy Commission staff concludes that the project would not conform with several applicable goals and policies of the Riverside County Integrated Plan as follows:

- LU 13.1, requiring preservation and protection of outstanding scenic vistas and visual features for the enjoyment of the traveling public. The project would be a highly visible industrial feature in the panoramic, vista views from the southern ridges of Palen McCoy Wilderness, the northeastern ridges of Chuckwalla Mountains Wilderness, and Joshua Tree National Park (though at slightly greater distance).
- LU 13.3, requiring the design and appearance of new structures within Designated County scenic highway corridors (I-10) to be compatible with the surrounding scenic setting. The project would have an industrial appearance that would not be consistent with the surrounding, natural, undeveloped desert landscape.
- LU 20.1, requiring that structures be designed to maintain the environmental character in which they are located. The project's industrial character would not be consistent with the surrounding, natural, undeveloped desert landscape character.
- LU 20.2, requiring that development be designed to blend with undeveloped natural contours of the site and avoid a manufactured appearance. The project would have an industrial, manufactured appearance.

- LU 20.4, requiring that development does not adversely impact the open space and rural character of the surrounding area. The project would convert an open, undeveloped desert landscape to an intensive industrial use.

As stated, staff concludes that the project would have significant unavoidable adverse impacts in both a direct and cumulative context. However, if the Energy Commission approves the amended project, staff recommends that the conditions of certification from the Commission Decision for the originally certified Palen Solar Power Project, as modified herein by staff, be adopted in order to minimize impacts to the greatest feasible extent.

CONDITIONS OF CERTIFICATION

The Energy Commission should adopt the following conditions of certification if it approves the amended project. Staff has proposed modifications to the conditions of certification as shown below. (Note: Deleted text is in ~~strikethrough~~, new text is **<u>bold and underlined</u>**).

Condition VIS-4 of the PPSP RSA was included in the RSA in response to BLM requirements for what was originally envisioned as a joint state/federal action. However, measures in that condition that are applicable to the current project have been incorporated in the other measures. Condition VIS-4 was thus deleted as redundant to these other conditions.

SURFACE TREATMENT OF PROJECT STRUCTURES AND BUILDINGS

VIS-1 The project owner shall treat the surfaces of all project structures and buildings visible to the public such that a) their colors minimize visual intrusion and contrast by blending with (matching) the existing characteristic landscape colors; b) their colors and finishes do not create excessive glare; and c) their colors and finishes are consistent with local policies and ordinances. The transmission line conductors shall be non-specular and non-reflective, and the insulators shall be non-reflective and non-refractive.

Following in-field consultation with the Energy Commission/BLM Visual Resources specialist and other representatives as deemed necessary, the project owner shall submit for Compliance Project Manager (CPM) review and approval, a specific Surface Treatment Plan that will satisfy these requirements. The treatment plan shall include:

A. A description of the overall rationale for the proposed surface treatment, including the selection of the proposed color(s) and finishes based on the characteristic landscape. Colors will be fielded tested using the actual distances from the KOPs to the proposed structures, using the proposed colors painted on representative surfaces;

B. A list of each major project structure, building, tank, pipe, and wall; the transmission line towers and/or poles; and fencing, specifying the color(s) and finish proposed for each. Colors must be identified by vendor, name, and pantone number; or according to a universal designation system;

C. One set of color brochures or color chips showing each proposed color and finish;

D. A specific schedule for completion of the treatment; and

E. A procedure to ensure proper treatment maintenance for the life of the project.

The project owner shall not specify to the vendors the treatment of any buildings or structures treated during manufacture, or perform the final treatment on any buildings or structures treated in the field, until the project owner receives notification of approval of the treatment plan by the CPM. Subsequent modifications to the treatment plan are prohibited without CPM approval.

Verification: At least 90 days prior to specifying to the vendor the colors and finishes of the first structures or buildings that are surface treated during manufacture, the project owner shall submit the proposed treatment plan to the CPM for review and approval and simultaneously to Riverside County for review and comment. If the CPM determines that the plan requires revision, the project owner shall provide to the CPM a plan with the specified revision(s) for review and approval by the CPM before any treatment is applied. Any modifications to the treatment plan must be submitted to the CPM for review and approval.

Prior to the start of commercial operation, the project owner shall notify the CPM that surface treatment of all listed structures and buildings has been completed and they are ready for inspection and shall submit to each one set of electronic color photographs from the same key observation points identified in (d) above. The project owner shall provide a status report regarding surface treatment maintenance in the Annual Compliance Report. The report shall specify a): the condition of the surfaces of all structures and buildings at the end of the reporting year; b) maintenance activities that occurred during the reporting year; and c) the schedule of maintenance activities for the next year.

REVEGETATION OF DISTURBED SOIL AREAS

VIS-2 The project owner shall minimize visual disturbances due to construction and revegetate disturbed soil areas to the greatest practical extent, as described in Condition of Certification **BIO-8,** measures 1, 2, 5, and 21. In order to address specifically visual concerns, the required spreading of preserved topsoil shall include reclamation of the area of disturbed soils used for laydown, project construction, and siting of the other ancillary operation and support structures that appear in the visual foreground of I-10.

Verification: Refer to Condition of Certification **BIO-8**.

TEMPORARY AND PERMANENT EXTERIOR LIGHTING

VIS-3 To the extent feasible, consistent with safety and security considerations, the project owner shall design and install all permanent exterior lighting and all temporary construction lighting such that a) lamps and reflectors are not visible from beyond the project site, including any off-site security buffer areas; b) lighting does not cause excessive reflected glare; c) direct lighting does not illuminate the nighttime sky, except for required FAA aircraft safety lighting (which should be an on-demand, audio-visual warning system that is triggered by radar technology); d) illumination of the project and its immediate vicinity is minimized, and e) the plan complies with local policies and ordinances. The project owner shall submit to the CPM for review and approval and simultaneously to the County of Riverside for review and comment a lighting mitigation plan that includes the following:

A. Location and direction of light fixtures shall take the lighting mitigation requirements into account;

B. Lighting design shall consider setbacks of project features from the site boundary to aid in satisfying the lighting mitigation requirements;

C. Lighting shall incorporate fixture hoods/shielding, with light directed downward or toward the area to be illuminated;

D. Light fixtures that are visible from beyond the project boundary shall have cutoff angles that are sufficient to prevent lamps and reflectors from being visible beyond the project boundary, except where necessary for security;

E. All lighting shall be of minimum necessary brightness consistent with operational safety and security; and

F. Lights in high illumination areas not occupied on a continuous basis (such as maintenance platforms) shall have (in addition to hoods) switches, timer switches, or motion detectors so that the lights operate only when the area is occupied.

Verification: At least 90 days prior to ordering any permanent exterior lighting or temporary construction lighting, the project owner shall contact the CPM to discuss the documentation required in the lighting mitigation plan. At least 60 days prior to ordering any permanent exterior lighting, the project owner shall submit to the CPM for review and approval and simultaneously to the County of Riverside for review and comment a lighting mitigation plan. If the CPM determines that the plan requires revision, the project owner shall provide to the CPM a revised plan for review and approval by the CPM.

The project owner shall not order any exterior lighting until receiving CPM approval of the lighting mitigation plan.

Prior to commercial operation, the project owner shall notify the CPM that the lighting has been completed and is ready for inspection. If after inspection, the CPM notifies the project owner that modifications to the lighting are needed, within 30 days of receiving that notification the project owner shall implement the modifications and notify the CPM that the modifications have been completed and are ready for inspection.

Within 48 hours of receiving a lighting complaint, the project owner shall provide the CPM with a complaint resolution form report as specified in the Compliance General

Conditions including a proposal to resolve the complaint, and a schedule for implementation. The project owner shall notify the CPM within 48 hours after completing implementation of the proposal. A copy of the complaint resolution form report shall be submitted to the CPM within 30 days.

PROJECT DESIGN

~~**VIS-4** To the extent possible, the project owner shall use proper design fundamentals to reduce the visual contrast to the characteristic landscape. These include proper siting and location; reduction of visibility; repetition of form, line, color (see VIS-1) and texture of the landscape; and reduction of unnecessary disturbance. Design strategies to address these fundamentals shall be based on the following factors:~~

~~**Earthwork:** Select locations and alignments that fit into the landforms to minimize the size of cuts and fills. Avoid hauling in or hauling out of excess earth cut or fill. Avoid rounding and/or warping slopes. Retain existing rock formations, vegetation, and drainage. Tone down freshly broken rock faces with emulsions or stains. Use retaining walls to reduce the amount and extent of earthwork. Retain existing vegetation by using retaining walls or fill slopes, reducing surface disturbance, and protecting roots from damage during excavations. Avoid soil types that generate strong color contrasts. Reduce dumping or sloughing of excess earth and rock on downhill slopes.~~

~~**Vegetation Manipulation:** Retain as much of the existing vegetation as possible. Use existing vegetation to screen the development from public viewing. Use scalloped, irregular cleared edges to reduce line contrast. Use irregular clearing shapes to reduce form contrast. Feather and thin the edges of cleared areas and retain a representative mix of plant species and sizes.~~

~~**Structures:** Minimize the number of structures and combine different activities in one structure. Use natural, self-weathering materials and chemical treatments on surfaces to reduce color contrast. Bury all or part of the structure. Use natural appearing forms to complement the characteristic landscape. Screen the structure from view by using natural land forms and vegetation. Reduce the line contrast created by straight edges.~~

~~**Linear Alignments:** Use existing topography to hide induced changes associated with roads, lines, and other linear features. Select alignments that follow landscape contours. Avoid fall-line cuts and bisecting ridge tops. Hug vegetation lines and avoid open areas such as valley bottoms. Cross highway corridors and less sharp angles.~~

~~**Reclamation and Restoration:** Reduce the amount of disturbed area and blend the disturbed areas into the characteristic landscape. Replace soil, brush, rocks, and natural debris over disturbed area. Newly introduce plant species should be of a form, color, and texture that blends with the landscape.~~

~~As early as possible in the site and facility design, the project owner shall meet with the CPM to discuss incorporation of these above factors into the design plans. At least 90 days prior to final site and facility design, the project owner shall contact the CPM to review the incorporation of the above factors into the final facility and site design plans. If the CPM determine that the site and facility plans require revision, the project owner shall provide to the CPM a revised plan for review and approval by the CPM.~~

REFERENCES

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APPENDIX VR-1

ENERGY COMMISSION VISUAL RESOURCE ANALYSIS EVALUATION CRITERIA

Energy Commission staff conducts a visual resource analysis according to Appendix G, "Environmental Checklist Form—Aesthetics," California Environmental Quality Act (CEQA). The CEQA analysis requires that commission staff make a determination of impact ranging from "Adverse and Significant" to "Not Significant."

Staff's analysis is based on Key Observation Points or KOPs. KOPs are photographs of locations within the project area that are highly visible to the public—for example, travel routes; recreational and residential areas; and bodies of water as well as other scenic and historic resources.

Those photographs are taken to indicate existing conditions without the project and then modified to include a simulation of the project. Consequently, staff has a visual representation of the viewshed before and after a project is introduced and makes its analysis accordingly. Information about that analytical process follows.

VISUAL RESOURCE ANALYSIS WITHOUT PROJECT

When analyzing KOPs of existing conditions without the project, staff considers the following conditions: visual quality, viewer concern, visibility, number of viewers, duration of view. Those conditions are then factored into an overall rating of viewer exposure and viewer sensitivity. Information about each condition and rating follows.

Visual Quality

An expression of the visual impression or appeal of a given landscape and the associated public value attributed to the resource. Visual quality is rated from *high* to *low*. A high rating is generally reserved for landscapes viewers might describe as picture-perfect.

Landscapes rated high generally are memorable because of the way the components combine in a visual pattern. In addition, those landscapes are free from encroaching elements, thus retaining their visual integrity. Finally, landscapes with high visual quality are visually coherent and harmonious when each element is considered as part of the whole. On the contrary, landscapes rated *low* are often dominated by visually discordant human alterations.

Viewer Concern

Viewer concern represents the reaction of a viewer to visible changes in the viewshed an area of land visible from a fixed vantage point. For example, viewers have a high expectation for views formally designated as a scenic area or travel corridor as well as for recreational and residential areas. Viewers generally expect that those views would be preserved. Travelers on highways and roads, including those in agricultural areas, are generally considered to have moderate viewer concerns and expectations.

However, viewers tend to have low-to-moderate viewer concern when viewing commercial buildings. And industrial uses typically have the lowest viewer concern. Regardless, the level of concern could be lower if the existing landscape contains discordant elements. In addition, some areas of lower visual quality and degraded visual character may contain particular views of substantially higher visual quality or interest to the public.

Visibility

Visibility is a measure of how well an object can be seen. Visibility depends on the angle or direction of views; extent of visual screening; and topographical relationships between the object and existing homes, streets, or parks. In that sense, visibility is determined by considering any and all obstructions that may be in the sightline—trees and other vegetation; buildings; transmission poles or towers; general air quality conditions such as haze; and general weather conditions such as fog.

Number of Viewers

Number of viewers is a measure of the number of viewers per day who would have a view of the proposed project. *Number of viewers* is organized into the following categories: residential according to the number of residences; motorist according to the number of vehicles; and recreationists.

Duration of View

Duration of view is the amount of time to view the site. For example, a high or extended view of a project site is one reached across a distance in two minutes or longer. In contrast, a low or brief duration of view is reached in a short amount of time—generally less than ten seconds.

Viewer Exposure

Viewer exposure is a function of three elements previously listed, *visibility*, *number of viewers*, and *duration of view*. Viewer exposure can range from a *low* to *high*. A partially obscured and brief background view for a few motorists represents a low value; and unobstructed foreground view from a large number of residences represents a high value.

Visual Sensitivity

Visual sensitivity is comprised of three elements previous listed, *visual quality*, *viewer concern*, and *viewer exposure*. Viewer sensitivity tends to be higher for homeowners or people driving for pleasure or engaged in recreational activities and lower for people driving to and from work or as part of their work.

Visual Resource Analysis with Project

Visual resource analyses with photographic simulations of the project involve the elements of contrast, dominance, view disruption, and visual change. Information about each element follows.

Contrast

Contrast concerns the degree to which a project's visual characteristics or elements — form, line, color, and texture — differ from the same visual elements in the existing landscape. The degree of contrast can range from *low* to *high*. A landscape with forms, lines, colors, and textures similar to those of a proposed energy facility is more visually absorbent; that is, more capable of accepting those characteristics than a landscape in which those elements are absent. Generally, visual absorption is inversely proportional to visual contrast.

Dominance

Dominance is a measure of (a) the proportion of the total field of view occupied by the field; (b) a feature's apparent size relative to other visible landscape features; and (c) the conspicuousness of the feature due to its location in the view.

A feature's level of dominance is lower in a panoramic setting than in an enclosed setting with a focus on the feature itself. A feature's level of dominance is higher if it is (1) near the center of the view; (2) elevated relative to the viewer; or (3) has the sky as a backdrop. As the distance between a viewer and a feature increases, its apparent size decreases; and consequently, its dominance decreases. The level of dominance ranges from *low* to *high*.

View Disruption

The extent to which any previously visible landscape features are blocked from view constitutes view disruption. The view is also disrupted when the continuity of the view is interrupted. When considering a project's features, higher quality landscape features can be disrupted by lower quality project features, thus resulting in adverse visual impacts. The degree of view disruption can range from *none* too *high*.

Visual Change

Visual change is a function of *contrast*, *dominance*, and *view disruption*. Generally, *contrast* and *dominance* contribute more to the degree of visual change than does *view disruption*.

APPENDIX VR-2

Figures

Figure 1 – Characteristic Landscape of the Project Site

Figure 2 – Project Viewshed

Figure 3 – Location of Key Observation Points (KOPs)

Figure 4A – Existing View from KOP 1, State Route 177/Coxcomb Mountain (JTNP)

Figure 4B – Visual Simulation of Proposed Project from KOP 1, State Route 177/Coxcomb Mountain (JTNP)

Figure 5A – Existing View from KOP 2 Northwest of Desert Center/Big Wash (JTNP)

Figure 5B – Visual Simulation of Proposed Project from KOP 2 Northwest of Desert Center/Big Wash (JTNP)

Figure 6A – Existing view from KOP 3, Eastbound I-10

Figure 6B – Visual Simulation of Proposed Project from KOP 3 Eastbound I-10

Figure 7A – Existing view from KOP 4, Westbound I-10

Figure 7B – Visual Simulation of Proposed Project from KOP 4, Westbound I-10

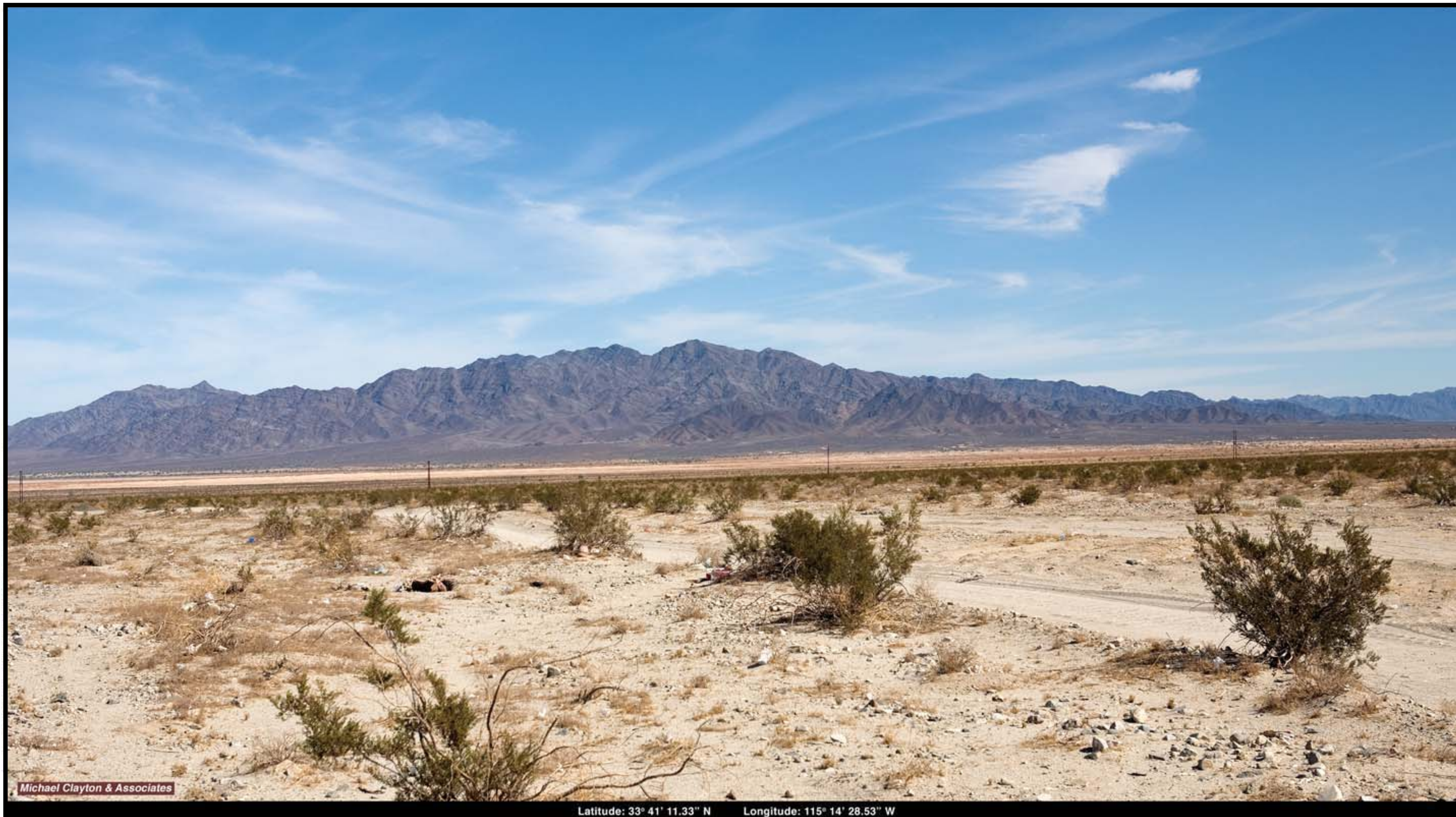
Figure 8A – Existing view from KOP 5, Corn Springs Road/Chuckwalla Mountains Wilderness

Figure 8B – Visual Simulation of Proposed Project from KOP 5, Corn Springs Road/Chuckwalla Mountains Wilderness

Figure 9A – Existing view from KOP 6 in the Palen McCoy Wilderness

Figure 9B – Visual Simulation of Proposed Project from KOP 6 in the Palen McCoy Wilderness

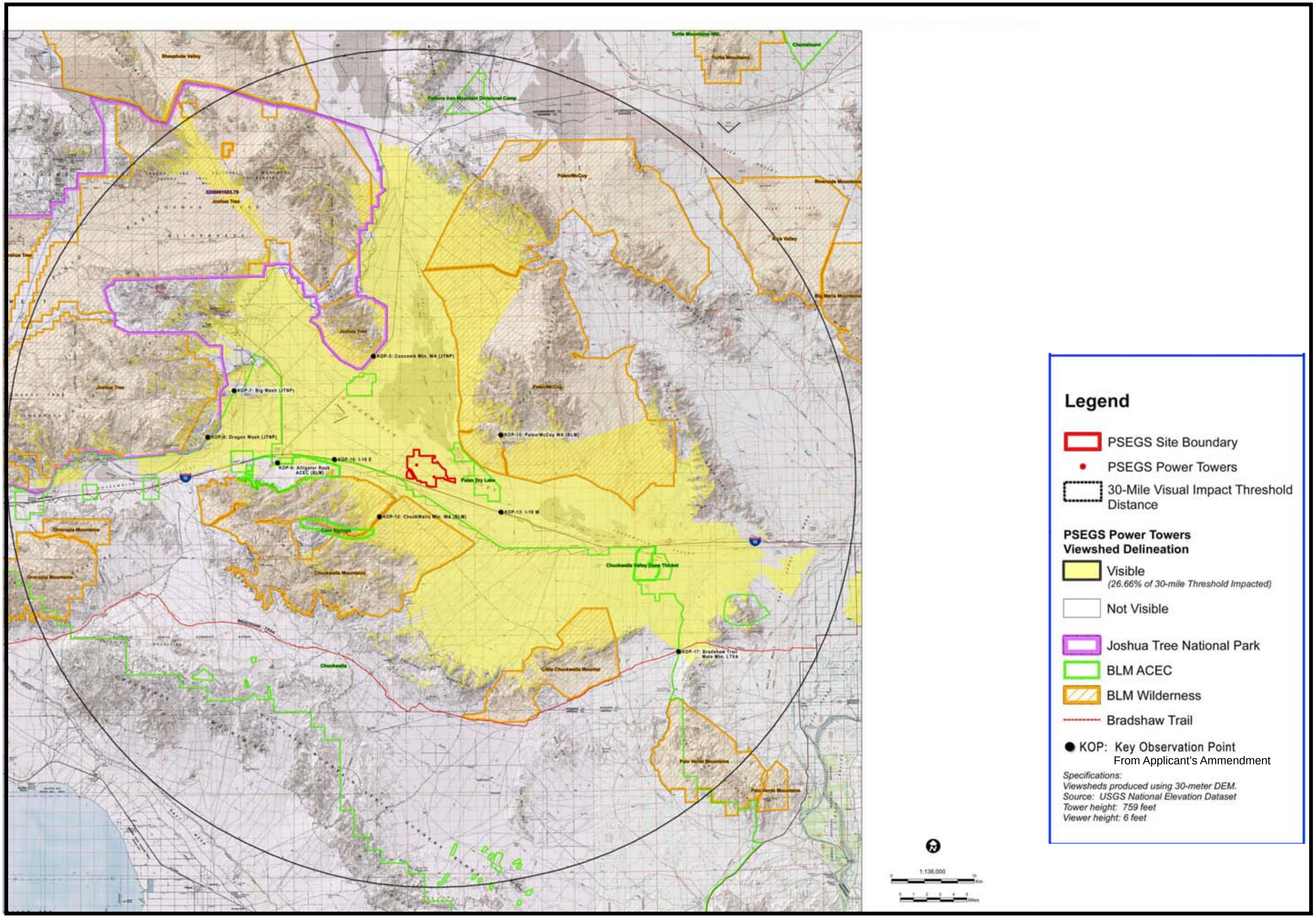
VISUAL RESOURCES - FIGURE 1
Palen Solar Electric Generating System - Characteristic Landscape of the Project Site



SOURCE: Michael Clayton and Associates

VISUAL RESOURCES - FIGURE 2

Palen Solar Electric Generating System - Viewshed Delineation

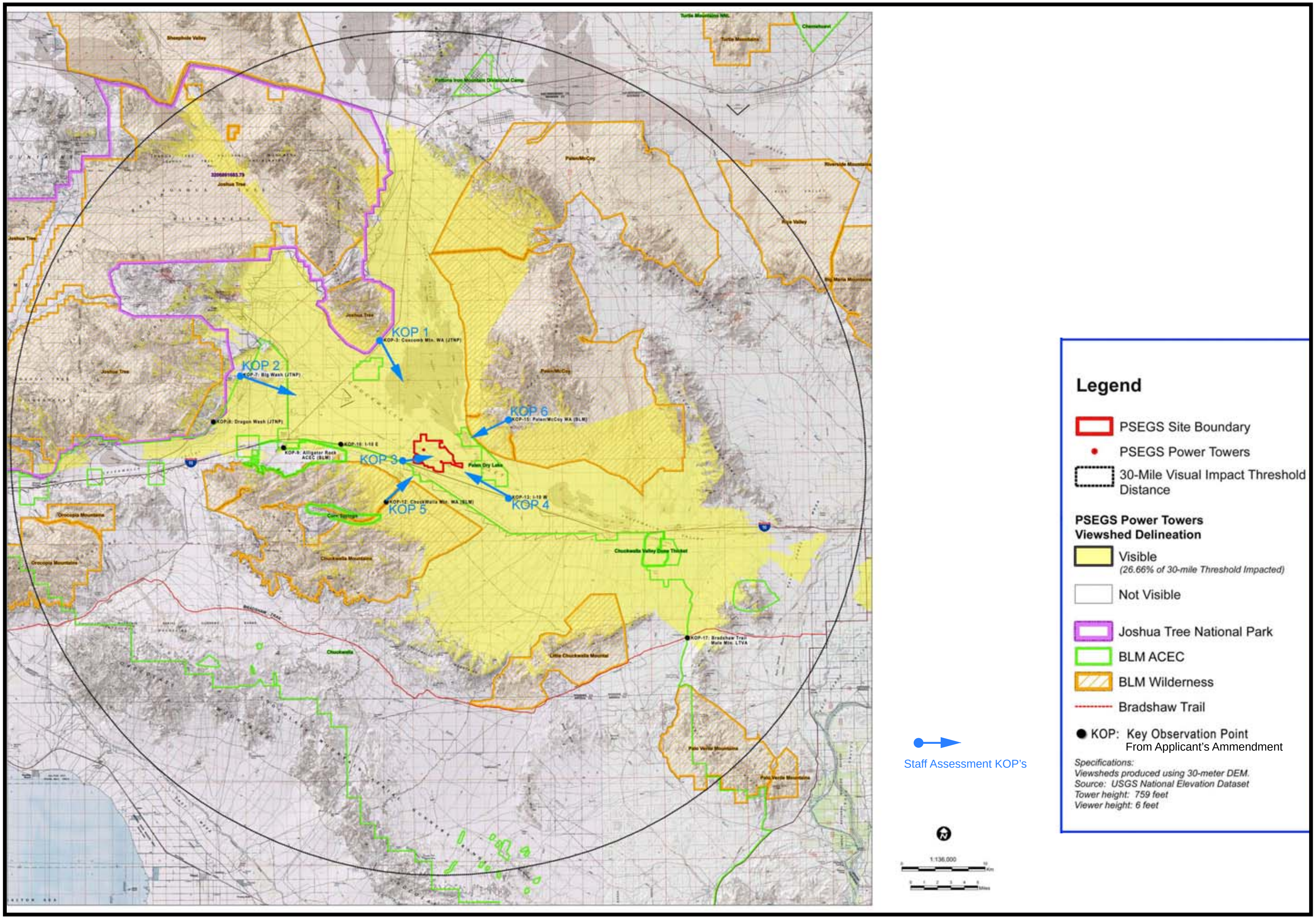


CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: 3DScape

VISUAL RESOURCES - FIGURE 3

Palen Solar Electric Generating System - Key Observation Points (KOPs)



CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: 3DScape

VISUAL RESOURCES - FIGURE 4a

Palen Solar Electric Generating System - KOP 1 - State Route 177/Coxcomb Mountain (JTNP) - Existing Condition

CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: 3DScape

VISUAL RESOURCES - FIGURE 4b

Palen Solar Electric Generating System - KOP 1 - State Route 177/Coxcomb Mountain (JTNP) - Proposed Condition

CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: 3DScape

VISUAL RESOURCES - FIGURE 5a

Palen Solar Electric Generating System - KOP 2 - Northwest of Desert Center/Big Wash (JTNP) - Existing Condition

CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: 3DScape

VISUAL RESOURCES - FIGURE 5b

Palen Solar Electric Generating System - KOP 2 - Northwest of Desert Center/Big Wash (JTNP) - Proposed Condition

SOURCE: 3DScape

VISUAL RESOURCES - FIGURE 6a

Palen Solar Electric Generating System - KOP 3 - Eastbound I-10 (Middleground Distance) - Existing Condition

CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: 3DScape

VISUAL RESOURCES - FIGURE 6b

Palen Solar Electric Generating System - KOP 3 - Eastbound I-10 (Middleground Distance) - Proposed Condition

SOURCE: 3DScape

VISUAL RESOURCES - FIGURE 7a

Palen Solar Electric Generating System - KOP 4 - Westbound I-10 (Background Distance) - Existing Condition

CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: 3DScape

VISUAL RESOURCES - FIGURE 7b

Palen Solar Electric Generating System - KOP 4 - Westbound I-10 (Background Distance) - Proposed Condition

SOURCE: 3DScape

VISUAL RESOURCES - FIGURE 8a

Palen Solar Electric Generating System - KOP 5 - Corn Springs Road/Chuckwalla Mountains Wilderness - Existing Condition

CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: 3DScape

VISUAL RESOURCES - FIGURE 8b

Palen Solar Electric Generating System - KOP 5 - Corn Springs Road/Chuckwalla Mountains Wilderness - Proposed Condition

CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: 3DScape

VISUAL RESOURCES - FIGURE 9a

Palen Solar Electric Generating System - KOP 6 - Palen McCoy Wilderness - Existing Condition

CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: 3DScape

VISUAL RESOURCES - FIGURE 9b

Palen Solar Electric Generating System - KOP 6 - Palen McCoy Wilderness - Proposed Condition

CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: 3DScape

WASTE MANAGEMENT

Ellen Townsend-Hough

SUMMARY OF CONCLUSIONS

The proposed amended project would employ the BrightSource power tower technology, which would eliminate parabolic trough technology and the need for heat transfer fluid (HTF). With the elimination of heat transfer fluid (HTF) and its risks, the HTF waste management system and Condition of Certification **WASTE-8** are no longer required.

Staff is awaiting updated information from project owner, including: an updated Environmental Site Assessment; the estimated type and volume of hazardous and non-hazardous waste expected to be generated by construction and operation of the proposed project; and an updated summary of the anticipated operation waste streams, estimated waste volumes and generation frequency and proposed management methods. This information is expected to be available for the FSA. The information is not anticipated to differ significantly from that of the original project, however, staff will verify this with the updated information. Staff anticipates that all other existing Waste Management conditions of certification will still apply.

Management of the waste generated during construction, operation and closure/decommissioning of the Palen Solar Electric Generating System (PSEGS or proposed modified project) would not generate a significant adverse impact under the California Environmental Quality Act (CEQA) guidelines (Appendix G: Environmental Checklist Section XVI, Utilities and Service Systems).

There is sufficient landfill capacity, and the project would be consistent with the applicable waste management laws, ordinances, regulations, and standards if the PSPP project's original conditions of certification are implemented. No cumulative waste management impacts would occur.

INTRODUCTION

This section presents an analysis of issues associated with wastes generated from the proposed construction, operation and closure/decommissioning of the proposed modified project. The technical scope of this analysis encompasses solid and liquid wastes existing on site and wastes that would likely be generated during facility construction, operation and closure/decommissioning. Management and discharge of wastewater is addressed in the **SOIL AND WATER RESOURCES** section of this document. Additional information related to waste management may also be covered in the **WORKER SAFETY** and **HAZARDOUS MATERIALS MANAGEMENT** sections of this document.

The Energy Commission staff's (hereafter referred to as staff) objectives in conducting this waste management analysis are to ensure that:

- the management of project wastes would be in compliance with all applicable laws, ordinances, regulations, and standards (LORS). Compliance with LORS ensures that wastes generated during the construction, operation and closure/decommissioning of the proposed modified project would be managed in an environmentally safe manner;

- the disposal of project wastes would adversely impact existing waste disposal facilities; and
- the site is managed in such a way that project wastes and waste constituents would not pose a significant risk to humans or the environment;

METHODOLOGY AND THRESHOLDS FOR DETERMINING ENVIRONMENTAL CONSEQUENCES

In accordance with CEQA guidelines (Appendix G: Environmental Checklist Section XVI, Utilities and Service Systems), staff evaluated project wastes in terms of landfill capacity and LORS compliance for both non-hazardous and hazardous wastes. The federal, state, and local environmental LORS listed in **Waste Management Table 1** have been established to ensure the safe and proper management of both non-hazardous and hazardous wastes in order to protect human health and the environment.

SETTING AND EXISTING CONDITIONS

PROPOSED MODIFIED PROJECT

The proposed PSEGS site encompasses 3,794 acres and is located approximately 0.5 miles north of U.S. Interstate-10 and approximately 10 miles east of the community of Desert Center, in an unincorporated area of Riverside County, California. The site is located on vacant, undeveloped public land administered by the Bureau of Land Management (BLM).

The proposed modified project site is vacant and largely undeveloped; the only existing structure on the site is Southern California Edison's Eagle Mountain-Blythe 161 kV transmission line that traverses and would be rerouted along the border of the southwestern portion of the site. Three identified desert washes traverse the site; these washes originate from culverts built under the I-10 freeway when the freeway was constructed in the late 1960s (Solar Millennium 2009a, page 2-4). The proposed modified project site is in an area shown on maps as the Chuckwalla Valley, and is 2 to 3 miles northeast of the Chuckwalla Mountains and approximately 2 miles southwest of the Palen Mountains (Solar Millennium 2009a, page 2-4).

The proposed amended project would employ the BrightSource power tower technology, which would eliminate parabolic trough technology and the need for heat transfer fluid (HTF).

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS (LORS)

Waste Management Table 1
Laws, Ordinances, Regulations, and Standards (LORS)

Applicable LORS	Description
Federal	
Title 42, United States Code (U.S.C.), §6901, et seq. Solid Waste Disposal Act of 1965 (as amended and revised by the Resource Conservation and Recovery Act of 1976, et al.)	The Solid Waste Disposal Act, as amended and revised by the Resource Conservation and Recovery Act (RCRA) et al., establishes requirements for the management of solid wastes (including hazardous wastes), landfills, underground storage tanks, and certain medical wastes. The statute also addresses program administration, implementation and delegation to states, enforcement provisions, and responsibilities, as well as research, training, and grant funding provisions. RCRA Subtitle C establishes provisions for the generation, storage, treatment, and disposal of hazardous waste, including requirements addressing: • Generator record keeping practices that identify quantities of hazardous wastes generated and their disposition; • Waste labeling practices and use of appropriate containers; • Use of a manifest when transporting wastes; • Submission of periodic reports to the United States Environmental Protection Agency (U.S. EPA) or other authorized agency; and • Corrective action to remediate releases of hazardous waste and contamination associated with RCRA-regulated facilities. RCRA Subtitle D establishes provisions for the design and operation of solid waste landfills. RCRA is administered at the federal level by U.S. EPA and its 10 regional offices. The Pacific Southwest regional office (Region 9) implements U.S. EPA programs in California, Nevada, Arizona, and Hawaii.
Title 42, U.S.C., §9601, et seq. Comprehensive Environmental Response, Compensation and Liability Act	The Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), also known as *Superfund*, establishes authority and funding mechanisms for cleanup of uncontrolled or abandoned hazardous waste sites, as well as cleanup of accidents, spills, or emergency releases of pollutants and contaminants into the environment. Among other things, the statute addresses: • Reporting requirements for releases of hazardous substances; • Requirements for remedial action at closed or abandoned hazardous waste sites, and brownfields; • Liability of persons responsible for releases of hazardous substances or waste; and • Requirements for property owners/potential buyers to conduct “all appropriate inquiries” into previous ownership and uses of the property to 1) determine if hazardous substances have been or may have been released at the site, and 2) establish that the owner/buyer did not cause or contribute to the release. A Phase I Environmental Site Assessment is commonly used to satisfy CERCLA “all appropriate inquiries” requirements.

Applicable LORS	Description
Title 40, Code of Federal Regulations (C.F.R.), Subchapter I – Solid Wastes	These regulations were established by U.S. EPA to implement the provisions of the Solid Waste Disposal Act and RCRA (described above). Among other things, the regulations establish the criteria for classification of solid waste disposal facilities (landfills), hazardous waste characteristic criteria and regulatory thresholds, hazardous waste generator requirements, and requirements for management of used oil and universal wastes. • Part 257 addresses the criteria for classification of solid waste disposal facilities and practices. • Part 258 addresses the criteria for municipal solid waste landfills. • Parts 260 through 279 address management of hazardous wastes, used oil, and universal wastes (i.e., batteries, mercury-containing equipment, and lamps). U.S. EPA implements the regulations at the federal level. However, California is a RCRA-authorized state, so most of the solid and hazardous waste regulations are implemented by state agencies and authorized local agencies in lieu of U.S. EPA.
Title 49, C.F.R., Parts 172 and 173. Hazardous Materials Regulations	These regulations address the United States Department of Transportation (DOT) established standards for transport of hazardous materials and hazardous wastes. The standards include requirements for labeling, packaging, and shipping of hazardous materials and hazardous wastes, as well as training requirements for personnel completing shipping papers and manifests. Section 172.205 specifically addresses use and preparation of hazardous waste manifests in accordance with Title 40, CFR, section 262.20.
Federal Clean Water Act, 33 U.S.C. §1251 et seq.	The Clean Water Act controls discharge of wastewater to the surface waters of the U.S.
State	
California Health and Safety Code (Health and Safety Code), Chapter 6.5, §25100, et seq. Hazardous Waste Control Act of 1972, as amended	This California law creates the framework under which hazardous wastes must be managed in California. The law provides for the development of a state hazardous waste program that administers and implements the provisions of the federal RCRA program. It also provides for the designation of California-only hazardous wastes and development of standards (regulations) that are equal to or, in some cases, more stringent than federal requirements. The California Environmental Protection Agency (Cal/EPA), Department of Toxic Substances Control (DTSC) administers and implements the provisions of the law at the state level. Certified Unified Program Agencies (CUPAs) implement some elements of the law at the local level.

Applicable LORS	Description
Title 22, California Code of Regulations (Cal. Code Regs.), Division 4.5. Environmental Health Standards for the Management of Hazardous Waste	These regulations establish requirements for the management and disposal of hazardous waste in accordance with the provisions of the California Hazardous Waste Control Act and federal RCRA. As with the federal requirements, waste generators must determine if their wastes are hazardous according to specified characteristics or lists of wastes. Hazardous waste generators must obtain identification numbers; prepare manifests before transporting the waste off site; and use only permitted treatment, storage, and disposal facilities. Generator standards also include requirements for record keeping, reporting, packaging, and labeling. Additionally, while not a federal requirement, California requires that hazardous waste be transported by registered hazardous waste transporters. The standards addressed by Title 22, CAL. CODE REGS. include: • Identification and Listing of Hazardous Waste (Chapter 11, §66261.1, et seq.). • Standards Applicable to Generator of Hazardous Waste (Chapter 12, §66262.10, et seq.). • Standards Applicable to Transporters of Hazardous Waste (Chapter 13, §66263.10, et seq.). • Standards for Universal Waste Management (Chapter 23, §66273.1, et seq.). • Standards for the Management of Used Oil (Chapter 29, §66279.1, et seq.). • Requirements for Units and Facilities Deemed to Have a Permit by Rule (Chapter 45, §67450.1, et seq.). The Title 22 regulations are established and enforced at the state level by DTSC. Some generator and waste treatment standards are also enforced at the local level by CUPAs.
Health and Safety Code, Chapter 6.11 §§25404 – 25404.9 Unified Hazardous Waste and Hazardous Materials Management Regulatory Program (Unified Program)	The Unified Program consolidates, coordinates, and makes consistent the administrative requirements, permits, inspections, and enforcement activities of the six environmental and emergency response programs listed below. • Aboveground Petroleum Storage Act requirements for Spill Prevention, Control, and Countermeasure (SPCC) Plans. • Hazardous Materials Release and Response Plans and Inventories (Business Plans). • California Accidental Release Prevention (CalARP) Program. • Hazardous Materials Management Plan / Hazardous Materials Inventory Statements. • Hazardous Waste Generator / Tiered Permitting Program. • Underground Storage Tank Program. The state agencies responsible for these programs set the standards for their programs while local governments implement the standards. The local agencies implementing the Unified Program are known as CUPAs. The DTSC’s Calexico Field Office is the CUPA for the SES Solar Two project. Note: The Waste Management analysis only considers application of the Hazardous Waste Generator/Tiered Permitting element of the Unified Program.

Applicable LORS	Description
Title 27, Cal. Code Regs., Division 1, Subdivision 4, Chapter 1, §15100, et seq. Unified Hazardous Waste and Hazardous Materials Management Regulatory Program	While these regulations primarily address certification and implementation of the program by the local CUPAs, the regulations do contain specific reporting requirements for businesses. • Article 9 – Unified Program Standardized Forms and Formats (§§ 15400–15410). • Article 10 – Business Reporting to CUPAs (§§15600–15620).
Public Resources Code, Division 30, §40000, et seq. California Integrated Waste Management Act of 1989	The California Integrated Waste Management Act (CIWMA) establishes mandates and standards for management of solid waste in California. The law addresses solid waste landfill diversion requirements; establishes the preferred waste management hierarchy (source reduction first, then recycling and reuse, and treatment and disposal last); sets standards for design and construction of municipal landfills; and addresses programs for county waste management plans and local implementation of solid waste requirements.
Title 14, Cal. Code Regs., Division 7, §17200, et seq. California Integrated Waste Management Board	These regulations implement the provisions of the California Integrated Waste Management Act and set forth minimum standards for solid waste handling and disposal. The regulations include standards for solid waste management, as well as enforcement and program administration provisions. • Chapter 3 – Minimum Standards for Solid Waste Handling and Disposal. • Chapter 3.5 – Standards for Handling and Disposal of Asbestos Containing Waste. • Chapter 7 – Special Waste Standards. • Chapter 8 – Used Oil Recycling Program. • Chapter 8.2 – Electronic Waste Recovery and Recycling.
Health and Safety Code, Division 20, Chapter 6.5, Article 11.9, §25244.12, et seq. Hazardous Waste Source Reduction and Management Review Act of 1989	This law was enacted to expand the state's hazardous waste source reduction activities. Among other things, it establishes hazardous waste source reduction review, planning, and reporting requirements for businesses that routinely generate more than 12,000 kilograms (approximately 26,400 pounds) of hazardous waste in a designated reporting year. The review and planning elements are required to be done on a four-year cycle, with a summary progress report due to DTSC every fourth year.
Title 22, Cal. Code Regs., §67100.1 et seq. Hazardous Waste Source Reduction and Management Review	These regulations further clarify and implement the provisions of the Hazardous Waste Source Reduction and Management Review Act of 1989 (noted above). The regulations establish the specific review elements and reporting requirements to be completed by generators subject to the act.
Title 23, Cal. Code Regs., Division 3, Chapters 16 and 18	These regulations relate to hazardous material storage and petroleum UST cleanup, as well as hazardous waste generator permitting, handling, and storage. The DTSC Imperial County CUPA is responsible for local enforcement.

Applicable LORS	Description
Local	
County of Riverside General Plan, Safety Element: Policy S 6.1	Describes the County's policies and siting criteria identified in the County of Riverside Hazardous Waste Management Plan including coordination of hazardous waste facility responsibilities on a regional basis through the Southern California Hazardous Waste Management Authority
Riverside County Code Title 8 Chapters 8.60, 8.84, and 8.132, Health and Safety	Establishes requirements for the use, generation, storage, and disposal of hazardous and non-hazardous materials and wastes within the County.
Riverside County Code, Chapter 8.32, Ordinance No. 787, Fire	Adopted the 2007 California Fire Code.

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

This waste management analysis addresses: a) existing project site conditions and the potential for contamination associated with prior activities on or near the project site, and b) the impacts from the generation and management of wastes during project construction, operation and closure/decommissioning.

EXISTING PROJECT SITE CONDITIONS AND POTENTIAL FOR CONTAMINATION

For any site in California proposed for the construction of a power plant, the applicant must provide documentation about the nature of any potential or existing releases of hazardous substances or contamination at the site. If potential or existing releases or contamination at the site are identified, the CEQA significance of the release or contamination would be determined by site-specific factors, including, but not limited to: the amount and concentration of contaminants or contamination; the proposed use of the area where the contaminants/contamination is found; and any potential pathways for workers, the public, or sensitive species or environmental areas to be exposed to the contaminants. Any unmitigated contamination or releases of hazardous substances that pose a risk to human health or environmental receptors would be considered significant under CEQA by staff.

As a first step in documenting existing site conditions, the Energy Commission's power plant site certification regulations require that a Phase I Environmental Site Assessment (ESA) be prepared[1] and submitted as part of an Application for Certification (AFC). If a new project is proposed for the property on which the initial Phase I ESA was prepared, the Phase I ESA must be updated. While a Phase I ESA was prepared for the original PSPP project, because of the proposed changes to the original project, the project owner will provide an updated Phase I ESA for staff review prior to the Final Staff Assessment (FSA).

[1] Title 20, California Code of Regulations, section 1704(c) and Appendix B, section (g)(12)(A). Note that the Phase I ESA must be prepared according to American Society for Testing and Materials protocol or an equivalent method agreed upon by the applicant and the Energy Commission staff.

The Phase I ESA is conducted to identify any conditions indicative of releases and threatened releases of hazardous substances at the site and to identify any areas known to be contaminated (or a source of contamination) on or near the site.

In general, the Phase I ESA uses a qualified environmental professional to conduct inquiries into past uses and ownership of the property, research hazardous substance releases and hazardous waste disposal at the site and within a certain distance of the site, and visually inspect the property, making observations about the potential for contamination and possible areas of concern. After conducting all necessary file reviews, interviews, and site observations, the environmental professional then provides findings about the environmental conditions at the site. In addition, since the Phase I ESA does not include sampling or testing, the environmental professional may also give an opinion about the potential need for any additional investigation. Additional investigation may be needed, for example, if there were significant gaps in the information available about the site, if an ongoing release is suspected, or to confirm an existing environmental condition.

If additional investigation is needed to identify the extent of possible contamination, a Phase II ESA may be required. The Phase II ESA usually includes sampling and testing of potentially contaminated media to verify the level of contamination and the potential for remediation at the site.

In conducting its assessment of a proposed modified project, staff will review the project's Phase I ESA and work with the appropriate oversight agencies as necessary to determine if additional site characterization work is needed and if additional mitigation is necessary to ensure protection of human health and the environment from hazardous substance releases and on-site contamination.

A Phase I Environmental Site Assessment (ESA), dated May 2009, was prepared by AECOM in accordance with the American Society for Testing and Materials Standard Practice E 1527-05 for ESAs. The Phase I ESA is included as Appendix I of the project's AFC. The 2009 ESA did not identify any Recognized Environmental Conditions (REC) in connection with historic or current site operations. A REC is the presence or likely presence of any hazardous substances or petroleum products on a property under the conditions that indicated an existing release, past release, or a material threat of a release of any hazardous substance or petroleum products into structures on the property or in the ground, groundwater, or surface water of the property. The staff analysis for the approved Palen project was published December 15, 2010. The Phase I Environmental Site Assessment (ESA) presented in the Application for Certification for the Approved project was completed in May 2009. At the time the 2009 ESA was completed, portions of the site to be developed included federal and private property and the site was larger than that proposed for the proposed project.

In ASTM E 1527-05, provisions for updating an existing ESA are provided. According to ASTM E 1527-05, Section 4.6, *Continued Viability of Environmental Site Assessment* and Section 6 *User's Responsibility*, the ESA is required to be updated within a year if a new project is proposed for the property on which the initial ESA was prepared. The project owner will provide an updated Phase I ESA prior to the FSA.

IMPACTS FROM GENERATION AND MANAGEMENT OF WASTES DURING CONSTRUCTION, OPERATION AND PROJECT CLOSURE/DECOMMISSIONING

As mentioned previously, staff considers project waste management to result in no significant adverse impacts (as defined per CEQA guidelines in Checklist Section XVI) if there is available landfill capacity and the project complies with LORS. Staff thus reviewed the applicant's proposed solid and hazardous waste management methods regarding the management of project-related wastes generated during construction, operation, and closure/decommissioning of the proposed modified project to determine whether the methods proposed are consistent with the LORS identified for waste disposal and recycling. Staff then reviewed the capacity available at off-site treatment and disposal sites to determine whether or not the proposed power plant's waste would impact the available capacity.

The handling and management of waste generated by the PSEGS would follow the hierarchical approach of source reduction, recycling, treatment, and disposal as specified in California Public Resources Code Sections 40051 and 40196. The first priority of the project owner is to use materials that reduce the waste that is generated. The next level of waste management would involve reusing or recycling wastes. For wastes that cannot be recycled, treatment will be used, if possible, to make the waste nonhazardous. Finally, waste that cannot be reused, recycled or treated would be transported off site to a permitted treatment, storage, or disposal facility.

The project's General Compliance Conditions of Certification, including Compliance Monitoring and Closure Plan (Compliance Plan), have been established as required by Public Resources Code section 25532. The plan provides a means for assuring that the facility is constructed, operated and closed in compliance with public health and safety, environmental and other applicable regulations, guidelines, and conditions adopted or established by the California Energy Commission. This Compliance Plan will include Conditions of Certification identified in the following sections.

DIRECT/INDIRECT IMPACTS AND MITIGATION

Existing Site Conditions

Historical use of the site included General George Patton's Desert Training Camps during World War II. The PSEGS site is near Palen Pass, which was the site of some of the largest mock battles in the California-Arizona Maneuver Area. Live-fire training occurred in camps and facilities in the area and conventional and unconventional land mines and improvised personnel mines have been detected in addition to unexploded ordinance (UXO). Due to the proximity of the PSEGS site to Palen Pass and the camps, the applicant plans to conduct pre-construction UXO surveys with qualified technicians (that meet Department of Defense requirements) and/or employ UXO experts during ground disturbances in areas that may contain UXO (AECOM 2010a, DR-WM-279). The applicant also provided an outline for the MEC/UXO Recognition Training Program in its response to staff data request WM-280 (AECOM 2010a). Existing Condition of Certification **WASTE-1** requires UXO training, investigation, removal, and disposal.

In the event that contamination is identified during any phase of construction, existing Condition of Certification **WASTE-2** requires that an experienced and qualified Professional Engineer or Professional Geologist be available for consultation in the event contaminated soil is encountered. If contaminated soil is identified, existing Condition of Certification **WASTE-3** requires that the Professional Engineer or Professional Geologist inspect the site, determine what is required to characterize the nature and extent of contamination, and provide a report to the Energy Commission Compliance Project Manager (CPM) and DTSC with findings and recommended actions.

Proposed Modified Project

Proposed Modified Project – Construction Impacts and Mitigation

Site preparation and construction of the two phases of the proposed solar project and its associated facilities would last approximately 34 months and generate non-hazardous, universal, and hazardous wastes in solid and liquid forms. Before construction begins, the project owner would develop and implement a Construction Waste Management Plan to ensure that waste is recycled when possible and properly landfilled as necessary. Existing Condition of Certification **WASTE-4** requires the project owner to submit the Construction Waste Management Plan to the CPM at least 30 days prior to the start of construction activities.

Non-Hazardous Waste

Construction activities would generate non-hazardous solid wastes, consisting of scrap wood, concrete, steel, glass, plastic, paper, insulating materials, aluminum, and food waste. The project owner will provide staff information on the estimated type and volume of non-hazardous waste expected to be generated from construction of the proposed project prior to the FSA. The non-hazardous waste that may be generated is not anticipated to differ significantly from that of the original project, however, staff will verify this with the updated information. For all construction waste, recyclable materials would be separated and removed to recycling facilities; non-recyclable materials would be disposed of at a Class III landfill.

Wastewater would be generated during construction, and would include storm water runoff, sanitary waste, dust suppression drainage, and equipment wash water. Storm water runoff would be managed in accordance with appropriate LORS. Sanitary waste would be contained in portable facilities and routinely disposed of at an offsite treatment/disposal facility by a sanitary service. Potentially contaminated equipment wash water would be contained at designated wash areas and transported to a wastewater treatment facility via a licensed hauler. Please see the **SOIL AND WATER RESOURCES** section of this document for more information on the management of project wastewater.

Universal Waste

Anticipated universal waste generated during construction includes: spent batteries (e.g., alkaline dry cell, nickel-cadmium, and lithium ion) and empty or nonempty aerosol cans. Spent batteries and aerosol cans would be recycled by licensed universal waste handlers.

Universal waste would be accumulated for less than one year and recycled off site.

Hazardous Waste

During construction, anticipated hazardous waste includes empty hazardous material containers; solvents, used oil, paint, and oily rags; heat exchanger cleaning waste (chelant-type solution); and flushing and cleaning wash water. The project owner will provide staff information on the estimated type and volume of hazardous waste expected to be generated by the proposed project prior to the FSA. The hazardous waste that may be generated is not anticipated to differ significantly from that of the original project, however, staff will verify this with the updated information. Empty hazardous material containers would be returned to the vendor or disposed of at a hazardous waste facility; solvents, used oils, paint, and oily rags would be disposed of at a hazardous waste facility, recycled, or used for energy recovery; heat exchanger cleaning waste would be disposed of at a permitted hazardous waste disposal facility; and flushing and cleaning wash water would be recycled, used for energy recovery, or disposed of depending on specific waste stream characteristics.

In the unlikely event that contaminated soil is encountered during excavation activities, the soil would be segregated, sampled, and tested to determine appropriate disposal and treatment options. If the soil is classified as hazardous, the Riverside County Department of Environmental Health would be notified and the soil hauled to a Class I landfill or other appropriate soil treatment and recycling facility, as required. The Riverside County Department of Environmental Health would be notified also if previously unknown wells, tanks, or other underground storage facilities are discovered during construction. Subsequent removal of such equipment, including potential remediation activities, would be conducted in accordance with applicable LORS (Solar Millennium 2009a, pages 5.16-15 and 5.16-16). Staff believes that existing Conditions of Certification **WASTE-2** and **-3** would be adequate to address any soil contamination contingency that may be encountered during construction of the project and would further support compliance with LORS.

The generation of hazardous waste requires a unique hazardous waste generator identification number. The hazardous waste generator number is determined based on site location and therefore, both the construction contractor and the PSEGS project owner/operator could be considered the generator of hazardous wastes at the site. The PSEGS project owner would obtain a unique hazardous waste generator identification number for the site prior to starting construction. This would ensure compliance with California Code of Regulations Title 22, Division 4.5. Existing Condition of Certification **WASTE-5** would require the PSEGS project owner to submit the notification and issued identification number documentation to the CPM.

Hazardous wastes would be collected in hazardous waste accumulation containers and stored in a laydown area, warehouse area, or storage tank on equipment skids for less than 90 days (or less than 180 days in the case of lead acid batteries). The accumulated wastes would then be properly manifested, transported, and disposed of at a permitted hazardous waste management facility by licensed hazardous waste collection and disposal firms. Staff reviewed the disposal methods and concluded that all wastes would be disposed of in accordance with all applicable LORS. Should any construction waste management-related enforcement action be taken or initiated by a regulatory agency, the project owner would be required by existing Condition of Certification **WASTE-6** to notify the CPM whenever the owner becomes aware of such action.

Staff reviewed PSPP's proposed waste management methods described in AFC section 5.16.4 and concluded that project construction wastes would be managed in accordance with all applicable LORS. While some information is outstanding and will not be available until the FSA, the information is not anticipated to differ significantly from that of the original project, however, staff will verify this with the updated information. Absent any unusual circumstances, staff considers project compliance with LORS and staff's proposed conditions of certification to be sufficient to ensure that no significant adverse impacts would occur (per CEQA Guidelines) as a result of construction waste management activities.

Proposed Modified Project – Construction and Demolition (C&D) Waste Diversion and Mitigation

The Integrated Waste Management Act of 1989 [Assembly Bill (AB) 939, Sher, Chapter 1095, Statutes of 1989] set landfill waste diversion goals of 50 percent (by 2000) for local jurisdictions. To meet this goal, many jurisdictions require applicants for construction and demolition (C&D) projects to submit a reuse/recycling plan for at least 50 percent of C&D materials prior to the issuance of a building or demolition permit. While the proposed modified project is not responsible to a local jurisdiction (Riverside County does not have a construction and demolition waste diversion ordinance), staff encourages the applicant to meet the 50 percent waste diversion rate.

Proposed Modified Project – Operation Impacts and Mitigation

The proposed modified project would generate non-hazardous, universal, and hazardous wastes in solid and liquid forms under normal operating conditions. The project owner will provide an updated summary of the anticipated operation waste streams, estimated waste volumes and generation frequency, and proposed management methods.

The project owner would develop and implement an Operations Waste Management Plan. In addition, the project owner would be required to document the project's actual operational waste stream and obtain approval for the Operations Waste Management Plan prior to the start of construction per existing Condition of Certification **WASTE-7**. These measures would ensure that operational wastes are treated in compliance with all LORS and that an accurate record of the project's waste generation, storage, and disposal practices is maintained.

Non-Hazardous Waste

Operation of the project is expected to generate non-hazardous waste, including routine maintenance wastes (such as used air filters, spent deionization resins, sand and filter media) as well as domestic and office wastes (such as office paper, newsprint, aluminum cans, plastic, and glass). All non-hazardous wastes would be recycled, to the maximum extent possible, and non-recyclable wastes would be regularly transported off site to a solid waste disposal facility.

Non-hazardous liquid wastes would be generated during facility operation and would include reverse osmosis membrane cleaning waste, reverse osmosis system concentrate, sanitary wastewater, and storm water runoff.

Reverse osmosis membrane cleaning waste would be adjusted to neutralize its pH and used as a dust suppressant on site or disposed of at a permitted waste management facility. Sanitary waste water would be piped to an on-site septic system and leach field. Reverse osmosis system concentrate would be used for dust control if determined to be inert or disposed of at a permitted waste management facility if determined to be designated waste.

Stormwater runoff is discussed in the **SOIL AND WATER RESOURCES** section of this document.

Universal Waste

Project operations would generate universal waste, including: spent batteries (e.g., alkaline dry cell, nickel-cadmium, and lithium ion) and spent fluorescent bulbs or high-intensity discharge lamps.

Universal waste would be accumulated for less than one year and recycled off site.

Hazardous Waste

Project operations would generate hazardous wastes, including: used hydraulic fluid, oils, turbine, and other hydraulic equipment; effluent from the oily water separation system resulting from plant wash down; oil adsorbent and oil filters.

Used hydraulic fluid, oils, and grease would be recycled; effluent from the oily water separation system would be recycled; oil adsorbent and oil filters would be sent offsite for recovery or disposal at a Class I landfill; spent activated carbon would be sent off site for regeneration at a permitted management facility.

The PSEGS project owner would be considered the generator of hazardous wastes at the site during facility operations. Therefore, the PSEGS project owner's unique hazardous waste generator identification number, obtained prior to construction, would be retained and used for hazardous waste generated during facility operation.

Proper hazardous material handling, good housekeeping practices, and personnel training would help keep spill wastes to a minimum. However, to ensure proper cleanup and management of any contaminated soils or waste materials generated from hazardous materials spills, existing Condition of Certification **WASTE-9,** requires the project operator to document, clean up, and properly manage and dispose of wastes from any hazardous materials spills or releases in accordance with all applicable federal, state, and local requirements. More information related to hazardous materials management is provided in the **HAZARDOUS MATERIALS MANAGEMENT** section of this document.

The hazardous wastes generated during proposed modified project operations would be temporarily stored on site, transported off site by licensed hazardous waste haulers, and recycled or disposed of at authorized disposal facilities in accordance with established standards applicable to generators of hazardous waste (Title 22, Cal. Code Regs., §66262.10 et seq.). Should any operations waste management-related enforcement action be taken or initiated by a regulatory agency, the project owner would be required by existing Condition of Certification **WASTE-6** to notify the CPM when advised of any such action.

Proposed Modified Project – Closure and Decommissioning Impacts and Mitigation

The closure or decommissioning of the proposed modified project would produce both hazardous and non-hazardous solid and liquid waste. The project owner did not identify waste streams or quantities of materials requiring disposal from decommissioning. Required elements of a facility's non-operation and closure are outlined in a repair/restoration plan and facility closure plan as specified in proposed Conditions of Certification **COMPLIANCE-14** and **15**. To ensure adequate review of a planned project closure, the PSEGS project owner shall submit a proposed facility closure plan to the Energy Commission for review and approval at least 12 months (or other period of time agreed to by the CPM) prior to commencement of closure activities. The facility closure plan will document non-hazardous and hazardous waste management practices including: the inventory, management, and disposal of hazardous materials and wastes, and permanent disposal of permitted hazardous materials and waste storage units. The plan will identify landfills with adequate capacity to receive closure and decommissioning wastes.

Condition of Certification **WASTE-8** will no longer apply. Conditions of Certification **WASTE-1** through **-10,** excluding **WASTE-8**, would continue to apply to the proposed modified project during closure and decommissioning of the project.

Proposed Modified Project – Impact on Existing Waste Disposal Facilities

Non-Hazardous Waste

The project owner will provide new information on the quantity of waste generated during construction and operation prior to the FSA. The volume of non-hazardous waste that may be generated is not anticipated to differ significantly from that of the original project, however, staff will verify this with the updated information. -The non-hazardous waste would be stored on site in appropriate containers and recycled or disposed of in a Class III landfill on a regular basis.

There are six Class III waste disposal facilities in Riverside County[2] that could potentially accommodate the non-hazardous construction and operation wastes generated by the proposed modified project. The combined remaining capacity of these six landfills is over 200 million cubic yards; however, the remaining capacity of the Oasis Sanitary Landfill is only 75,727 cubic yards, and the remaining capacity of the Desert Center Landfill is only 23,246 cubic yards[3].

[2] http://www.rivcowm.org/opencms/landfill_info/landfill_hours.html

[3] http://www.calrecycle.ca.gov/SWFacilities/Directory/SearchList/List?COUNTY=Riverside&LEA=33-AA

As noted above, type and quantity of waste for non-operation and closure have not been identified. The repair/restoration plan and facility closure plan prepared pursuant to Conditions of Certification **COMPLIANCE-14** and **15** will provide this information as well as disposal facilities with adequate capacity to receive wastes.

The non-recyclable, non-reusable component of the waste stream would contribute to filling the available Class III landfill capacity in Riverside County, and could contribute a substantial portion of the remaining capacity at the Desert Center Landfill and the Oasis Sanitary Landfill. Existing Condition of Certification **WASTE-10** would require that all project-related non-hazardous, non-recyclable, and non-reusable construction and operation waste be diverted to Riverside County landfills other than the Desert Center Landfill and the Oasis Sanitary Landfill. Disposal of the non-hazardous solid wastes generated by the proposed modified project could occur without impacting the capacity or remaining life of the other Class III facilities in Riverside County.

Hazardous Waste

Table 5.16-4 of the PSPP AFC identifies two Class I waste disposal facilities in California that are currently accepting waste. These same landfills which could be used to manage proposed modified project wastes are: the Clean Harbors Buttonwillow Landfill in Kern County and the Chemical Waste Management Kettleman Hills Landfill in Kings County. In total, there is a combined excess of 10 million cubic yards of remaining hazardous waste disposal capacity at these landfills, with at least 30 years remaining in their operating lifetimes (Solar Millennium 2009a, page 5.16-11). In addition, the Kettleman Hills facility is in the process of permitting an additional 4.6 to 4.9 million cubic yards of disposal capacity (Waste Management 2009).

Hazardous wastes generated during construction, operation and closure/decommissioning would be recycled to the extent possible and practical. Those wastes that cannot be recycled would be transported off site to a permitted treatment, storage, or disposal facility.

PROJECT-RELATED FUTURE ACTIONS – WASTE MANAGEMENT

Currently there are no project-related future actions related to Waste Management.

ENVIRONMENTAL SETTING

Waste management activities associated with the proposed action would include the storage, transport, recycling, or disposal of all project waste streams. Waste streams generally include solid waste and liquid waste. For the purposes of this analysis, discharges to the atmosphere are not included as a waste stream. Atmospheric discharges and air quality are described in the **Air Quality** section. Solid waste would include office type materials (paper, cardboard, newspaper, etc.) and any other solid material that is stored or disposed of as a non-hazardous waste. Liquid waste may include human septic waste, process fluid waste, and storm water runoff.

All waste streams are regulated and discharges or disposal of any waste material either requires specific permitting or disposal at a permitted facility under the conditions of the operator. Both solid and liquid waste streams can be either hazardous or non-hazardous, depending on the constituents in the waste stream and the characteristics (ignitability, reactivity, toxicity, and corrosivity) of the waste. The status of the waste stream determines both the storage options for the material, and the disposal method for the material.

Liquid waste disposal facilities include municipal waste water treatment plants and individual sewage disposal systems (ISDS). Municipal waste treatment plants are allowed to receive residential, commercial, and industrial human sewage material, and some regulated industrial liquid waste streams. Residential human sewage waste can also be disposed of in ISDS. Any liquid waste stream that is considered hazardous must be disposed of in a Class I landfill or through a combination of recycling and disposal at a permitted facility.

Uncontrolled solid waste disposal facilities may be present within the proposed transmission line ROW area. These facilities may include historic fill areas associated with urban solid waste disposal, areas of domestic solid waste present on private property, or areas of illegal solid waste disposal on public lands. These types of facilities may or may not be publicly known, mapped, and identified. Public records for these facilities would be reviewed as part of Phase I ESA completed prior to permitting of the project. Unknown areas of solid waste disposal may be encountered during project construction activities.

ENVIRONMENTAL IMPACTS

Construction would generate waste largely in the form of soil from structure/substation excavation, utility line cable, and scrap metal from the replacement of existing structures. Hazardous wastes generated during construction and operation would be recycled to the extent possible and practical. Those wastes that cannot be recycled would be transported off site to a permitted treatment, storage, or disposal facility.

Due to the number and capacity of landfills serving the project area, capacity for materials generated from construction of the SCE Red Bluff Substation would be available. Because the exact amount of material recycling is unknown, the total amount of waste requiring landfill disposal is unknown. Recycling activities would greatly reduce the quantity of construction-related materials transported to local landfills.

As the waste generated by the substation would occur over the entire construction period and could be dispersed among the various landfills serving the entire project area, the daily waste exported off site would be a fraction of the maximum daily throughput for any of the landfills in the area. Therefore, construction waste generated by the project would not substantially affect the remaining capacities of local landfills to serve local demands.

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).

There is the potential for substantial future development in eastern Riverside County and throughout the southern California desert region. Analysis of cumulative impacts is based on data provided in the following maps and tables:

- Rio Mesa Solar Electric Generating Facility - Area Map
- Executive Summary-Table 1 Existing Projects
- Executive Summary Table 2 Foreseeable Projects in Project Area
- Executive Summary-Table 3 Foreseeable Projects in the California Desert
- Executive Summary-Table 4 Projects Submitted and On Hold

The analysis in this section first defines the geographic area over which cumulative impacts related to waste management could occur. The cumulative impact analysis itself describes the potential for cumulative impacts to occur as a result of implementation of the proposed modified project along with the listed local and regional projects.

Existing Cumulative Conditions

Cumulative impacts can occur within 1-10/Eastern Riverside County area if implementation of the PSEGS project could combine with those of other local or regional projects. Cumulative impacts could also occur as a result of development of some of the many proposed solar and wind development projects that have been or are expected to be under consideration by the BLM, the Energy Commission and Riverside County in the near future. Many of these projects are located within the California Desert Conservation Area, as well as on BLM land in Nevada and Arizona.

The geographic extent for the analysis of the cumulative impacts associated with the PSEGS project is Riverside County, the location of the closest large Class III landfills. This geographic scope is appropriate because waste disposal facilities in Riverside County are the ones most likely to be used for disposal of waste generated by the PSEGS Project considering regulatory acceptability and transport costs.

Future Foreseeable Projects

The PSEGS Project would generate non-hazardous solid waste that would add to the total waste generated in Riverside County. The projects listed in Executive Summary Tables 1, 2, 3 and 4 would generate additional volumes of non-hazardous waste in Riverside County. There are approximately 44 foreseeable projects in Riverside County. Twenty-three of the projects are energy projects. An estimated 8,298 MW, including Eagle Mountain Pumped Storage Project, of foreseeable projects are proposed to be built in Riverside County. The proposed projects will generate volumes of waste that are both larger and smaller than the PSEGS Project.

Foreseeable Projects in the Project Area

Staff used a value of 100 cubic yards per MW as a rough guide for determining total volume of non-hazardous solid wastes that could result from implementation of all the projects listed in **Executive Summary Tables 2** and **3**, the majority of which are renewable energy facilities. Until the project owner is able to provide staff with estimates of waste expected from the PSEGS project, Staff estimates that the PSEGS project with generate a total lifetime value of 64,090 cubic yards of non-hazardous solid waste. This estimate is based on the amount of non-hazardous solid waste that would have been generated for the PSPP Project. Using the PSPP amount is conservative because another comparable power tower project estimated it would generate approximately 50,000 cubic yards over the lifetime of the project. These quantities do not include closure or decommissioning wastes; disposal at landfills with adequate capacity would be a condition in facility closure plans. The approximately 450,000 cubic yards generated from projects listed in **Executive Summary Table 2** compares to the almost 200,000,000 cubic yards of Class III landfill capacity available to these generators as indentified in AFC Table 5.16-4 (Solar Millennium 2009a, page 5.16-10, 11). Using the conservative value of 64,090 cubic yards, Staff concludes that the non-hazardous waste generated by the PSEGS project would not result in significant adverse cumulative waste management impacts under CEQA.

As stated above, the non-recyclable component of the 3,000 cubic yards of total lifetime hazardous waste from another comparable power tower project would not impact the capacity or remaining life of the Class I waste facilities. Using a similar conversion factor as that noted above, staff estimated that approximately 16,000 cubic yards of lifetime hazardous waste would be generated by the projects listed in **Executive Summary Table 2**. This compares to the almost 10,000,000 cubic yards of Class I landfill capacity available to these generators as identified in AFC Table 5.16-4 (Solar Millennium 2009a, page 5.16-10, 11). Staff concludes that hazardous waste generated by the PSEGS Project would not result in significant adverse cumulative waste management impacts under CEQA.

Foreseeable Renewable Projects in the California Desert

Implementation of the multiple solar and wind projects proposed to be developed in the California Desert, and other planned non-energy projects, would result in an increase in generation of hazardous and non-hazardous solid and liquid waste and would add to the total quantity of waste generated throughout the desert. Nearly, 7,000 MW of foreseeable renewable energy projects were proposed for the California desert. However, project wastes would be recycled wherever practical and sufficient capacity is available throughout the area, especially with the addition of the Mesquite Regional Landfill with a capacity of 600 million tons when it is fully constructed (Fisher 2013)**.** Therefore, impacts of the PSEGS project, when combined with impacts of the future solar and wind, and other development projects, currently proposed within the California desert would be less than one percent of total remaining landfill capacity and would not result in significant adverse and unavoidable cumulative impacts, under CEQA, with regard to waste management.

Cumulative Impact Conclusion

Impacts of the PSEGS project would combine with impacts of past, present, and reasonably foreseeable projects to result in a contribution to local and regional cumulative impacts related to waste management.

The amount of non-hazardous and hazardous wastes generated during construction, operation and closure/decommissioning of the PSEGS project would add to the total quantity of hazardous and non-hazardous waste generated in Riverside County. However, sufficient capacity is available at treatment and disposal facilities to handle the volumes of wastes that would be generated by the project. Therefore, staff concludes that the waste generated by the PSEGS project would not result in significant adverse cumulative waste management impacts, under CEQA, either locally or regionally, provided that applicant complies with **WASTE-10** and diverts project wastes to other Riverside County landfills with adequate capacity.

COMPLIANCE WITH LORS

Energy Commission staff concludes that the proposed modified project would comply with all applicable LORS regulating the management of hazardous and non-hazardous wastes during both facility construction and operation. The applicant is required to recycle and/or dispose of hazardous and non-hazardous wastes at facilities licensed or otherwise approved to accept the wastes. Because hazardous wastes would be produced during both project construction and operation, the proposed modified project would be required to obtain a hazardous waste generator identification number from U.S. EPA. The proposed modified project would also be required to properly store, package, and label all hazardous waste; use only approved transporters; prepare hazardous waste manifests; keep detailed records; and appropriately train employees in accordance with state and federal hazardous waste management requirements.

NOTEWORTHY PUBLIC BENEFITS

Staff has not identified any noteworthy public benefits associated with waste management.

CONCLUSIONS

Consistent with the three main objectives for staff's waste management analysis (as noted in the Introduction section of this analysis), staff provides the following conclusions:

After review of the project owner's proposed waste management procedures, staff concludes that project wastes would be managed in compliance with all applicable waste management LORS. Staff notes that construction, demolition, and operation wastes would be characterized and managed as either hazardous or non-hazardous waste. All non-hazardous wastes would be recycled or reused to the extent feasible, and non-recyclable wastes would be collected by a licensed hauler and disposed of at a permitted solid waste disposal facility. Hazardous wastes would be accumulated on site in accordance with maximum allowable accumulation times, and then properly manifested, transported to, and disposed of at a permitted hazardous waste management facility by licensed hazardous waste collection and disposal companies.

Staff believes that the disposal of project-generated non-hazardous wastes from PSEGS would be less than the original PSPP project, and would not adversely impact Class III landfill capacity, and disposal of project-related hazardous wastes would not adversely impact Class I landfill capacity, however, staff will verify the anticipated volumes of waste prior to the FSA. The project owner will also provide staff with an updated Phase I ESA that will outline a detailed description of the current PSEGS project site configuration and verity that there are no new recognized environmental conditions, prior to the FSA.

Existing Conditions of Certification **WASTE-1** through **-7**, **-9** and -**10** will ensure that the modified PSEGS project will remain in compliance and no new Conditions of Certification are proposed. These conditions would require the project owner to:

- Ensure the project site is investigated and remediated for any unexploded ordnance that may pose a risk to construction personnel or the environment (**WASTE-1**);
- Ensure the project site is investigated and any contamination identified is remediated as necessary, with appropriate professional and regulatory agency oversight (**WASTE-2** and **-3);**
- Obtain approval for the Construction Waste Management and Operation Waste Management Plans detailing the types and volumes of wastes to be generated and how wastes will be managed, recycled, and/or disposed of after generation (**WASTE-4** and **-7**);
- Obtain a hazardous waste generator identification number from the United States Environmental Protection Agency (**WASTE-5**).
- Report any waste management-related LORS enforcement actions and how violations will be corrected (**WASTE-6**);
- Ensure that all spills or releases of hazardous substances are reported and cleaned-up in accordance with all applicable federal, state, and local requirements (**WASTE-9**); and
- Ensure that non-recyclable solid waste is diverted to landfills with sufficient remaining capacity (**WASTE-10**).

Because the proposed amended project would employ the BrightSource power tower technology, which would eliminate parabolic trough technology and the need for heat transfer fluid (HTF), staff is recommending the deletion of Waste Discharge Requirement stipulations for treatment of HTF-contaminated soils (**WASTE-8)**.

PROPOSED CONDITIONS OF CERTIFICATION

Staff has proposed modifications to the **Waste Management** conditions of certification as shown below. (**Note:** Deleted text is in ~~strikethrough~~; new text is **<u>bold and underlined</u>**)

WASTE-1 The project owner shall prepare a UXO Identification, Training and Reporting Plan to properly train all site workers in the recognition, avoidance and reporting of military waste debris and ordnance. The project owner shall submit the plan to the Compliance Project Manager (CPM) for review and approval prior to the start of construction. The project owner shall provide documentation of the plan and provide survey results to the CPM. The plan shall contain, at a minimum, the following:

- A description of the training program outline and materials, and the qualifications of the trainers; and
- Identification of available trained experts who will oversee earth-moving activities where ordnance could be uncovered and respond to notification of discovery of any ordnance (unexploded or not); and
- Work plan to identify, recover, and remove discovered ordnance, and to complete additional field screening, including geophysical surveys to investigate adjacent areas for surface, near surface or buried ordnance in all proposed land disturbance areas.

Verification: The project owner shall submit the UXO Identification, Training and Reporting Plan to the CPM for approval no later than 30 days prior to the start of site mobilization. The results of geophysical surveys shall be submitted to the CPM within 30 days of completion of the surveys.

WASTE-2 The project owner shall provide the résumé of an experienced and qualified Professional Engineer or Professional Geologist to the Compliance Project Manager (CPM) for review and approval. The résumé shall show experience in remedial investigation and feasibility studies. This Professional Engineer or Professional Geologist shall be available during site characterization (if needed), excavation, grading, and demolition activities. The Professional Engineer or Professional Geologist shall be given authority by the project owner to oversee any earth-moving activities that have the potential to disturb contaminated soil and impact public health, safety, and the environment.

Verification: No later than 30 days prior to the start of site mobilization the project owner shall submit the resume to the CPM for review and approval.

WASTE-3 If potentially contaminated soil is identified during site characterization, excavation, grading, or demolition at either the proposed site or linear facilities—as evidenced by discoloration, odor, detection by handheld instruments, or other signs—the Professional Engineer or Professional Geologist shall inspect the site; determine the need for sampling to confirm the nature and extent of contamination; and provide a written report to the project owner, representatives of Department of Toxic Substances Control (DTSC) or Regional Water Quality Control Board (RWQCB) and the Compliance Project Manager (CPM) stating the recommended course of action.

Depending on the nature and extent of contamination, the Professional Engineer or Professional Geologist shall have the authority to temporarily suspend construction activity at that location for the protection of workers or the public. If in the opinion of the Professional Engineer or Professional Geologist significant remediation may be required, the project owner shall contact the CPM and representatives of the DTSC or RWQCB for guidance and possible oversight.

Verification: The project owner shall submit any reports filed by the Professional Engineer or Professional Geologist to the CPM within 5 days of their receipt. The project owner shall notify the CPM within 24 hours of any orders issued to halt construction.

WASTE-4 The project owner shall submit a Construction Waste Management Plan to the Compliance Project Manager (CPM) for review and approval prior to the start of construction. The plan shall contain, at a minimum, the following:

- a description of all construction waste streams, including projections of frequency, amounts generated and hazard classifications;
- a survey of structures to be demolished that identifies the types of waste to be managed;
- a reuse/recycling plan for construction and demolition materials that meets or exceeds the 50 percent waste diversion goal established by the Integrated Waste Management Compliance Act; and,
- management methods to be used for each waste stream, including temporary on-site storage, housekeeping and best management practices to be employed, treatment methods, and companies providing treatment services, waste testing methods to assure correct classification, methods of transportation, disposal requirements and sites, and recycling and waste minimization/reduction plans.

Verification: The project owner shall submit the Construction Waste Management Plan to the CPM for approval no later than 30 days prior to the initiation of construction activities at the site.

WASTE-5 The project owner shall obtain a hazardous waste generator identification number from the United States Environmental Protection Agency (USEPA) prior to generating any hazardous waste during project construction and operations.

Verification: The project owner shall keep a copy of the identification number on file at the project site and provide documentation of the hazardous waste generation and notification and receipt of the number to the CPM in the next scheduled Monthly Compliance Report after receipt of the number. Submittal of the notification and issued number documentation to the CPM is only needed once unless there is a change in ownership, operation, waste generation, or waste characteristics that requires a new notification to USEPA. Documentation of any new or revised hazardous waste generation notifications or changes in identification number shall be provided to the CPM in the next scheduled compliance report.

WASTE-6 Upon notification of any impending waste management-related enforcement action related to project site activities by any local, state, or federal authority, the project owner shall notify the CPM of any such action taken or proposed against the project itself, or against any waste hauler or disposal facility or treatment operator with which the owner contracts for the project, and describe the owner's response to the impending action or if a violation has been found, how the violation will be corrected.

<u>Verification:</u> The project owner shall notify the CPM in writing within 10 days of receiving written notice from authorities of an impending enforcement action. The CPM shall notify the project owner of any changes that will be required in the way project-related wastes are managed as a result of a finalized action against the project.

WASTE-7 The project owner shall submit the Operation Waste Management Plan to the CPM for review and approval. The plan shall contain, at a minimum, the following:

- a detailed description of all operation and maintenance waste streams, including projections of amounts to be generated, frequency of generation, and waste hazard classifications;
- management methods to be used for each waste stream, including temporary on-site storage, housekeeping and best management practices to be employed, treatment methods and companies providing treatment services, waste testing methods to ensure correct classification, methods of transportation, disposal requirements and sites, and recycling and waste minimization/source reduction plans;
- information and summary records of contacts with the local Certified Unified Program Agency and the Department of Toxic Substances Control regarding any waste management requirements necessary for project activities. Copies of all required waste management permits, notices, and/or authorizations shall be included in the plan and updated as necessary;
- a detailed description of how facility wastes will be managed and any contingency plans to be employed, in the event of an unplanned closure or planned temporary facility closure; and
- a detailed description of how facility wastes will be managed and disposed upon closure of the facility.

<u>Verification:</u> The project owner shall submit the Operation Waste Management Plan to the CPM for approval no later than 30 days prior to the start of project operation. The project owner shall submit any required revisions to the CPM within 20 days of notification from the CPM that revisions are necessary.

The project owner shall also document in each Annual Compliance Report the actual volume of wastes generated and the waste management methods used during the year, provide a comparison of the actual waste generation and management methods used to those proposed in the original Operation Waste Management Plan, and update the Operation Waste Management Plan as necessary to address current waste generation and management practices.

~~**WASTE-8** The project owner shall document all releases and spills of Heat Transfer Fluid (HTF) as described in Condition **WASTE-9** and report only those that are 42 gallons or more, the CERCLA reportable quantity, as required in the **Soil and Water Resources** section of this Decision. Cleanup and temporary staging of HTF-contaminated soils shall be conducted in accordance with the approved Operation Waste Management Plan required in Condition **WASTE-**~~

~~**7**. The project owner shall sample HTF-contaminated soil from CERCLA reportable incidents involving 42 gallons or more in accordance with the United States Environmental Protection Agency's (USEPA) current version of "Test Methods for Evaluating Solid Waste" (SW-846). Samples shall be analyzed in accordance with USEPA Method 8015 or other method to be reviewed and approved by DTSC and the CPM.~~

~~Within 28 days of an HTF spill, the project owner shall provide the results of the analyses and their assessment of whether the HTF-contaminated soil is considered hazardous or non-hazardous to the Department of Toxic Substances Control (DTSC) and the CPM for review and approval.~~

~~If DTSC, and the CPM determine the HTF-contaminated soil is considered hazardous, it shall be disposed of in accordance with California Health and Safety Code Section 25203 and procedures outlined in the approved Operation Waste Management Plan required in Condition **WASTE-7** and reported to the CPM in accordance with Condition **WASTE-9**.~~

~~If DTSC and the CPM determine the HTF-contaminated soil is considered non-hazardous it shall be retained in the land treatment unit (LTU) and treated on-site in accordance with the Waste Discharge Requirements contained in the **Soil and Water Resources** section of this Decision.~~

~~**Verification:** The project owner shall submit to the CPM and the DTSC for approval the project owner's assessment of whether the HTF contaminated soil is considered hazardous or non-hazardous under state regulations. HTF-contaminated soil that exceeds the regulatory hazardous waste levels must be disposed of in accordance with California Health and Safety Code Section 25203. HTF-contaminated soil that does not exceed the hazardous waste levels may be discharged to the on-site LTU. For discharges into the LTU, the project owner shall comply with the Waste Discharge Requirements contained in the **Soil and Water Resources** section of this Decision.~~

WASTE-9 The project owner shall ensure that all accidental spills or unauthorized releases of hazardous substances, hazardous materials, and hazardous waste are documented and remediated, and that wastes generated from accidental spills and unauthorized releases are properly managed and disposed of in accordance with all applicable federal, state, and local LORS and requirements. For the purpose of this Condition of Certification, "release" shall have the definition in Title 40 of the Code of Federal Regulations, Part 302.3.

Verification: No later than 30 days of the date that a project-related hazardous substance release was discovered, the project manager shall provide a copy of the accidental spill or unauthorized release documentation to the CPM.

The project owner shall document management of all accidental spills and unauthorized releases of hazardous substances, hazardous materials, and hazardous wastes that occur on the project property or related linear facilities. The documentation shall include, at a minimum, the following information: location of release; date and time of release; reason for release; volume released; how release was managed and material cleaned up; amount of contaminated soil and/or cleanup wastes generated; if the release was reported; to whom the release was reported; release corrective action and cleanup requirements placed by regulating agencies; level of cleanup achieved and actions taken to prevent a similar release or spill; and disposition of any hazardous wastes and/or contaminated soils and materials that may have been generated by the release.

WASTE-10 The project owner shall ensure that none of the project's non-hazardous, non-recyclable, and non-reusable construction and operation wastes shall be diverted to or deposited at either the Desert Center Landfill or the Oasis Sanitary Landfill.

Verification: The project owner shall provide documentation of all project-related solid waste disposal activities and identify the landfills receiving project-related wastes in the Annual Compliance Report submitted to the CPM.

REFERENCES

CEC 2010a – California Energy Commission/A. Solomon (TN 55988). Staff Assessment and Draft Environmental Impact Statement Dated March 19, 2010. Submitted to CEC/Docket Unit on March 19, 2010

CEC 2010b – California Energy Commission/A. Solomon (TN 58252). Revised Staff Assessment Part 1, Dated September 1, 2010. Submitted to CEC/Docket unit on September 1, 2010

CEC 2010c – California Energy Commission/A. Solomon (TN 58497). Revised Staff Assessment Part II, Dated September 16, 2010. Submitted to CEC/Docket Unit September 16, 2010

CEC 2010e – California Energy Commission/Hearing Office (TN 59208). Errata to the Presiding Member's Proposed Decision, dated December 10, 2010. Submitted to CEC/Docket Unit on December 10, 2010

CEC 2010f – California Energy Commission/Hearing Office (TN 59350). Commission Decision, Dated December 15, 2010. Submitted to CEC/Docket Unit on December 22, 2010

Fisher 2013 – Megan Fisher CalRecycle email to Ellie Townsend-Hough CEC dated May 22, 2013.

Palen 2012a – Palen Solar Holdings, LLC / Galati Blek, Scott Galati (TN 68910). Palen Solar Holdings, LLC's Petition for Amendment, dated December 17, 2012. Submitted to CEC/C. Stora on December 18, 2012

Palen 2013a – Palen Solar Holdings, LLC /Galati Blek, Scott Galati (TN 69471). Palen Solar Holding's Supplement Number One to support petition to amendment, dated February 8, 2013. Submitted to CEC/C. Stora on February 14, 2013

Palen 2013f – Palen Solar Holdings, LLC (TN 70096). Palen Solar Holdings, LLC response to CEC Data Request set 1 (1-18). Submitted to CEC/Docket Unit on March 25, 2013

Solar Millennium 2009a – Solar Millennium (TN: 52939). Application for Certification Vol 1 & 2, Dated 8/24/2009.

WORKER SAFETY AND FIRE PROTECTION

Alvin Greenberg, Ph.D.

SUMMARY OF CONCLUSIONS

California Energy Commission (Energy Commission) staff (staff) concludes that if the project owner for the proposed modified Palen Solar Electric Generating System (PSEGS) provides a Project Construction Safety and Health Program and a Project Operations and Maintenance Safety and Health Program, as required by Conditions of Certification **WORKER SAFETY-1**and **-2** and fulfills the requirements of Conditions of Certification **WORKER SAFETY-3** through**-10**, the project would incorporate sufficient measures to ensure adequate levels of industrial safety and comply with applicable laws, ordinances, regulations, and standards. The conditions of certification in this section, including existing, modified, and new conditions, provide assurance that the Construction Safety and Health Program and the Operations and Maintenance Safety and Health Program proposed by the project owner would be reviewed by the appropriate agencies before implementation. The conditions also require verification that the proposed plans adequately assure worker safety and fire protection and comply with applicable laws, ordinances, regulations, and standards.

Staff has considered the position of PSEGS and the Riverside County Fire Department (RCFD) and all relevant information as well as past and current experience at other solar power plants in California and has determined that the project would cause a significant direct and cumulative impact on local fire protection services. Therefore, staff is proposing mitigation to reduce these impacts to less than significant by requiring payment to the RCFD for capital improvements and annual support (see proposed Condition of Certification **WORKER SAFETY-7**). Staff is also proposing a new condition (**WORKER SAFETY-10**) that would clarify the requirement for the project owner to submit plans for all fire detection and suppression systems to the RCFD and to pay the fire department's usual and customary fee for those reviews.

Lastly, in order to protect workers from potential exposure to Valley Fever, staff proposes Condition of Certification **WORKER SAFETY-8** which requires enhanced dust control measures.

INTRODUCTION

Worker safety and fire protection is regulated through laws, ordinances, regulations, and standards (LORS), at the federal, state, and local levels. Industrial workers at the facility operate equipment and handle hazardous materials daily and may face hazards that can result in accidents and serious injury. Protection measures are employed to eliminate or reduce these hazards or to minimize the risk through special training, protective equipment, and procedural controls.

The purpose of this Preliminary Staff Assessment (PSA) is to assess the worker safety and fire protection measures proposed by the PSEGS and to determine whether the project owner has proposed adequate measures to:

- comply with applicable safety LORS;

- protect the workers during construction and operation of the facility;
- protect against fire; and
- Provide adequate emergency response procedures.

METHODOLOGY AND THRESHOLDS FOR DETERMINING ENVIRONMENTAL CONSEQUENCES

Two issues are assessed in **Worker Safety and Fire Protection**:

- the potential for impacts on the safety of workers during demolition, construction, and operations activities, and
- Fire prevention/protection, emergency medical response, and hazardous materials spill response during demolition, construction, and operations.

Worker safety issues are thoroughly addressed by the California Department of Occupational Safety and Health (Cal/OSHA) regulations. If all LORS are followed, workers will be adequately protected. Thus, the standard for staff's review and determination of significant impacts on workers is whether or not the project owner has demonstrated adequate knowledge about and dedication to implementing all pertinent and relevant Cal/OSHA standards.

Regarding fire prevention matters, staff reviews and evaluates the on-site fire-fighting systems proposed by the project owner and the time needed for off-site local fire departments to respond to a fire, medical, or hazardous material emergency at the proposed power plant site. If on-site systems do not follow established codes and industry standards, staff recommends additional measures. Staff reviews and evaluates the local fire department capabilities and response time in each area and interviews the local fire officials to determine if they feel adequately trained, manned, and equipped to respond to the needs of a power plant. Staff then determines if the presence of the power plant would cause a significant impact on a local fire department. If it does, staff will recommend that the project owner mitigate this impact by providing increased resources to the fire department.

Staff has also established a procedure when a local fire department has identified either a significant incremental project impact to the local agency or a significant incremental cumulative impact to a local agency. Staff first conducts an initial review of the position and either agrees or disagrees with the fire department's determination that a significant impact would exist if the proposed power plant is built and operated. A process then starts whereby the project owner can either accept the determination made by staff or refute the determination by providing a Fire Needs Assessment and a Risk Assessment. The Fire Needs Assessment would address fire response and equipment/staffing/location needs while the Risk Assessment would be used to establish that while an impact to the fire department may indeed exist, the risk (chances) of that impact occurring and causing injury or death is less than significant.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

Worker Safety and Fire Protection Table 1
Laws, Ordinances, Regulations, and Standards (LORS)

Applicable LORS	Description
Federal	
Title 29 U.S. Code (USC) section 651 et seq (Occupational Safety and Health Act of 1970)	This act mandates safety requirements in the workplace with the purpose of "[assuring] so far as possible every working man and woman in the nation safe and healthful working conditions and to preserve our human resources" (29 USC §651).
Title 29 Code of Federal Regulation (CFR) sections 1910.1 to 1910.1500 (Occupational Safety and Health Administration Safety and Health Regulations)	These sections define the procedures for promulgating regulations and conducting inspections to implement and enforce safety and health procedures to protect workers, particularly in the industrial sector.
29 CFR sections 1952.170 to 1952.175	These sections provide federal approval of California's plan for enforcement of its own Safety and Health requirements, in lieu of most of the federal requirements found in 29 CFR sections 1910.1 to 1910.1500.
State	
Title 8 California Code of Regulations (Cal Code Regs.) all applicable sections (Cal/OSHA regulations)	These sections require that all employers follow these regulations as they pertain to the work involved. This includes regulations pertaining to safety matters during construction, commissioning, and operations of power plants, as well as safety around electrical components, fire safety, and hazardous materials use, storage, and handling.
24 Cal Code Regs. section 3, et seq.	This section incorporates the current addition of the Uniform Building Code.
Health and Safety Code section 25500, et seq.	This section presents Risk Management Plan requirements for threshold quantity of listed acutely hazardous materials at a facility.
Health and Safety Code sections 25500 to 25541	These sections require a Hazardous Material Business Plan detailing emergency response plans for hazardous materials emergency at a facility.
Local (or locally enforced)	
Riverside County Ordinance 457	Adopts specific building, mechanical, plumbing, and electrical codes from sources such as the California Building Standards Commission with county-specific modifications.
Riverside County Ordinance 787.6	Adopts the 2010 edition of the California Fire Code and portions of the 2010 edition of the California Building Code with county-specific modifications.
Riverside County Ordinance 615	Establishes requirements for the use, generation, storage and disposal of hazardous materials within the County.
Riverside County Department of Environmental Health, Hazardous Materials Releases	Adopts State requirements and guidelines to govern hazardous materials release response plans and inventories.
NFPA 850	This industry standard of the National Fire Protection Association (NFPA) address fire protection at electrical generating stations.
Chapter 22 of the 2010 California Fire Code	This section of the CFC addresses requirement for Motor Fuel-Dispensing Facilities and Repair Garages. It has been adopted by Riverside County and will apply to the fuel depot at the site.

Applicable LORS	Description
NFPA 30a	This is the NFPA code for Motor Fuel Dispensing Facilities and Repair Garages (2008Edition) and is the industry standard for fuel depots.

PROPOSED MODIFIED PROJECT

On December 17, 2012, Palen Solar Holdings, LLC (PSH) filed a petition with the Energy Commission requesting to modify the Palen Solar Power Project (PSPP) now called PSEGS. The major modification is replacing the parabolic trough solar collection system using heat transfer fluid with Bright Source's solar tower technology. Heliostats—elevated mirrors guided by a tracking system mounted on a pylon—focus the sun's rays on a solar receiver steam generator located atop a 750-foot tower near the center of each solar field to create steam to drive a turbine that generates electricity.

Two adjacent solar fields producing 250 MW each are proposed for a combined nominal output of approximately 500 MW. Each of the 250 MW solar fields would have a dedicated tower, solar field/heliostat array of approximately 85,000 heliostats, and a dedicated steam turbine generator/power block. Both solar fields would share common facilities, including a common area containing an administration building, warehouse, evaporation ponds, maintenance complex, a meter/valve station for incoming natural gas service to the site, an onsite switchyard, and a 10-mile single-circuit 230-kV generation tie-line. Other onsite facilities would include access and maintenance roads (either dirt, gravel, or paved), perimeter fencing, tortoise fencing, and other ancillary security facilities.

SETTING AND EXISTING CONDITIONS

The proposed facility would be located in Riverside County off Interstate 10 approximately 10 miles east of Desert Center, and would consist of two units producing a total output of 500 MW. Fire support services to the site would be under the jurisdiction of the Riverside County Fire Department (RCFD). The closest RCFD fire station to the project site is the Lake Tamarisk Station #49 located at 43880 Lake Tamarisk in Desert Center, about 13 miles from the project. The estimated response time is 14 minutes once dispatched. The next nearest station would be the Blythe Air Base Station #45 located about 40 miles east, with a response time of about 30 minutes once dispatched. The fire station in Indio (Terra Lago Station #87 located at 42900 Golf Center Parkway, about 59 miles west of the PSEGS) would also respond if necessary, with a response time of 45 minutes once dispatched. All RCFD fire stations are staffed full-time with a minimum of three personnel per shift which include paramedics (Solar Millennium 2009a, Section 5.11.2.6 and RCFD 2010a).

The project owner has stated that designated plant personnel would be trained as a hazardous materials response team and that one or more spill response kits would be available on-site (Solar Millennium 2009a, Section 5.6.4.2). In the event of a large incident involving hazardous materials, backup support would be provided by the RCFD, which has a hazmat response unit that is capable of responding to any incident at the proposed PSEGS. The RCFD hazmat unit is located in Palm Desert (about 70 miles away) and would respond within 1.5 to 2 hours (RCFD 2010a).

Worker Safety and Fire Protection Table 2
Fire and Emergency Response for the PSEGS

RCFD Station	Response Time[1]	Distance to PSEGS	EMS/HazMat Capability[2]
Lake Tamarisk Station #49	14 minutes	~13 miles	Y/Y
Blythe Air Base Station #45	30 minutes	~40 miles	Y/Y
Terra Lago Station #87	45 minutes	~59 miles	Y/Y

Notes:
1 - Response times are estimated from the moment of dispatch.
2 - All personnel are trained to EMT-1 level and first responder for hazardous materials incidents.
Source: E-mail communications with the RCFD (RCFD 2010a)

In addition to construction and operations worker safety issues, the potential exists for exposure to contaminated soil during site preparation. 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 (Solar Millennium 2009a, Section 5.16.2.3). However, staff has asked for an additional site assessment and thus this matter will be address in the FSA. To address the unlikely possibility that soil contamination would be encountered during construction of the PSEGS, proposed Conditions of Certification **WASTE-2** and **WASTE-3** require a registered professional engineer or geologist to be available during soil excavation and grading to ensure proper handling and disposal of contaminated soil. See the staff assessment section on **WASTE MANAGEMENT** for a more detailed analysis of this topic.

Another potential hazard present at this site is the likelihood of encountering unexploded ordinance (UXOs) left over from large scale military training exercises conducted along what is now the route of Interstate 10 between 1942 and 1945 and in 1964. During WW-II, the area served as part of General George S. Patton's Desert Training Center (DTC), the largest military facility in the world. As a result of these historic military maneuvers, there is a potential for unexploded ordnance (UXO) to occur at this site. Please see **WASTE MANAGEMENT** for further discussion of this issue. With implementation of **WASTE-1**, staff concludes that any potential impact to workers from UXO would be reduced to less than significant.

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

WORKER SAFETY

Industrial environments are potentially dangerous during construction and operation of facilities. Workers at the proposed PSEGS would be exposed to loud noises, moving equipment, trenches, and confined space entry and egress problems. The workers may experience falls, trips, burns, lacerations, and numerous other injuries. They have the potential to be exposed to falling equipment or structures, chemical spills, hazardous waste, fires, explosions, and electrical sparks and electrocution. It is important for the PSEGS to have well-defined policies and procedures, training, and hazard recognition and control at its facility to minimize such hazards and protect workers. If the facility complies with all LORS, workers will be adequately protected from health and safety hazards.

A Safety and Health Program would be prepared by the project owner to minimize worker hazards during construction and operation. Staff uses the phrase “Safety and Health Program” to refer to the measures that would be taken to ensure compliance with the applicable LORS during the construction and operational phases of the project.

Construction Safety and Health Program

Workers at the PSEGS would be exposed to hazards typical of construction and operation of a solar thermal electric power generating facility.

Construction Safety Orders are published at Title 8 California Code of Regulations sections 1502, et seq. These requirements are promulgated by Cal/OSHA and would be applicable to the construction phase of the project. The Construction Safety and Health Program would include the following:

- Construction Injury and Illness Prevention Program (8 Cal Code Regs. §1509)
- Construction Fire Prevention Plan (8 Cal Code Regs. §1920)
- Personal Protective Equipment Program (8 Cal Code Regs. §§1514-1522)
- Emergency Action Program and Plan

Additional programs under General Industry Safety Orders (8 Cal Code Regs. §§3200 to 6184), Electrical Safety Orders (8 Cal Code Regs. §§2299 to 2974) and Unfired Pressure Vessel Safety Orders (8 Cal Code Regs. §§450 to 544) would include:

- Electrical Safety Program
- Motor Vehicle and Heavy Equipment Safety Program
- Forklift Operation Program
- Excavation/Trenching Program
- Fall Protection Program
- Scaffolding/Ladder Safety Program
- Articulating Boom Platforms Program
- Crane and Material Handling Program
- Housekeeping and Material Handling and Storage Program
- Respiratory Protection Program
- Employee Exposure Monitoring Program
- Hand and Portable Power Tool Safety Program
- Hearing Conservation Program
- Back Injury Prevention Program
- Ergonomics Program

- Heat and Cold Stress Monitoring and Control Program
- Hazard Communication Program
- Lock Out/Tag Out Safety Program
- Pressure Vessel and Pipeline Safety Program
- Solar Components Safe Handling Program

The Application for Certification (AFC) includes adequate outlines of each of the above programs (Solar Millennium 2009a, Section 5.18.3.1). Prior to the start of construction of PSEGS, detailed programs and plans would be provided to the Energy Commission Compliance Project Manager (CPM) and to the RCFD pursuant to the Condition of Certification **WORKER SAFETY-1**.

Operations and Maintenance Safety and Health Program

Prior to the start of operations at PSEGS, the Operations and Maintenance Safety and Health Program would be prepared. This operational safety program would include the following programs and plans:

- Injury and Illness Prevention Program (8 Cal Code Regs. §3203)
- Fire Protection and Prevention Program (8 Cal Code Regs. §3221)
- Personal Protective Equipment Program (8 Cal Code Regs. §§3401 to 3411)
- Emergency Action Plan (8 Cal Code Regs. §3220)

In addition, the requirements under General Industry Safety Orders (8 Cal Code Regs. §§3200 to 6184), Electrical Safety Orders (8 Cal Code Regs. §§2299 to 2974) and Unfired Pressure Vessel Safety Orders (8 Cal Code Regs. §§450 to 544) would be applicable to the project. Written safety programs for PSEGS, which the project owner would develop, would ensure compliance with the above-mentioned requirements.

The AFC includes adequate outlines of the Injury and Illness Prevention Program, Emergency Action Plan, Fire Prevention Program, and Personal Protective Equipment Program (Solar Millennium 2009a, Section 5.18.3). These outlines are still applicable to PSEGS Prior to operation of PSEGS, all detailed programs and plans would be provided to the CPM and RCFD pursuant to Condition of Certification **WORKER SAFETY-2**.

Safety and Health Program Elements

As mentioned above, the project owner provided the proposed outlines for both a Construction Safety and Health Program and an Operations Safety and Health Program. The measures in these plans are derived from applicable sections of state and federal law. Both safety and health programs would be comprised of six more specific programs and would require major items detailed in the following paragraphs.

Injury and Illness Prevention Program

The IIPP would include the following components as presented in the AFC and are still applicable to PSEGS (Solar Millennium 2009a, Section 5.18.3.1):

- identity of person(s) with authority and responsibility for implementing the program;
- safety and health policy of the plan;
- definition of work rules and safe work practices for construction activities;
- system for ensuring that employees comply with safe and healthy work practices;
- system for facilitating employer-employee communications;
- procedures for identifying and evaluating workplace hazards and developing necessary program(s);
- methods for correcting unhealthy/unsafe conditions in a timely manner;
- safety procedures; and
- Training and instruction.

Fire Prevention Plan

California Code of Regulations requires an Operations Fire Prevention Plan (8 Cal Code Regs. §3221). The AFC outlines a proposed Fire Prevention Plan which is acceptable to staff for the PSEGS project (Solar Millennium 2009a, Section 5.18.3.2). The plan would accomplish the following:

- determine general program requirements (scope, purpose, and applicability);
- determine potential fire hazards;
- develop good housekeeping practices and proper handling and materials storage;
- determine potential ignition sources and control measures for these sources;
- determine persons responsible for equipment and system maintenance;
- locate portable and fixed fire-fighting equipment in suitable areas;
- establish and determine training and instruction requirements; and
- define recordkeeping requirements.

Under the existing license for the project, the project owner is required to submit a final Fire Prevention Plan to the CPM for review and approval and to the RCFD for review and comment to satisfy Conditions of Certification **WORKER SAFETY-1** and **WORKER SAFETY-2**. Staff is recommending that the Best Management Practices for the storage and application of herbicides be removed from **WORKER SAFETY-2** because herbicides are not proposed to be used to control vegetation in the heliostat field, no other changes are being made to these two conditions.

Personal Protective Equipment Program

California regulations require Personal Protective Equipment (PPE) and first aid supplies whenever hazards are present that, due to process, environment, chemicals or mechanical irritants, can cause injury or impair bodily function as a result of absorption, inhalation, or physical contact (8 Cal Code Regs. §§ 3380 to 3400). The PSEGS operational environment would require PPE.

All safety equipment must meet National Institute of Safety and Health (NIOSH) or American National Standards Institute (ANSI) standards and would carry markings, numbers, or certificates of approval. Respirators must meet NIOSH and Cal/OSHA standards. Each employee must be provided with the following information pertaining to the protective clothing and equipment:

- proper use, maintenance, and storage;
- when to use the protective clothing and equipment;
- benefits and limitations; and
- when and how to replace the protective clothing and equipment.

The PPE Program ensures that employers comply with the applicable requirements for PPE and provides employees with the information and training necessary to protect them from potential workplace hazards.

Emergency Action Plan

California regulations require an Emergency Action Plan (8 Cal Code Regs. §3220). The AFC contains a satisfactory outline for an emergency action plan (Solar Millennium 2009a, Section 5.18.3.2).

The outline lists plans to accomplish the following:

- establish scope, purpose, and applicability;
- identify roles and responsibilities;
- determine emergency incident response training;
- develop emergency response protocols;
- specify evacuation protocols;
- define post emergency response protocols; and
- determine notification and incident reporting.

Written Safety Program

In addition to the specific plans listed above, additional LORS called *safe work practices* apply to the project. Both the Construction and the Operations Safety Programs would address safe work practices under a variety of programs. The components of these programs include, but are not limited to, the programs found under the heading “Construction Safety and Health Program” in this Worker Safety and Fire Protection section.

Safety Training Programs

Employees would be trained in the safe work practices described in the above-referenced safety programs.

Additional Safety Issues

This solar power plant will present a unique work environment that includes a solar field located in the high desert. The solar field features thousands of mirrors that will focus intense solar flux on the top of a 750-foot tower. Workers will inspect the solar array for broken mirrors at least once each day by driving up and down dirt paths between the rows of mirrors and even under the mirrors thus generating dust. Cleaning the mirrors will also be conducted on a routine schedule. All these activities will take place year-round and especially during the summer months of peak solar power generation, when outside ambient temperatures routinely reach 115°F and above.

The project owner had indicated that workers will be adequately trained and protected, but did not included precautions against heat stress. However, the existing Conditions of Certification **WORKER SAFETY-1** and **-2** include a worker heat stress protection plan that implements and expands on existing Cal OSHA regulations (8 CCR 3395). Staff believes that effective implementation of a Heat Stress Protection Plan will mitigate the potential for significant risks to workers from heat during both construction and operations.

Additional Mitigation Measures

Protecting construction workers from injury and disease is among the greatest challenges in occupational safety and health. The following facts are reported by the National Institute for Occupational Safety and Health (NIOSH):

- More than 7 million persons work in the construction industry, representing 6 percent of the labor force. Approximately 1.5 million of these workers are self-employed.
- Of approximately 600,000 construction companies, 90 percent employ fewer than 20 workers. Few have formal safety and health programs.
- From 1980 to 1993, an average of 1,079 construction workers were killed on the job each year—more fatal injuries than in any other industry.
- Falls caused 3,859 construction worker fatalities (25.6 percent) between 1980 and 1993.
- Construction injuries account for 15 percent of workers' compensation costs.
- Assuring safety and health in construction is complex, involving short-term work sites, changing hazards, and multiple operations and crews working in close proximity.
- In 1990, Congress directed NIOSH to undertake research and training to reduce diseases and injuries among construction workers in the United States. Under this mandate, NIOSH funds both intramural and extramural research projects.

The hazards associated with the construction industry are thus well documented. These hazards increase in complexity in the multi-employer worksites typical of large, complex, industrial-type projects such as the construction of solar power plants. In order to reduce and/or eliminate these hazards, it has become standard industry practice to hire a Construction Safety Supervisor to ensure a safe and healthful environment for all personnel. That this standard practice has reduced and/or eliminated hazards has been evident in the audits staff recently conducted of power plants under construction. The federal Occupational Safety and Health Administration (OSHA) has also entered into strategic alliances with several professional and trade organizations to promote and recognize safety professionals trained as Construction Safety Supervisors, Construction Health and Safety Officers, and other professional designations. The goal of these partnerships is to encourage construction subcontractors in four areas:

- to improve their safety and health performance;
- to assist them in striving for the elimination of the four hazards (falls, electrical, caught in/between and struck-by hazards), which account for the majority of fatalities and injuries in this industry and have been the focus of targeted OSHA inspections;
- to prevent serious accidents in the construction industry through implementation of enhanced safety and health programs and increased employee training; and
- to recognize those subcontractors with exemplary safety and health programs.

To date, there are no OSHA or Cal/OSHA requirements that an employer hire or provide for a Construction Safety Officer. OSHA and Cal/OSHA regulations do, however, require that safety be provided by an employer and the term *Competent Person* is used in many OSHA and Cal/OSHA standards, documents, and directives. A Competent Person is usually defined by OSHA as an individual who, by way of training and/or experience, is knowledgeable of standards, is capable of identifying workplace hazards relating to the specific operations, is designated by the employer, and has authority to take appropriate action. Condition of Certification **WORKER SAFETY-3** requires that the project owner to designate and provide for a power plant site Construction Safety Supervisor which serves as the Competent Person as required by OSHA and Cal/OSHA. Staff does not propose any changes to this condition.

As discussed above, the hazards associated with the construction industry are well documented. These hazards increase in complexity in the multi-employer worksites typical of large, complex, industrial-type projects such as the construction of solar power plants.

Accidents, fires, and a worker death have occurred at Energy Commission-certified power plants in the past due to the failure to recognize and control safety hazards and the inability to adequately supervise compliance with occupational safety and health regulations. Safety problems have been documented by Energy Commission staff in safety audits conducted in 2005 at several power plants under construction. The findings of the audit staff include, but are not limited to, such safety oversights as:

- lack of posted confined space warning placards/signs;
- confusing and/or inadequate electrical and machinery lockout/tagout permitting and procedures;
- confusing and/or inappropriate procedures for handing over lockout/tagout and confined space permits from the construction team to commissioning team and then to operations;
- dangerous placement of hydraulic elevated platforms under each other;

- inappropriate placement of fire extinguishers near hotwork;
- dangerous placement of numerous power cords in standing water on the site, thus increasing the risk of electrocution;
- construction of an unsafe aqueous ammonia unloading pad;
- inappropriate and unsecure placement of above-ground natural gas pipelines inside the facility but too close to the perimeter fence; and
- lack of adequate employee- or contractor-written training programs addressing proper procedures to follow in the event of finding suspicious packages or objects either on or off site.

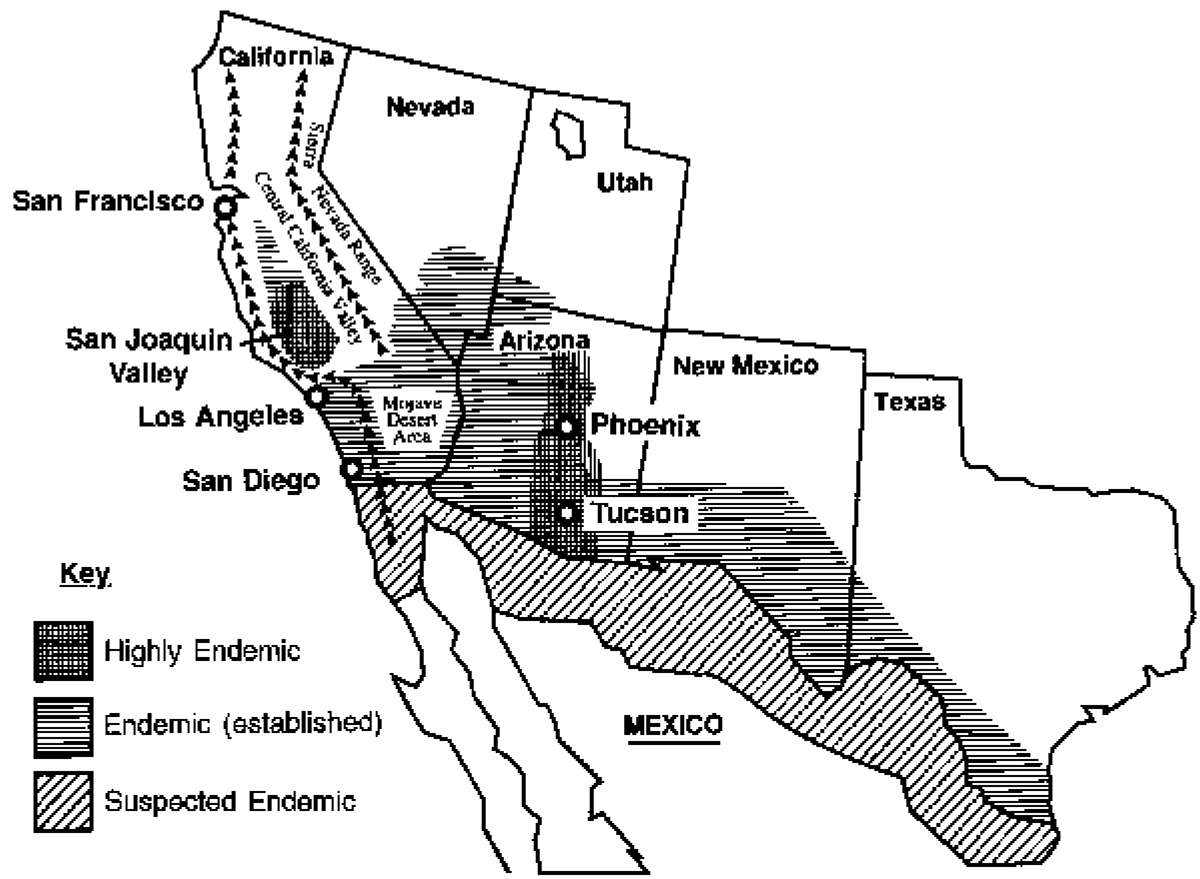
In order to reduce and/or eliminate these hazards, it is necessary for the Energy Commission to have a professional Safety Monitor on site to track compliance with Cal/OSHA regulations and periodically audit safety compliance during construction, commissioning, and the hand-over to operational status. These requirements are outlined in existing Condition of Certification **WORKER SAFETY-4**. A Safety Monitor, hired by the project owner, yet reporting to the Chief Building Official (CBO) and CPM, will serve as an “extra set of eyes” to ensure that safety procedures and practices are fully implemented at all power plants certified by the Energy Commission. During the audits conducted by staff, most site safety professionals welcomed the audit team and actively engaged it in questions about the team’s findings and recommendations. These safety professionals recognized that safety requires continuous vigilance and that the presence of an independent audit team provided a fresh perspective of the site. Staff does not propose any changes to **WORKER SAFETY-4**.

Valley Fever (Coccidioidomycosis)

Coccidioidomycosis or "Valley Fever" (VF) is primarily encountered in southwestern states, particularly in Arizona and California. It is caused by inhaling the spores of the fungus Coccidioides immitis, which are released from the soil during soil disturbance (e.g., during construction activities) or wind erosion. The disease usually affects the lungs and can have potentially severe consequences, especially in at-risk individuals such as the elderly, pregnant women, and people with compromised immune systems. Trenching, excavation, and construction workers are often the most exposed population. Treatment usually includes rest and antifungal medications. No effective vaccine currently exists for Valley Fever. VF is endemic to the San Joaquin Valley in California, which presumably gave this disease its common name. In California, the highest VF rates are recorded in Kern, Kings, and Tulare Counties, followed by Fresno and San Luis Obispo Counties. LA County, San Diego County, San Bernardino County, and Riverside County also have reported VF cases although much fewer.

A February 2013 outbreak of Valley Fever affecting at least 28 workers at a photovoltaic solar plant in eastern San Luis Obispo County, along with an increase in inmates at two San Joaquin Valley prisons coming down with the disease, has sparked renewed interest and concern. (The California Department of Public Health, Cal-OSHA, and San Luis Obispo County are investigating that outbreak.) The Centers for Disease Control and Prevention says the total number of Valley Fever cases nationwide rose by nearly 900 percent from 1998 to 2011. Researchers don't have a good explanation for the dramatic increase even when accounting for growing populations throughout the Southwest, although when soil is dry and it is windy, more spores are likely to become airborne in endemic areas, according to Dr. Gil Chavez, Deputy Director of the Center for Infectious Diseases at the California Department of Public Health.

Worker Safety and Fire Protection Figure 1
Geographic Distribution of Coccidioidomycosis*



*Source: CDC 2006, Figure 2

A 2004 CDC report found that the number of reported cases of coccidioidomycosis in the US increased by 32 percent during 2003-2004, with the majority of these cases occurring in California and Arizona. The report attributed these increases to changes in land use, demographics, and climate in endemic areas, although certain cases might be attributable to increased physician awareness and testing (CDC 2006). According to the CDC Morbidity and Mortality Weekly Report of February 2009, incidences of valley fever have increased steadily in Arizona and California in the past decade. Cases of coccidioidomycosis averaged about 2.5 per 100,000 population annually from 1995 to 2000 and increased to 8.0 per 100,000 population between 2000 and 2006 (incident rates tripled). In 2007 there was a slight drop in cases, but the rate was still the highest it has been since 1995. The report identified Kern County as having the highest incidence rates (150.0 cases per 100,000 population), and non-Hispanic blacks having the highest hospitalization rates (7.5 per 100,000 population). In addition, between the years 2000 and 2006, the number of valley fever related hospitalizations climbed from

1.8 to 4.3 per 100,000 population (611 cases in 2000 to 1,587 cases in 2006) and then decreased to 1,368 cases in 2007 (3.6 per 100,000 population). Overall in California, during 2000-2007, a total of 752 (8.7percent) of the 8,657 persons hospitalized for coccidioidomycosis died (CDC 2009).

A 2007 study published in the Emerging Infectious Diseases journal of the Center for Disease Control and Prevention (CDC), found the frequency of hospitalization for coccidioidomycosis in the entire state of California to be 3.7 per 100,000 residents per year for the period between 1997 and 2002 (see Table 1 below). There were 417 deaths from VF in California in those years, resulting in a mortality rate of 2.1 per 1 million California residents annually.

Worker Safety and Fire Protection Table 3
Hospitalizations for Coccidioidomycosis, California, 1997–2002

Category	Total Hospitalizations	Total Person-Years ($x10^6$)	Frequency of Hospitalization[1]	Frequency of Hospitalization for Coccidiodal Meningitis[1]
Year				
1997	1,269	32.5	3.90	0.706
1998	1,144	32.9	3.50	0.706
1999	1,167	33.4	3.5	0.61
2000	1,100	34.0	3.23	0.62
2001	1,291	34.7	3.7	0.58
2002	1,486	35.3	4.2	0.71
Totals	7,457	203.0	3.67	0.657
Highest-Incidence Counties				
Kern	1,700	3.97	42.8	
Tulare	479	2.21	21.7	
Kings	133	0.77	17.4	
San Luis Obispo	170	1.48	11.5	

Notes:
1 - Per 100,000 residents per year
Source: Flaherman 2007

Riverside County has approximately 50 cases of VF per year (population is roughly 2 million) while nearby San Diego County has about 120 cases per year (population roughly 3 million). In comparison, an average of over 1,000 cases have been reported annually in Kern County during the last five years. Cases of VF in Riverside County have remained steady in the past several years, fluctuating only slightly between 48 and 55 cases per year. Nine deaths related to VF have been reported in Riverside County between 2005 and 2008 (Williams 2009). A rate of 50 cases per year per 2,000,000 persons corresponds to a risk of about 25 in 1 million and a rate of 2.5 cases per 100,000 persons, which is lower than the average rate for the entire state of California (~3.6 cases per 100,000 residents). Data received from the Riverside County Department of Public Health indicates that the crude VF rate in Riverside County between 1999 and

2006 has been even lower, about 15 per 100,000 residents. The region in which the PSEGS project would be located (between Blythe and Desert Center) has recorded 5 or fewer cases between 1999 and 2006 (RCDPH 2007).

Worker Safety and Fire Protection Table 4
Valley Fever Rates in Riverside County

County of Riverside **Reported Cases: Coccidioidomycosis (Valley Fever)** **Years 1999-2006, by Zip Code of Residence[1]**			
Zip Code	**PO Name**	**8-Year Total**	**8-Year Estimated Crude Aggregate Rate (per 10,000)**
92236	Coachella	5	1.7
92225	Blythe	5	2.8
92883	Corona	5	2.6
92591	Temecula	5	1.5
92201	Indio	6	1.0
92505	Riverside	6	1.4
92544	Hemet	7	1.6
92530	Lake Elsinore	7	1.4
92506	Riverside	7	1.5
92879	Corona	8	1.6
92507	Riverside	10	1.9
92583	San Jacinto	10	4.0
92570	Perris	11	2.5
92220	Banning	12	3.8
92586	Sun City	12	6.2
92509	Riverside	13	1.8
92504	Riverside	21	4.0
92503	Riverside	32	4.1
TOTAL	ALL COUNTY	280	1.5

Notes:
1 - Only zip codes for which more than 4 cases were recorded during the 8-year period are included
Source: DHS: AVSS CMR reporting
Compiled: Riverside County Department of Public Health, Epidemiology and Program Evaluation, Kevin Meconis, Epidemiologist, 11/19/2007

A 1996 paper that tried to explain the sudden increase in Coccidioidomycosis cases that began in the early 1990’s found that the San Joaquin Valley in California has the largest population of C. immitis, which is found to be distributed unevenly in the soil and seems to be concentrated around animal burrows and ancient Indian burial sites. It is usually found 4 to 12 inches below the surface of the soil. The paper also reported that incidences of coccidioidomycosis vary with the seasons; with highest rates in late summer and early fall when the soil is dry and the crops are harvested. Dust storms are frequently followed by outbreaks of coccidioidomycosis (Kirkland 1996). A modeling attempt to establish the relationship between fluctuations in VF incident rates and weather conditions in Kern County found that there is only a weak connection between weather and VF cases (weather patterns correlate with up to 4percent of outbreaks).

The study concluded that the factors that cause fluctuations in VF cases are not weather-related but rather biological and anthropogenic (i.e. human activities, primarily construction on previously undisturbed soil) (Talamantes 2007).

During correspondence with Dr. Michael MacLean of the Kings County Health Department, he noted that according to his experience and of those who study VF, it is very hard to find the fungus in soil that was previously farmed and irrigated, which greatly reduces the risk of infection resulting from disturbance of farmed lands. This does not apply to previously undisturbed lands where excavation, grading, and construction may correlate with increases in VF cases. Dr. MacLean feels that with the current state of knowledge, we can only speculate on the causes and trends influencing VF cases and he does not feel that construction activities are necessarily the cause of VF outbreaks (KCEHS 2009).

Valley Fever is spread through the air. If soil containing the fungus is disturbed by construction, natural disasters, or wind, the fungal spores get into the air where people can breathe in the spores. The disease is not spread from person to person. Occupational or recreational exposure to dust is an important consideration. Agricultural workers, construction workers, or others (such as archeologists) who dig in the soil in the disease-endemic area of the Central Valley are at the highest risk for the disease (CDC 2006; CDHS 2010). The risk for disseminated coccidioidomycosis is much higher among some ethnic groups, particularly African-Americans and Filipinos. In these ethnic groups, the risk for disseminated coccidioidomycosis is tenfold that of the general population (CDC 2006).

Worker Safety and Fire Protection Table 5
Disease Forms of Valley Fever

Categories	**Notes**
Asymptomatic	• Occurs in about 50 percent of patients
Acute Symptomatic	• Pulmonary syndrome that combines cough, chest pain, shortness of breath, fever, and fatigue. • Diffuse pneumonia affects immunosuppressed individuals • Skin manifestations include fine papular rash, erythema nodosum, and erythema multiforme • Occasional migratory arthralgias and fever
Chronic Pulmonary	• Affects between 5 to 10% of infected individuals • Usually presents as pulmonary nodules or peripheral thin-walled cavities
Extrapulmonary/Disseminated Varieties	
Chronic skin disease	• Keratotic and verrucose ulcers or subcutaneous fluctuant abscesses
Joints / Bones	• Severe synovitis and effusion that may affect knees, wrists, feet, ankles, and/or pelvis • Lytic lesions commonly affecting the axial skeleton

Categories	Notes
Meningeal Disease	• The most feared complication • Presenting with classic meningeal symptoms and signs • Hydrocephalus is a frequent complication
Others	• May affect virtually any organ, including thyroid, GI tract, adrenal glands, genitourinary tract, pericardium, peritoneum

FIRE HAZARDS

During construction and operation of the proposed PSEGS project, there is the potential for both small fires and major structural fires. Electrical sparks, combustion of fuel oil, hydraulic fluid, mineral oil, insulating fluid at the power plant switchyard or flammable liquids, explosions, and over-heated equipment, may cause small fires. Major structural fires in areas without automatic fire detection and suppression systems are unlikely to develop at power plants. Compliance with all LORS and providing mitigation to the RCFD would be adequate to assure protection from all fire hazards.

Staff reviewed the information provided in the AFC and spoke to representatives of the RCFD to determine if available fire protection services and equipment would adequately protect workers and to determine the project's impact on fire protection services in the area. The PSEGS will rely on both on-site fire protection systems and local fire protection services. The on-site fire protection system provides the first line of defense for small fires. The on-site system for the power blocks and common area are the same regardless of the type of solar generating system used (parabolic trough or tower). In the event of a major fire, fire support services, including trained firefighters and equipment for a sustained response, would be provided by the RCFD (RCFD 2010a).

Construction

During construction, the permanent fire protection systems proposed for the PSEGS would be installed as soon as practical; until then portable fire extinguishers would be placed throughout the site at appropriate intervals and periodically maintained. Safety procedures and training would be implemented according to the guidelines of the Construction Fire Protection and Prevention Plan (Solar Millennium 2009a, Section 5.18.3.1).

The project owner has also indicated that it intends to construct and operate a concrete batch plant and an above-ground fuel depot on the site during construction. The fuel depot (which may remain in service during operations) will contain a maximum of 20,000 gallons of diesel fuel and 500 gallons of gasoline (Galati & Blek2010i, Revised Project Description).The concrete batch plant will be required to have additional fire detection and suppression systems that will be reviewed and evaluated by the Riverside County Fire Marshall and the Energy Commission CPM.

The fire protection measures that are required by code for the fuel depot and dispensing facility include:

- Chapter 22 of the 2007 California Fire Code: Motor Fuel-Dispensing Facilities and Repair Garages (formally adopted by Riverside County)

- NFPA 30a: Code for Motor Fuel Dispensing Facilities and Repair Garages (2008Edition)

Applicable sections of the 2007 Ca Fire Code and NFPA 30a are very similar; however NFPA 30a contains more details for fuel tank design specifications and other requirements. The requirements listed in these codes include the materials to be used to construct fuel tanks, location of dispensing devices, spacing from other structures, fencing, physical protective barriers, shut-off valves, emergency relief venting, secondary containment, vapor and liquid detection systems with alarms, and other general design requirements.

NFPA 30a requires the following:

- 7.3.5 Fixed Fire Protection.
- 7.3.5.1 For an unattended, self-serve, motor fuel dispensing facility, additional fire protection shall be provided where required by the *authority having jurisdiction.(italics added)*
- 7.3.5.2 Where required, an automatic fire suppression system shall be installed in accordance with the appropriate NFPA standard, manufacturers' instructions, and the listing requirements of the systems.
- 9.2.5 Basic Fire Control.
- 9.2.5.1 Sources of Ignition. Smoking materials, including matches and lighters, shall not be used within 6m (20 ft) of areas used for fueling, servicing fuel systems…
- 9.2.5.2 Fire Extinguishers. Each motor fuel dispensing facility or repair garage shall be provided with fire extinguishers installed, inspected, and maintained as required by NFPA 10, *Standard for Portable Fire Extinguishers.* Extinguishers for outside motor fuel dispending areas shall be provided according to the extra (high) hazard requirements for Class B hazards, except that the maximum travel distance to an 80 B:C extinguisher shall be permitted to be 30.48m (100 feet).
- 9.2.5.3 Fire Suppression Systems. Where required, automatic fire suppression systems shall be installed in accordance with appropriate NFPA standard, manufacturer's instructions, and the listing requirements of the systems.

The authority having jurisdiction is the Energy Commission and the RCFD which will review and comment on the fire detection and suppression plans for the fuel depot before it is built and operated.

The only fire protection measure explicitly listed in the CA Fire Code is a requirement for fire extinguishers to be located within 75 feet of the fuel dispensing equipment. Neither the CFC nor the Riverside County codes require sprinkler systems for fuel dispensing facilities. Section 2203.2 of the CFC requires an approved, clearly identified and readily accessible emergency disconnect switch at an approved location to stop the transfer of fuel to the fuel dispensers in the event of a fuel spill or other emergency. Section 2205.3 requires spill control to prevent liquids spilled during dispensing operations from flowing into buildings and section 2206.5 requires that above-ground tanks be provided with secondary containment in the form of drainage control or placement of berms or dikes in accordance with Chapter 34. The project owner has proposed to install secondary containment.

Staff has assessed the proposed concrete batch plant and fuel depot and has determined that the project owner intends to meet all codes and standards in their operations of the batch plant and fuel depot. Proposed Condition of Certification Worker Safety-1 would require the RCFD to review and the CPM to review and approve the fire protection systems for the fuel depot.

Operation

The information in the AFC indicates that the project intends to meet the fire protection and suppression requirements of the 2007 California Fire Code, all applicable recommended NFPA standards (including Standard 850 addressing fire protection at electric generating plants), and all Cal/OSHA requirements, with the exception of providing a secondary access road and gate for emergency response vehicles. The proposed PSEGS has only one access point, that being through the main gate (via a new paved access road from an I-10 interchange), and the AFC and the Petition to Amend make no mention of needing a secondary access road to the site or another access gate through the perimeter fence (Solar Millennium 2009a, Section 2.5.6.5, Palen 2012a). Indeed, the Petition requests that the requirement for a second access road found in existing Condition **WORKER SAFETY-6** be removed. Both the California Fire Code (24 CCR Part 9, chapter 5, section 503.1.2) and the Uniform Fire Code (sections 901 and 902) require that access to the site be reviewed and approved by the fire department, and the RCFD stated that a second road and gate for fire and emergency responders is required for this site (RCFD 2010b).

Staff originally recommended, that a second access road and access gate was necessary to ensure fire department and other emergency response access should the main road or main gate be blocked. Additionally, the fire department may wish to suppress a fire from multiple sides and access to another part of the site would be needed. A second access road and gate is a standard requirement of the California Fire Code and NFPA codes and existing Condition **WORKER SAFETY-6** requires such a road.

However, there are several site-specific reasons why staff is not now recommending a second emergency access road but is instead recommending at least two emergency access gates (one each on the north fence line and the south fence line) but not an access road.

First, the removal of heat transfer fluid (HTF) and propane from the proposed modified project lowers the fire risk significantly. And although the need for rescue and high-structure fire fighting has been significantly elevated with the proposed towers in the modified project, the need to obtain access from different sides is greatly reduced. But just as important, various site-specific issues render the placement of a secondary access road problematical.

From a biological perspective, there are several constraints to be considered when siting the secondary access road. Desert tortoise critical habitat occurs north of the I-10 freeway, along the southwestern perimeter of the project site. Development within critical habitat is not desired, and can be costly given the 5:1 mitigation ratio.. Additionally, large vegetated ephemeral washes flow across the area likely to be impacted by a secondary access road. Development within washes disrupts natural processes, adversely impacting wildlife and the greater ecosystem by increasing sedimentation, increasing the number of nonnative plants, and destruction of rare microphyll vegetation within and along the washes, which recuperate very slowly under desert conditions. Impacts to desert dry wash woodland are typically mitigated at a 3:1 ratio. For any alignment chosen, thorough and time-consuming surveys of existing would need to be performed as per the following partial list:

- Jurisdictional Delineation (CDFG Code 1600)
- Protocol desert tortoise surveys
- General wildlife surveys
- General botanical surveys
- Rare plant surveys
- Burrowing owl surveys

In order to comply with the requirements of LORS, staff proposes modification to Condition of Certification **WORKER SAFETY-6** that would require the project owner to provide at least two secondary access gates for emergency vehicles to enter the site from around the perimeter in the event the main access road is blocked. There must be at least two access gates equipped with either a keypad or key for fire department and other emergency response personnel to open the gate. The RCFD, the California Highway Patrol, and the Riverside County Sheriff's Department shall be given access to these gates. In the event of an emergency that requires the RCFD to enter the site through these gates, the RCFD will be able to access the gate by using their two all-terrain fire engines that were purchased for them by the Genesis Solar Energy Project. PSEGS will be required by **WORKER SAFETY-6** to "buy-into" these specialized fire engines by paying one-half the costs (payable to Genesis) and one-half the annual operating/maintenance costs (payable to Genesis).

Fire suppression elements in the proposed plant would include both fixed and portable fire extinguishing systems. The fire water would be supplied from up to ten on-site wells and stored in two 800,000-gallon water storage tanks (one at each unit) with a dedicated fire protection supply of 600,000 gallons in each power block and 480,000 gallons in a storage tank in the common area (Palen 2012a). One primary electric and one diesel-fueled backup firewater pump would ensure water supply to each fire protection loop at a maximum flow of 5000 gpm (Palen 2012a).

Fire hydrants would be installed throughout the site per NFPA requirements and a sprinkler deluge system would be installed in areas of risk including each unit's transformer. A sprinkler system would be installed at the steam turbine generators (STGs), in the towers, and in administrative buildings (Palen 2012a). In addition to the fixed fire protection system, appropriate class of service portable extinguishers and fire hydrants/hose stations would be located throughout the facility at code-approved intervals.

According to NFPA standards and Uniform Fire Code (UFC) requirements, the fire protection system must have fire detection sensors and monitoring equipment that would trigger alarms and automatically actuate the suppression systems. Staff has determined that these systems will ensure adequate fire protection.

The project owner would be required by Conditions of Certification **WORKER SAFETY-1** and**-2** to provide the final Fire Protection and Prevention Program to staff and to the RCFD prior to construction and operation of the project to confirm the adequacy of the proposed fire protection measures.

Staff has considered the position of the RCFD and all relevant information as well as past experience at existing solar power plants that are similar to the proposed modified project. The proposed facility would be located in an area that is currently served by the RCFD. The fire, HazMat, rescue, inspection, and EMS needs at the proposed plant are real and would pose significant added demands on local fire protection services. In addition, staff concludes that the RCFD's Hazmat Response Team is not adequately equipped and staffed to respond to hazardous materials incidents at the proposed facility with an adequate response time. Staff concurs with the past and current assessment of the RCFD and has determined that the PSEGS would cause a significant direct and cumulative impact on the local fire department.

Staff concludes that the RCFD will have to provide some level of services and encumber significant time and funds in six areas:

1. Becoming familiar with and planning for emergency responses to a facility using a solar energy technology new to Riverside County.
2. Plan reviews, inspections, and permitting.
3. Fire response.
4. Hazmat spill response.
5. Rescue.
6. Emergency Medical Services (EMS).

Because there are no thermal solar power plants currently operating within the jurisdiction of the RCFD, staff reviewed incidents involving solar power plants in San Bernardino County, including the newly built segments of the Ivanpah facility. In summary, staff found that including emergency response for fire, rescue, medical and hazardous materials incidents, approximately 30 incidents occurred since 1998 that required the San Bernardino County Fire Department (and other fire stations through mutual aid agreements) to respond to four solar power plant sites currently operating within San Bernardino County. These included fires, fire alarm activations, injuries, medical emergencies, hazardous materials spills, complaints/calls from the public, and false alarms. However, the available records did not include documentation of a major fire at the SEGS 8 facility (80 MW) in January of 1990 that required a large part of the regional resources from four different fire districts including the San Bernardino County, Edwards Air Force Base, California Department of Forestry (now Cal Fire), and the Kern

County fire departments. This fire is the largest incident that has occurred at a solar thermal plant in California and demonstrates the magnitude of fire department resources that can be required to respond to a fire at a large thermal solar facility. The inability to quickly control this event had ramifications for the project's finances and reliability - it took almost two years to bring the SEGS 8 heaters back on-line and supplement the solar field generation – and resulted in a "draw-down" of emergency response resources in the northern part of San Bernardino County. A "draw-down" is when emergency response teams vacate an area to respond to an emergency, thus leaving that area without adequate fire and other emergency response services. This represents a very serious situation where the population and infrastructure is left vulnerable.

The proposed PSEGS is very different from the industrial, commercial, and residential development currently found in the Riverside County desert region. It is also different from the existing solar plants located at Harper Lake and Kramer Junction in San Bernardino County. The PSEGS would consist of two towers, 750-feet high that would be similar to the solar towers being built and presently under commissioning at the Ivanpah project. The towers would present a much greater challenge for rescue than the original, mostly ground-level, project and present a greater challenge to fight a fire at the high elevations of the tower.

Presently, the RCFD is not able to respond to fire, hazmat, rescue, and EMS emergencies in a timely manner at the PSEGS. The standard fire department response for a fire or for a hazmat spill includes response of six engines and at least three fire fighters on each engine. To fight a fire inside a structure, the RCFD must adhere to standard operating procedures and Cal-OSHA regulations that require "two in, two out". Thus, a response of three fire fighters from one station would not allow fire fighters to attack a fire from within a structure or conduct a rescue. Confined space and collapsed trench rescues would also be problematic with only three fire fighters. Therefore, no matter what size the fire or how many workers are initially in need of rescue, the RCFD would dispatch engines from at least three fire stations so that at a minimum, nine firefighters are sent to the scene but the RCFD could eventually dispatch a total of 9 engines. Even if mutual aid was available and an "automatic aid" pact was in effect, the RCFD would still have to respond to an emergency at the PSEGS site because it is the Authority Having Jurisdiction.

Additionally, it is very important to note that the PSEGS will be located in an extremely harsh desert environment. The ability of a fire fighter to perform duties while wearing a turn-out coat, heavy boots, and a respirator (self contained breathing apparatus) is limited under the best of circumstances. If conducting a rescue or fighting a fire that necessitates use of a respirator, the high-temperatures of the desert, often exceed 115° F, severely limits a fire fighter's ability to perform the duties to 15 minutes at a time. This severe time restriction necessitates the mobilization of more fire fighters to respond to the emergency.

Staff has also developed an Emergency Response Matrix that staff, the fire departments, and project owners may use to assess the level of emergency response need (CEC 2013). This analytical tool has a weighting scheme for the various categories of fire department response and utilizes professional judgment in the assignment of the “score” to the categories. Staff has tested this methodology on existing and planned solar power plants and concludes it to be useful but cautions against using it as the sole basis for determining need or for allocating financial responsibility for direct individual or cumulative impacts. Otherwise, staff recommends that the project owner prepare an independent fire needs assessment and a fire risk assessment for the Palen project to better assess impacts on emergency response services in the jurisdictions.

Staff’s analysis and determination of mitigation is based upon the following:

1. A revised Staff Emergency Response Matrix;
2. The recent events at the Ivanpah Solar Energy Project which utilizes solar tower technology;
3. The increased need for and difficulty of rescue in a tower;
4. The need for the RCFD to expend resources to become familiar with new technology within its jurisdiction;
5. The decreased fire risk due to the removal of HTF and propane from the project;
6. The decreased risk of explosion due to the removal of propane; and
7. Staff’s expertise and judgment.

Although the modified project will undoubtedly lower the risks of certain impacts, other risks would be raised. The original PSPP project is required to pay to the RCFD as mitigation of both direct and cumulative impacts a total of $12,100,000 over a 30-year project lifespan ($850,000 initially for capital improvements and $375,000 annually for operations and maintenance). This amount was determined by staff when considering the impacts of the three solar projects proposed for the I-10 corridor within Riverside County that included the Genesis project. Staff believes that when considering all the information available and then taking the ratio of the new scores obtained for the modified PSEGS (2.4) and the present Genesis project (2.8) when utilizing the revised Emergency Response Matrix and applying that ratio (0.86) to the $12,100,000 required by the Commission Decision, the result is a small reduction to ~$10,400,000 over thirty years and that would be the proper revised amount as mitigation to be paid by PSEGS.

Therefore, staff is modifying Condition of Certification **WORKER SAFETY- 7** for PSEGS to fund fire department capital improvements in the amount of $1,000,000 and to make an annual payment of $313,333 to mitigate both its individual impact on the fire department and its share of a cumulative impact on the fire department.

Alternatively, staff suggests that the PSEGS form and join a solar industry group or association that will provide membership to all solar power plants located within the jurisdiction of the RCFD or even across the greater California desert region to negotiate payment for their project-related shares of capital and operating costs to build and operate new fire protection/response infrastructure for these large, remote industrial facilities The group could ensure appropriate equipment and personnel as mitigation of project-related impacts on fire protection services on the most cost-effective basis. Staff proposes that the project owner be given this option to form and join a power generation industry association or group so that this association or group could negotiate payment for their project-related shares of RCFD capital and operating costs. The association would be able to raise funds, negotiate payment for emergency response services with the RCFD, and audit county and district fire department protection/emergency response expenditures to ensure that funds go towards associated emergency response needs. And, most importantly, develop and implement an appropriate fee structure for its members based on project characteristics (e.g., size, technology, chemical usage, or project location relative to emergency response infrastructure) and the re-payment of funds provided by its initial members upon the joining of new members. Staff urges the project owner and the Committee to consider this approach.

Also, because of a few problems at other solar and gas-fired power plants where questions about fire department plan review have been raised, staff believes that it is necessary to clearly define the duty of the project owner to work with the local fire department in the review of fire detection and suppression systems. Staff therefore recommends adoption of new condition **WORKER SAFETY-10** which would require the project owner to submit to the RCFD all plans and schematic diagrams that show the details of all fire detection and suppression systems and pay the RCFD its usual and customary fee for the review of those plans. The project owner would then be required to provide proof to the CPM that the plans have been submitted to the RCFD on a timely basis, a copy of the comments received from the RCFD, and proof that the usual and customary payments for plan review have been made to the fire department.

EMERGENCY MEDICAL SERVICES RESPONSE

Staff conducted a statewide survey to determine the frequency of Emergency Medical Services (EMS) response for natural gas-fired power plants in California. The purpose of the analysis was to determine what impact, if any, power plants may have on local emergency services. Staff concluded that incidents at gas-fired power plants that require EMS response are infrequent and represent an insignificant impact on the local fire departments, except for instances where response times are high or a rural fire department has mostly volunteer fire-fighting staff. However, staff has determined that the potential for both work-related and non-work-related heart attacks exists at power plants. In fact, staff's research on the frequency of EMS response to gas-fired power plants shows that many of the responses for cardiac emergencies involved non-work-related incidences, including those involving visitors. The need for prompt response within a few minutes is well documented in the medical literature. Staff believes that the quickest medical intervention can only be achieved with the use of an on-site automatic external defibrillator (AED); the response from an off-site provider would take longer regardless of the provider location. This fact is also well documented and serves as the basis for many private and public locations (e.g., airports, factories, government buildings) maintaining on-site cardiac defibrillation devices. Therefore, staff concludes that, with the advent of modern cost-effective cardiac defibrillation devices, it is proper in a power plant environment to maintain such a device and the trained staff on site in order to treat cardiac arrhythmias resulting from industrial accidents or other non-work related causes.

Existing Condition of Certification **WORKER SAFETY-5,** requires that a portable AED be located on site, that all power plant employees on site during operations be trained in its use, and that a representative number of workers on site during construction and commissioning also be trained in its use. Staff does not propose any changes to this condition.

CLOSURE AND DECOMMISSIONING IMPACTS AND MITIGATION

Closure of the proposed PSEGS (temporary or permanent) would follow a facility closure plan prepared by the project owner and designed to minimize public health and environmental impacts. Decommissioning procedures would be consistent with all applicable LORS (Solar Millennium 2009a, Section 5.6.3.4). Staff expects that impacts from the closure and decommissioning process would represent a fraction of the impacts associated with the construction or operation of the proposed PSEGS. Therefore based on staff's analysis for the construction and operation phases of this project, staff concludes that worker safety and fire protection-related impacts from closure and decommissioning of the PSEGS would be insignificant.

Red Bluff Substation

The SCE Red Bluff Substation is expected to be operational in December, 2013. Therefore, staff concludes that there won't be any overlap of construction phase of SCE Red Bluff Substation and the PSEGS. Therefore, there is no need to discuss the potential impacts of the construction of the SCE Red Bluff Substation.

Conclusion

Incorporation of the measures discussed above and the Conditions of Certification recommended for the PSEGS would ensure adequate levels of industrial safety and fire protection and would comply with applicable LORS. The substation project would not be likely to have significant impacts on local emergency and fire protection services if the proposed Conditions of Certification are implemented.

CUMULATIVE IMPACTS

The **Executive Summary** 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 modified project. In summary, these projects are placed into three categories:

- Past and present energy projects on BLM, State, and private lands: Forty-one projects are listed in **Executive Summary-Table 1**.
- Foreseeable future energy projects in the immediate area and in the desert region: Thirty-five foreseeable projects are listed in **Executive Summary-Table 2**.
- Past and present non-energy projects on BLM, State, and private lands: Ten projects are listed identified in **Executive Summary-Table 3**

All of the above projects are defined within a geographic area that has been identified by the Energy Commission 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 the California Environmental Quality Act (CEQA). Even if the cumulative projects listed in the **Executive Summary** tables have not yet completed the required environmental processes, they were considered in the cumulative impacts analyses in this section.

EFFECTS OF PAST AND PRESENT PROJECTS

For this analysis, staff notes that all of these projects or developments in the area or region have or will need the plan review and emergency response services of the RCFD. And, staff has found that when combined with the proposed PSEGS, all would have a cumulative impact on the region. The need for rescue, fire, hazardous materials, and EMS response is frequent yet not concentrated in this county because the distances between the projects are very great. Operating, under construction, or proposed power plants in the region in the area have had any direct fire protection impacts mitigated to a level of less than significance.

Staff has analyzed the potential for fire protection cumulative impacts at many other power plant projects located in California and in the region of the proposed PSEGS. A significant cumulative fire protection impact is defined as the simultaneous emergency at multiple locations that would require the concurrent response for rescue, fire fighting, hazardous materials spill control, and/or EMS response. Existing locations that would likely need emergency response, or locations where such facilities might likely be built, were both considered. Staff believes that while cumulative impacts are theoretically possible, they are not probable because of the many safeguards implemented to both prevent and control the work environment, spills, and fires. The chances of one event requiring a concerted response from the RCFD is high because accidents do happen at industrial environments. However, the chance of two or more occurring simultaneously, with resulting draw-down of fire department resources to the point of endangering other communities with lack of fire department coverage are real but not as great. Staff believes the risk of draw-down is significant and thus proposed mitigation in the form of **WORKER SAFETY-7** to address this cumulative impact and reduce it to a less than significant impact.

The project owner will develop and implement a fire protection program for the PSEGS independent of any other projects considered for potential cumulative impacts. Staff believes that the facility, as proposed by the project owner and with the additional mitigation measures proposed by staff, poses a less than significant risk.

<u>Contribution of the Palen Solar Electric Generating System to Cumulative Impacts</u>

Construction. The construction of PSEGS is not expected to result in short term adverse impacts related to fire protection during 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 PSEGS, however, short term impacts related to fire protection during construction of those cumulative projects are not expected to occur.

Operation. The operation of the PSEGS is expected to result in long term adverse impacts during operation of the project related to fire protection and staff has recommended mitigation in the form of **WORKER SAFETY-7** to reduce that impact to a less than significant level.

Decommissioning. The decommissioning of the PSEGS is not expected to result in adverse impacts related to fire protection 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, it is not expected that significant impacts related to fire protection during decommissioning of the PSEGS generated by the cumulative projects will occur.

COMPLIANCE WITH LORS

Staff concludes that construction and operation of the PSEGS project with staff's proposed mitigation would be in compliance with all applicable laws, ordinances, regulations, and standards (LORS) regarding long-term and short-term project impacts in the area of worker safety and fire protection.

NOTEWORTHY PUBLIC BENEFITS

Staff is unable to describe any noteworthy pubic benefit in the area of Worker Safety and Fire Protection.

RESPONSE TO AGENCY AND PUBLIC COMMENTS

No comments related to Worker Safety/Fire Protection have been received to date.

CONCLUSIONS

Staff concludes that if the project owner for the proposed PSEGS project provides a Project Construction Safety and Health Program and a Project Operations and Maintenance Safety and Health Program as required by Conditions of Certification **WORKER SAFETY-1**, and **-2** and fulfils the requirements of Conditions of Certification **WORKER SAFETY-3** through **-10**, the project would incorporate sufficient measures to ensure adequate levels of industrial safety and comply with applicable LORS. With the implementation of staff's proposed Condition of Certification **WORKER SAFETY-9** (enhanced dust control measures), the potential impacts of Valley Fever would be minimized. Staff also concludes that the operation of this power plant, with mitigation, would not significantly impact the provision of emergency services.

PROPOSED CONDITIONS OF CERTIFICATION

Staff has proposed modifications to the conditions of certification as shown below. (**Note:** Deleted text is in ~~strikethrough~~, new text is **<u>bold and underlined</u>**)

WORKER SAFETY-1 The project owner shall submit to the Compliance Project Manager (CPM) a copy of the Project Construction Safety and Health Program that complies with all applicable federal and state LORS for Worker Safety and Health and includes the following:

- a Construction Personal Protective Equipment Program;
- a Construction Exposure Monitoring Program;
- a Construction Injury and Illness Prevention Program, including measures to prevent exposure to Valley Fever;
- a Construction heat stress protection plan that implements and expands on existing Cal-OSHA regulations as found in 8 CCR 3395;
- a Construction Emergency Action Plan; and
- a Construction Fire Prevention Plan that includes the concrete batch plant and the above-ground fuel depot.

The Personal Protective Equipment Program, the Exposure Monitoring Program, the Heat Stress Protection Plan, and the Injury and Illness Prevention Program shall be submitted to the CPM for review and approval concerning compliance of the program with all applicable safety orders. The Construction Emergency Action Plan and the Fire Prevention Plan shall be submitted to the Riverside County Fire Department (RCFD) for review and comment prior to submittal to the CPM for approval.

Verification: At least 30 days prior to the start of construction, the project owner shall submit to the CPM for review and approval a copy of the Project Construction Safety and Health Program. The project owner shall provide a copy of a letter to the CPM from the Riverside County Fire Department stating the fire department's comments on the Construction Fire Prevention Plan and Emergency Action Plan.

WORKER SAFETY-2 The project owner shall submit to the CPM a copy of the Project Operations and Maintenance Safety and Health Program that complies with all applicable federal and state LORS related to Worker Safety and Health and includes the following:

- an Operation Injury and Illness Prevention Plan, including measures to prevent exposure to Valley Fever;
- an Operation heat stress protection plan that implements and expands on existing Cal OSHA regulations (8 CCR 3395);
- ~~a Best Management Practices (BMP) for the storage and application of herbicides;~~
- an Emergency Action Plan;
- Hazardous Materials Management Program;
- Fire Prevention Plan that includes the fuel depot should the project owner elect to maintain and operate the fuel depot during operations (8 Cal Code Regs. § 3221) as well as the fire protection measures described in this Decision and any necessary upgrades required by current applicable LORS; and

- Personal Protective Equipment Program (8 Cal Code Regs, §§ 3401-3411).

The Operation Injury and Illness Prevention Plan, Emergency Action Plan, Heat Stress Protection Plan, ~~BMP for Herbicides,~~ and Personal Protective Equipment Program shall be submitted to the CPM for review and comment concerning compliance of the programs with all applicable safety orders. The Fire Prevention Plan and the Emergency Action Plan shall also be submitted to the Riverside County Fire Department for review and comment.

Verification: At least 30 days prior to the start of first-fire or commissioning, the project owner shall submit to the CPM for approval a copy of the Project Operations and Maintenance Safety and Health Program. The project owner shall provide a copy of a letter to the CPM from the Riverside County Fire Department stating the fire department's comments on the Operations Fire Prevention Plan and Emergency Action Plan.

WORKER SAFETY-3 The project owner shall provide a site Construction Safety Supervisor (CSS) who, by way of training and/or experience, is knowledgeable of power plant construction activities and relevant laws, ordinances, regulations, and standards; is capable of identifying workplace hazards relating to the construction activities; and has authority to take appropriate action to assure compliance and mitigate hazards. The CSS shall:

- have overall authority for coordination and implementation of all occupational safety and health practices, policies, and programs;
- assure that the safety program for the project complies with Cal/OSHA and federal regulations related to power plant projects;
- assure that all construction and commissioning workers and supervisors receive adequate safety training;
- complete accident and safety-related incident investigations and emergency response reports for injuries and inform the CPM of safety-related incidents; and
- assure that all the plans identified in Conditions of Certification **WORKER SAFETY-1** and **-2** are implemented.

Verification: At least 30 days prior to the start of site mobilization, the project owner shall submit to the CPM the name and contact information for the Construction Safety Supervisor (CSS). The contact information of any replacement CSS shall be submitted to the CPM within one business day.

The CSS shall submit in the Monthly Compliance Report a monthly safety inspection report to include:

A. A record of all employees trained for that month (all records shall be kept on site for the duration of the project);

B. A summary report of safety management actions and safety-related incidents that occurred during the month;

C. A report of any continuing or unresolved situations and incidents that may pose danger to life or health; and

D. A report of accidents and injuries that occurred during the month.

WORKER SAFETY-4 The project owner shall make payments to the Chief Building Official (CBO) for the services of a Safety Monitor based upon a reasonable fee schedule to be negotiated between the project owner and the CBO. Those services shall be in addition to other work performed by the CBO. The Safety Monitor shall be selected by and report directly to the CBO and will be responsible for verifying that the Construction Safety Supervisor, as required in Condition of Certification **WORKER SAFETY-3**, implements all appropriate Cal/OSHA and Energy Commission safety requirements. The Safety Monitor shall conduct on-site (including linear facilities) safety inspections at intervals necessary to fulfill those responsibilities.

<u>Verification:</u> At least 30 days prior to the start of construction, the project owner shall provide proof of its agreement to fund the Safety Monitor services to the CPM for review and approval.

WORKER SAFETY-5 The project owner shall ensure that a portable automatic external defibrillator (AED) is located on site during construction and operations and shall implement a program to ensure that workers are properly trained in its use and that the equipment is properly maintained and functioning at all times. During construction and commissioning, the following persons shall be trained in its use and shall be on site whenever the workers that they supervise are on site: the Construction Project Manager or delegate, the Construction Safety Supervisor or delegate, and all shift foremen. During operations, all power plant employees shall be trained in its use. The training program shall be submitted to the CPM for review and approval.

<u>Verification:</u> At least 60 days prior to the start of site mobilization, the project owner shall submit to the CPM proof that a portable automatic external defibrillator (AED) exists on site and a copy of the training and maintenance program for review and approval.

WORKER SAFETY-6 The project owner shall:

A. Provide ~~a~~ **<u>not less than two (2)</u>** secondary site access gates for emergency personnel to enter the site**<u>, one on the north site of the site and the other on the south side of the site</u>**. ~~This~~ **<u>These</u>** secondary site access gate**<u>s</u>** shall be **<u>located</u>** at least one-~~quarter~~half mile from the main gate **<u>and shall be equipped with locks that can be opened by emergency response personnel including the Riverside County Fire Department, the Riverside County Sheriff's Department, and the California Highway Patrol</u>**.

~~B.~~ **<u>In lieu of providing</u>** ~~Provide~~ a second access road which provides entry to the site**<u>, the project owner shall share the financial responsibility for the costs of obtaining and maintaining two all-terrain fire engines for the Riverside County Fire Department and shall initially pay to the</u>**

Genesis Solar Energy Project owner an amount equally to 50 percent of the costs of the engines plus annually 50 percent of the annual maintenance. ~~This road shall be at a minimum an all-weather gravel road, at least 20 feet wide, and shall come from the Interstate-10 right-of-way to the project site at the location of where the fence line of the eastern solar field comes the nearest to the I-10 right-of-way, if approved by Caltrans, a locked gate shall be placed in the I-10 right-of-way fence. The RCFD, the California Highway Patrol, and the Riverside County Sheriff's Department shall be given access to the gate.~~

C. Maintain the main access road ~~and the second access road~~ and provide a plan for construction and implementation.

Plans for the secondary access gates, the method of gate operation, ~~secondary gravel road,~~ and maintenance of the roads shall be submitted to the Riverside County Fire Department for review and comment and to the CPM for review and approval.

Verification: At least 60 days prior to the start of site mobilization, the project owner shall submit to the RCFD and the CPM preliminary plans showing the **locations of at least two (2)** secondary site access gates to the site, a description of how the secondary site access gate**s** will be opened by the fire department and other emergency services, and a description and map showing the location, dimensions, and composition of the main road~~, and the gravel road to the secondary site access gate~~.

At least 30 days prior to the start of site mobilization, the project owner shall submit the secondary site access gates final plans plus the road maintenance plan to the CPM for review and approval. The final plan submittal shall also include a letter containing comments from the Riverside County Fire Department or a statement that no comments were received.

At least 30 days prior to the start of site mobilization, the project owner shall submit to the CPM proof of payment for one-half of the cost of the two all-terrain fire trucks to the Genesis Solar Energy Project owner. In the Project Owners Annual Report, the project owner shall provide proof that it has paid to the Genesis Solar Energy Project owner its share of the annual maintenance costs of the two all-terrain fire trucks.

~~At least 30 days after approval by Caltrans, the project owner shall submit final plans for the gate in the I-10 right-of-way to the Riverside County Fire Department for review and comment and to the CPM for review and approval.~~

WORKER SAFETY-7 The project owner shall ~~either:~~

~~A. Reach an agreement with the Riverside County Fire Department regarding funding of its project-related share of capital costs to build fire protection/response infrastructure and provide appropriate equipment as mitigation of project-related impacts on fire protection services,~~ ~~**or**~~~~, if no agreement can be reached shall~~ fund its share of the capital costs in the amount of ~~$850,000~~ **$1,000,000** and shall provide an annual payment of

~~$375,000~~ **$313,333** to the RCFD ~~for the support of three fire department staff~~ commencing with the date of site mobilization and continuing annually thereafter on the anniversary until the final date of power plant decommissioning.

Verification: At least 30 days prior to the start of site mobilization, the project owner shall provide **proof** to the CPM ~~for review and approval~~ ~~either:A copy of the agreement with the RCFD or D~~ documentation that ~~a letter of credit in the amount of $850,000~~ **$1,000,000** has been ~~provided~~ paid to the RCFD **for capital costs and documentation that the annual payment of** ~~a letter of credit in the amount of $375,000 will be provided~~ $313,333 has been paid to **the** RCFD ~~each year at the start of commercial operations~~. Proof of the annual ~~$375,000 letter of credit~~ payment of $313,333 ~~has been made commencing with site mobilization~~ **made each year** shall be included each year in the Project Owner's Annual Report to the CPM.

~~**WORKER SAFETY-8** The project owner shall place a water spray system on the two LPG storage tanks. The engineering design plans shall comply with NFPA 15, *Standard for Water Spray Fixed Systems for Fire Protection* and be provided to the CPM for review and approval prior to commencing construction of the water spray system.~~

~~**Verification**~~: ~~At least 30 days prior to site mobilization, the project owner shall provide the engineering design plans to the CPM for review and approval. At least 30 days prior to the delivery of any LPG to the facility, the project owner shall provide a written statement to the CPM that the LPG tank water spray system has been built and successfully tested.~~

WORKER SAFETY-~~9~~8 The project owner shall develop and implement an enhanced Dust Control Plan that includes the requirements described in Conditions **AQ-SC3** and **AQ-SC4**, and additionally requires:

A. Site worker use of dust masks (NIOSH N-95 or better) whenever visible dust is present;

B. ~~Implementation of Rule 402 of the Kern County Air Pollution Control District (as amended Nov. 3, 2004); and~~ **No downwind PM10 ambient concentrations to increase more than 50 micrograms per cubic meter above upwind concentrations as determined by simultaneous upwind and downwind sampling. High-volume particulate matter samplers or other EPA-approved equivalent method(s) for PM10 monitoring shall be used. Samplers shall be:**

a. Operated, maintained, and calibrated in accordance with 40 Code of Federal Regulations (CFR), Part 50, Appendix J, or appropriate EPA-published documents for EPA-approved equivalent methods(s) for PM10 sampling;

b. Reasonably placed upwind and downwind of the large operation based on prevailing wind direction and as close to the property line as feasible, such that other sources of fugitive dust between the sampler and the property line are minimized; and

<u>c. Operated during active operations.</u>

C. Implementation of enhanced dust control methods (increased frequency of watering, use of dust suppression chemicals, etc. consistent with **AQ-SC4**) immediately whenever visible dust persists in the breathing zone of the workers, or when PM10 measurements obtained when implementing B (above) indicate an increase in PM10 concentrations due to project activities of 50 $\mu g/m^3$ or more.

<u>Verification:</u> At least 30 days prior to the commencement of site mobilization, the enhanced Dust Control Plan shall be provided to the CPM for review and approval.

WORKER SAFETY-~~10~~<u>9</u> The project owner shall participate in annual joint training exercises with the Riverside County Fire Department (RCFD). The project owner shall coordinate this training with other Energy Commission-licensed solar power plants within Riverside County such that this project shall host the annual training on a rotating yearly basis with the other solar power plants.

<u>Verification:</u> At least 10 days prior to the start of commissioning, the project owner shall submit to the CPM proof that a joint training program with the RCFD is established. In each January Monthly Compliance Report during construction and the Annual Compliance Report during operation, the project owner shall include the date, list of participants, training protocol, and location of the annual joint training.

<u>WORKER SAFETY-10 The project owner shall submit to the Riverside County Fire Department (RCFD) all plans and schematic diagrams that show the details of all fire detection and suppression systems and shall pay the RCFD its usual and customary fee for the review of those plans. The project owner shall provide proof to the CPM that the plans have been submitted to the RCFD on a timely basis and a copy of the comments received from the RCFD.</u>

<u>Verification:</u> **<u>In each Monthly Compliance Report during construction and in the Annual Compliance Report during operation, the project owner shall include any and all comments received from the RCFD on fire detection and suppression systems and proof that the required plan review fees have been paid to the fire department.</u>**

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Engineering Assessment

FACILITY DESIGN

Shahab Khoshmashrab

SUMMARY OF CONCLUSIONS

The California Energy Commission (Energy Commission) staff (staff) concludes that the design, construction, and eventual closure of the Palen Solar Electric Generating System (PSEGS) and its linear facilities would likely comply with applicable engineering laws, ordinances, regulations and standards. The proposed modifications as described in the Petition to Amend would not change staff's analysis or the conditions of certification as approved in the December 2010 Energy Commission Decision for the approved Palen Solar Power Project (PSPP). The existing conditions of certification below would ensure compliance with these laws, ordinances, regulations and standards.

INTRODUCTION

Facility design encompasses the civil, structural, mechanical, and electrical engineering design of the PSEGS. The purpose of this analysis is to:

- Verify that the laws, ordinances, regulations and standards (LORS) that apply to the engineering design and construction of the project have been identified;
- Verify that both the project and its ancillary facilities are sufficiently described, including proposed design criteria and analysis methods, in order to provide reasonable assurance that the project would be designed and constructed in accordance with all applicable engineering LORS, which would ensure the public health and safety;
- Determine whether special design features should be considered during final design to address conditions unique to the site which could influence public health and safety; and,
- Describe the design review and construction inspection process and establish the conditions of certification used to monitor and ensure compliance with the engineering LORS, in addition to any special design requirements.

Subjects discussed in this analysis include:

- Identification of the engineering LORS that apply to facility design;
- Evaluation of the project owner's proposed design criteria, including identification of criteria essential to public health and safety;
- Proposed modifications and additions provided in the Petition to Amend necessary for compliance with applicable engineering LORS; and
- Conditions of certification proposed by staff to ensure that the project would be designed and constructed to comply with all applicable engineering LORS, which would ensure public health and safety.

LAWS, ORDINANCES, REGULATIONS AND STANDARDS

Lists of LORS applicable to each engineering discipline (civil, structural, mechanical, and electrical) are described in the PSEGS Petition to Amend (Palen 2012a, §§ 2.15.1, 3.1.4, Appendices 2E through 2J). Key LORS are listed in **Facility Design Table 1,** below:

Facility Design Table 1
Key Engineering Laws, Ordinances, Regulations and Standards (LORS)

Applicable LORS	Description
Federal	Title 29 Code of Federal Regulations (CFR), Part 1910, Occupational Safety and Health standards
State	2010 (or latest edition) California Building Standards Code (CBSC) (also known as Title 24, California Code of Regulations)
Local	Riverside County regulations and ordinances
General	American National Standards Institute (ANSI) American Society of Mechanical Engineers (ASME) American Welding Society (AWS) American Society for Testing and Materials (ASTM)

PROPOSED MODIFIED PROJECT

The modifications proposed in the petition include replacing the parabolic trough solar collection system, steam turbine generator, and associated heat transfer fluid with BrightSource's solar tower technology. Heliostats—elevated mirrors guided by a tracking system mounted on a pylon—focus the sun's rays on a solar receiver steam generator (SRSG) located atop a 750-foot-tall tower near the center of each solar field to create steam to drive a turbine that generates electricity. These modifications do not change staff's analysis or conclusions as related to **Facility Design**.

SETTING AND EXISTING CONDITIONS

PSEGS would be built on a site located in Riverside County, California. For more information on the site and its related project description, please see the **PROJECT DESCRIPTION** section of this document. Additional engineering design details are contained in the Petition to Amend, § 3.1.3, Appendices 2E through 2J.

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

The purpose of this analysis is to ensure that the project would be built to applicable engineering codes, which would ensure public health and life safety. This analysis further verifies that applicable engineering LORS have been identified and that the project and its ancillary facilities have been described in adequate detail. It also evaluates the project owner's proposed design criteria, describes the design review and construction inspection process, and establishes conditions of certification that would monitor and ensure compliance with engineering LORS and any other special design requirements. These conditions allow both the California Energy Commission (Energy

Commission) compliance project manager (CPM) and the project owner to adopt a compliance monitoring scheme that would verify compliance with these LORS.

SITE PREPARATION AND DEVELOPMENT

Staff has evaluated the proposed design criteria for grading, flood protection, erosion control, site drainage, and site access, in addition to the criteria for designing and constructing linear support facilities such as natural gas and electric transmission interconnections. The project owner proposes the use of accepted industry standards (see Palen 2012a, § 3.1.4, Appendces 2E through 2J for a representative list of applicable industry standards), design practices, and construction methods in preparing and developing the site. Staff concludes that this project, including its linear facilities, would most likely comply with all applicable site preparation LORS, and proposes conditions of certification (see below and the **GEOLOGY AND PALEONTOLOGY** section of this document) to ensure that compliance is met.

MAJOR STRUCTURES, SYSTEMS, AND EQUIPMENT

Major structures, systems, and equipment are structures and their associated components or equipment that are necessary for power production, costly or time consuming to repair or replace, are used for the storage, containment, or handling of hazardous or toxic materials, or could become potential health and safety hazards if not constructed according to applicable engineering LORS.

PSEGS shall be designed and constructed to the 2010 California Building Standards Code (CBSC), also known as Title 24, California Code of Regulations, which encompasses the California Building Code (CBC), California Building Standards Administrative Code, California Electrical Code, California Mechanical Code, California Plumbing Code, California Energy Code, California Fire Code, California Code for Building Conservation, California Reference Standards Code, and other applicable codes and standards in effect when the design and construction of the project actually begin. If the initial designs are submitted to the chief building official (CBO) for review and approval after the update to the 2010 CBSC takes effect, the 2010 CBSC provisions shall be replaced with the updated provisions.

Certain structures in a power plant may be required, under the CBC, to undergo dynamic lateral force (structural) analysis; others may be designed using the simpler static analysis procedure. In order to ensure that structures are analyzed according to their appropriate lateral force procedure, staff has included Condition of Certification **STRUC-1**, below, which, in part, requires the project CBO’s review and approval of the owner’s proposed lateral force procedures before construction begins.

PROJECT QUALITY PROCEDURES

The project’s Petition to Amend (Palen 2012a, § 3.1.3, Appendices 2E through 2J) describes a quality program intended to inspire confidence that its systems and components will be designed, fabricated, stored, transported, installed, and tested in accordance with all appropriate power plant technical codes and standards. Compliance with design requirements will be verified through specific inspections and audits. Implementation of this quality assurance/quality control (QA/QC) program will ensure that PSEGS is actually designed, procured, fabricated, and installed as described in this analysis.

COMPLIANCE MONITORING

Under California Code of Regulations Title 24, Part 2, Section 104.2 of the CBC, the CBO is authorized and directed to enforce all provisions of the CBC. The Energy Commission itself serves as the building official, and has the responsibility to enforce the code for all of the energy facilities it certifies. In addition, the Energy Commission has the power to interpret the CBC and adopt and enforce both rules and supplemental regulations that clarify application of the CBC's provisions.

The Energy Commission's design review and construction inspection process conforms to CBC requirements and ensures that all facility design conditions of certification are met. As provided by Section 104.2.2 of the CBC, the Energy Commission appoints experts to perform design review and construction inspections and act as delegate CBOs on behalf of the Energy Commission. These delegates typically include the local building official and/or independent consultants hired to provide technical expertise that is not provided by the local official alone. The project owner, through permit fees provided by the CBC, pays the cost of these reviews and inspections. While building permits in addition to Energy Commission certification are not required for this project, the project owner pays in lieu of CBC permit fees to cover the costs of these reviews and inspections.

Staff has developed proposed conditions of certification to ensure public health and safety and compliance with engineering design LORS. Some of these conditions address the roles, responsibilities, and qualifications of the engineers who will design and build the proposed modified project (conditions of certification **GEN-1** through **GEN-8**). These engineers must be registered in California and sign and stamp every submittal of design plans, calculations, and specifications submitted to the CBO. These conditions require that every element of the project's construction (subject to CBO review and approval) be approved by the CBO before it is performed. They also require that qualified special inspectors perform or oversee special inspections required by all applicable LORS.

While the Energy Commission and delegate CBO have the authority to allow some flexibility in scheduling construction activities, these conditions are written so that no element of construction (of permanent facilities subject to CBO review and approval) which could be difficult to reverse or correct can proceed without prior CBO approval. Elements of construction that are not difficult to reverse may proceed without approval of the plans. The project owner bears the responsibility to fully modify construction elements in order to comply with all design changes resulting from the CBO's subsequent plan review and approval process.

FACILITY CLOSURE

The removal of a facility from service, or closure, as a result of the project reaching the end of its useful life, may range from "mothballing" to removal of all equipment and appurtenant facilities and restoration of the site. Future conditions that may affect the closure decision are largely unknown at this time.

In order to assure that closure of the facility will be completed in a manner that is environmentally sound, safe and will protect public health and safety, the project owner shall submit a closure plan to the Energy Commission for review and approval prior to the commencement of closing the facility as required in **COM-15; Facility Closure Plans** in the **GENERAL CONDITIONS** section of this PSA.

The requirements in the **GENERAL CONDITIONS** are adequate protection, even in the unlikely event of project abandonment.

CUMULATIVE IMPACT ANALYSIS

Not applicable.

NOTEWORTHY PUBLIC BENEFITS

Staff has not identified any noteworthy public benefits associated with this **FACILITY DESIGN** section.

RESPONSE TO AGENCY AND PUBLIC COMMENTS

Staff received no public or agency comments which relate to facility design.

CONCLUSIONS

The laws, ordinances, regulations and standards (LORS) identified in the Petition to Amend and supporting documents directly apply to the project. Staff has evaluated the proposed engineering LORS, design criteria, and design methods in the record, and concludes that the design, construction, and eventual closure of the project will likely comply with applicable engineering LORS.

The proposed conditions of certification will ensure that PSEGS is designed and constructed in accordance with applicable engineering LORS. This will be accomplished through design review, plan checking, and field inspections that will be performed by the CBO or other Energy Commission delegate. Staff will audit the CBO to ensure satisfactory performance.

Though future conditions that could affect decommissioning are largely unknown at this time, it can reasonably be concluded that if, the project owner submits a decommissioning plan as required in the **General Conditions** portion of this document prior to decommissioning, decommissioning procedures will comply with all applicable engineering LORS.

Energy Commission staff recommends that:

1. The proposed conditions of certification be adopted to ensure that the project is designed and constructed in a manner that protects the public health and safety and complies with all applicable engineering LORS;

2. The project be designed and built to the 2010 CBSC (or successor standards, if in effect when initial project engineering designs are submitted for review); and

3. The CBO reviews the final designs, checks plans, and performs field inspections during construction. Energy Commission staff shall audit and monitor the CBO to ensure satisfactory performance.

PROPOSED CONDITIONS OF CERTIFICATION

All the **Facility Design** Conditions of Certification remain unchanged except for a minor edit to update the edition of the CBSC (see below). (**Note:** Deleted text is in ~~strikethrough~~, new text is **<u>bold and underlined.</u>**)

GEN-1 The project owner shall design, construct, and inspect the project in accordance with the ~~2007~~**<u>2010</u>** California Building Standards Code (CBSC), also known as Title 24, California Code of Regulations, which encompasses the California Building Code (CBC), California Building Standards Administrative Code, California Electrical Code, California Mechanical Code, California Plumbing Code, California Energy Code, California Fire Code, California Code for Building Conservation, California Reference Standards Code, and all other applicable engineering LORS in effect at the time initial design plans are submitted to the CBO for review and approval (the CBSC in effect is the edition that has been adopted by the California Building Standards Commission and published at least 180 days previously). The project owner shall ensure that all the provisions of the above applicable codes are enforced during the construction, addition, alteration, moving, demolition, repair, maintenance, or closure of the completed facility. All transmission facilities (lines, switchyards, switching stations and substations) are covered in the conditions of certification in the **TRANSMISSION SYSTEM ENGINEERING** section of this document.

In the event that the initial engineering designs are submitted to the CBO when the successor to the ~~2007~~**<u>2010</u>** CBSC is in effect, the ~~2007~~**<u>2010</u>** CBSC provisions shall be replaced with the applicable successor provisions. Where, in any specific case, different sections of the code specify different materials, methods of construction or other requirements, the most restrictive shall govern. Where there is a conflict between a general requirement and a specific requirement, the specific requirement shall govern.

The project owner shall ensure that all contracts with contractors, subcontractors, and suppliers clearly specify that all work performed and materials supplied comply with the codes listed above.

<u>Verification:</u> Within 30 days following receipt of the certificate of occupancy, the project owner shall submit to the CPM a statement of verification, signed by the responsible design engineer, attesting that all designs, construction, installation, and inspection requirements of the applicable LORS and the Energy Commission's decision have been met in the area of facility design. The project owner shall provide the CPM a copy of the certificate of occupancy within 30 days of receipt from the CBO.

Once the certificate of occupancy has been issued, the project owner shall inform the CPM at least 30 days prior to any construction, addition, alteration, moving, demolition, repair, or maintenance to be performed on any portion(s) of the completed facility that requires CBO approval for compliance with the above codes. The CPM will then determine if the CBO needs to approve the work.

GEN-2 Before submitting the initial engineering designs for CBO review, the project owner shall furnish the CPM and the CBO with a schedule of facility design submittals, and master drawings and master specifications list. The master drawings and master specifications list shall contain a list of proposed submittal packages of designs, calculations, and specifications for major structures, systems, and equipment. Major structures, systems, and equipment are structures and their associated components or equipment that are necessary for power production, costly or time consuming to repair or replace, are used for the storage, containment, or handling of hazardous or toxic materials, or could become potential health and safety hazards if not constructed according to applicable engineering LORS. The schedule shall contain the date of each submittal to the CBO. To facilitate audits by Energy Commission staff, the project owner shall provide specific packages to the CPM upon request.

Verification: At least 60 days (or a project owner- and CBO-approved alternative time frame) prior to the start of rough grading, the project owner shall submit to the CBO and to the CPM the schedule, and the master drawings and master specifications list of documents to be submitted to the CBO for review and approval. These documents shall be the pertinent design documents for the major structures, systems, and equipment defined above in Condition of Certification **GEN-2**. Major structures and equipment shall be added to or deleted from the list only with CPM approval. The project owner shall provide schedule updates in the monthly compliance report.

GEN-3 The project owner shall make payments to the CBO for design review, plan checks, and construction inspections, based upon a reasonable fee schedule to be negotiated between the project owner and the CBO, in accordance with the ~~2007~~**2010** CBC. These fees may be based on the value of the facilities reviewed; may be based on hourly rates; or may be otherwise agreed upon by the project owner and the CBO.

Verification: The project owner shall make the required payments to the CBO in accordance with the agreement between the project owner and the CBO. The project owner shall send a copy of the CBO's receipt of payment to the CPM in the next monthly compliance report indicating that applicable fees have been paid.

GEN-4 Prior to the start of rough grading, the project owner shall assign a California-registered architect, or a structural or civil engineer, as the resident engineer (RE) in charge of the project. All transmission facilities (lines, switchyards, switching stations, and substations) are addressed in the conditions of certification in the **TRANSMISSION SYSTEM ENGINEERING** section of this document.

The RE may delegate responsibility for portions of the project to other registered engineers. Registered mechanical and electrical engineers may be delegated responsibility for mechanical and electrical portions of the project, respectively. A project may be divided into parts, provided that each part is clearly defined as a distinct unit. Separate assignments of general responsibility may be made for each designated part.

The RE shall:

1. Monitor progress of construction work requiring CBO design review and inspection to ensure compliance with LORS;

2. Ensure that construction of all facilities subject to CBO design review and inspection conforms in every material respect to applicable LORS, these conditions of certification, approved plans, and specifications;

3. Prepare documents to initiate changes in approved drawings and specifications when either directed by the project owner or as required by the conditions of the project;

4. Be responsible for providing project inspectors and testing agencies with complete and up-to-date sets of stamped drawings, plans, specifications, and any other required documents;

5. Be responsible for the timely submittal of construction progress reports to the CBO from the project inspectors, the contractor, and other engineers who have been delegated responsibility for portions of the project; and

6. Be responsible for notifying the CBO of corrective action or the disposition of items noted on laboratory reports or other tests when they do not conform to approved plans and specifications.

The resident engineer (or his delegate) must be located at the project site, or be available at the project site within a reasonable period of time, during any hours in which construction takes place.

The RE shall have the authority to halt construction and to require changes or remedial work if the work does not meet requirements.

If the RE or the delegated engineers are reassigned or replaced, the project owner shall submit the name, qualifications and registration number of the newly assigned engineer to the CBO for review and approval. The project owner shall notify the CPM of the CBO's approval of the new engineer.

<u>Verification:</u> At least 30 days (or project owner- and CBO-approved alternative time frame) prior to the start of rough grading, the project owner shall submit to the CBO for review and approval, the resume and registration number of the RE and any other delegated engineers assigned to the project. The project owner shall notify the CPM of the CBO's approvals of the RE and other delegated engineer(s) within five days of the approval.

If the RE or the delegated engineer(s) is subsequently reassigned or replaced, the project owner has five days to submit the resume and registration number of the newly assigned engineer to the CBO for review and approval. The project owner shall notify the CPM of the CBO's approval of the new engineer within five days of the approval.

GEN-5 Prior to the start of rough grading, the project owner shall assign at least one of each of the following California registered engineers to the project: a civil engineer; a soils, geotechnical, or civil engineer experienced and knowledgeable in the practice of soils engineering; and an engineering geologist. Prior to the start of construction, the project owner shall assign at least one of each of the following California registered engineers to the project: a design engineer who is either a structural engineer or a civil engineer fully competent and proficient in the design of power plant structures and equipment supports; a mechanical engineer; and an electrical engineer. (California Business and Professions Code section 6704 et seq., and sections 6730, 6731 and 6736 require state registration to practice as a civil engineer or structural engineer in California). All transmission facilities (lines, switchyards, switching stations, and substations) are handled in the conditions of certification in the **TRANSMISSION SYSTEM ENGINEERING** section of this document.

The tasks performed by the civil, mechanical, electrical, or design engineers may be divided between two or more engineers, as long as each engineer is responsible for a particular segment of the project (for example, proposed earthwork, civil structures, power plant structures, equipment support). No segment of the project shall have more than one responsible engineer. The transmission line may be the responsibility of a separate California registered electrical engineer.

The project owner shall submit, to the CBO for review and approval, the names, qualifications, and registration numbers of all responsible engineers assigned to the project.

If any one of the designated responsible engineers is subsequently reassigned or replaced, the project owner shall submit the name, qualifications and registration number of the newly assigned responsible engineer to the CBO for review and approval. The project owner shall notify the CPM of the CBO's approval of the new engineer.

A. The civil engineer shall:

1. Review the foundation investigations, geotechnical, or soils reports prepared by the soils engineer, the geotechnical engineer, or by a civil engineer experienced and knowledgeable in the practice of soils engineering;

2. Design (or be responsible for the design of), stamp, and sign all plans, calculations, and specifications for proposed site work, civil works, and related facilities requiring design review and inspection by the CBO. At a minimum, these include: grading, site preparation, excavation, compaction, construction of secondary containment, foundations, erosion and sedimentation control structures, drainage facilities, underground utilities, culverts, site access roads and sanitary sewer systems; and

3. Provide consultation to the RE during the construction phase of the project and recommend changes in the design of the civil works facilities and changes to the construction procedures.

B. The soils engineer, geotechnical engineer, or civil engineer experienced and knowledgeable in the practice of soils engineering, shall:

1. Review all the engineering geology reports;

2. Prepare the foundation investigations, geotechnical, or soils reports containing field exploration reports, laboratory tests, and engineering analysis detailing the nature and extent of the soils that could be susceptible to liquefaction, rapid settlement or collapse when saturated under load;

3. Be present, as required, during site grading and earthwork to provide consultation and monitor compliance with requirements set forth in the ~~2007~~**2010** CBC (depending on the site conditions, this may be the responsibility of either the soils engineer, the engineering geologist, or both); and

4. Recommend field changes to the civil engineer and RE.

This engineer shall be authorized to halt earthwork and to require changes if site conditions are unsafe or do not conform to the predicted conditions used as the basis for design of earthwork or foundations.

C. The engineering geologist shall:

1. Review all the engineering geology reports and prepare a final soils grading report; and

2. Be present, as required, during site grading and earthwork to provide consultation and monitor compliance with the requirements set forth in the ~~2007~~**2010** CBC (depending on the site conditions, this may be the responsibility of either the soils engineer, the engineering geologist, or both).

D. The design engineer shall:

1. be directly responsible for the design of the proposed structures and equipment supports;

2. Provide consultation to the RE during design and construction of the project;

3. Monitor construction progress to ensure compliance with engineering LORS;

4. Evaluate and recommend necessary changes in design; and

5. Prepare and sign all major building plans, specifications, and calculations.

E. The mechanical engineer shall be responsible for, and sign and stamp a statement with, each mechanical submittal to the CBO, stating that the proposed final design plans, specifications, and calculations conform to all of the mechanical engineering design requirements set forth in the Energy Commission's decision.

F. The electrical engineer shall:

1. be responsible for the electrical design of the project; and

2. Sign and stamp electrical design drawings, plans, specifications, and calculations.

Verification: At least 30 days (or project owner- and CBO-approved alternative time frame) prior to the start of rough grading, the project owner shall submit to the CBO for review and approval, resumes and registration numbers of the responsible civil engineer, soils (geotechnical) engineer and engineering geologist assigned to the project.

At least 30 days (or project owner- and CBO-approved alternative time frame) prior to the start of construction, the project owner shall submit to the CBO for review and approval, resumes and registration numbers of the responsible design engineer, mechanical engineer, and electrical engineer assigned to the project.

The project owner shall notify the CPM of the CBO's approvals of the responsible engineers within five days of the approval.

If the designated responsible engineer is subsequently reassigned or replaced, the project owner has five days in which to submit the resume and registration number of the newly assigned engineer to the CBO for review and approval. The project owner shall notify the CPM of the CBO's approval of the new engineer within five days of the approval.

GEN-6 Prior to the start of an activity requiring special inspection, including prefabricated assemblies, the project owner shall assign to the project, qualified and certified special inspector(s) who shall be responsible for the special inspections required by the ~~2007~~**2010** CBC. All transmission facilities (lines, switchyards, switching stations, and substations) are handled in conditions of certification in the **TRANSMISSION SYSTEM ENGINEERING** section of this document.

A certified weld inspector, certified by the American Welding Society (AWS), and/or American Society of Mechanical Engineers (ASME) as applicable, shall inspect welding performed on-site requiring special inspection (including structural, piping, tanks and pressure vessels).

The special inspector shall:

1. Be a qualified person who shall demonstrate competence, to the satisfaction of the CBO, for inspection of the particular type of construction requiring special or continuous inspection;

2. Inspect the work assigned for conformance with the approved design drawings and specifications;

3. Furnish inspection reports to the CBO and RE. All discrepancies shall be brought to the immediate attention of the RE for correction, then, if uncorrected, to the CBO and the CPM for corrective action; and

4. Submit a final signed report to the RE, CBO, and CPM, stating whether the work requiring special inspection was, to the best of the inspector's knowledge, in conformance with the approved plans, specifications, and other provisions of the applicable edition of the CBC.

Verification: At least 15 days (or project owner- and CBO-approved alternative time frame) prior to the start of an activity requiring special inspection, the project owner shall submit to the CBO for review and approval, with a copy to the CPM, the name(s) and qualifications of the certified weld inspector(s), or other certified special inspector(s) assigned to the project to perform one or more of the duties set forth above. The project owner shall also submit to the CPM a copy of the CBO's approval of the qualifications of all special inspectors in the next monthly compliance report.

If the special inspector is subsequently reassigned or replaced, the project owner has five days in which to submit the name and qualifications of the newly assigned special inspector to the CBO for approval. The project owner shall notify the CPM of the CBO's approval of the newly assigned inspector within five days of the approval.

GEN-7 If any discrepancy in design and/or construction is discovered in any engineering work that has undergone CBO design review and approval, the project owner shall document the discrepancy and recommend required corrective actions. The discrepancy documentation shall be submitted to the CBO for review and approval. The discrepancy documentation shall reference this condition of certification and, if appropriate, applicable sections of the CBC and/or other LORS.

Verification: The project owner shall transmit a copy of the CBO's approval of any corrective action taken to resolve a discrepancy to the CPM in the next monthly compliance report. If any corrective action is disapproved, the project owner shall advise the CPM, within five days, of the reason for disapproval and the revised corrective action to obtain CBO's approval.

GEN-8 The project owner shall obtain the CBO's final approval of all completed work that has undergone CBO design review and approval. The project owner shall request the CBO to inspect the completed structure and review the submitted documents. The project owner shall notify the CPM after obtaining the CBO's final approval. The project owner shall retain one set of approved engineering plans, specifications, and calculations (including all approved changes) at the project site or at another accessible location during the operating life of the project. Electronic copies of the approved plans, specifications, calculations, and marked-up as-builts shall be provided to the CBO for retention by the CPM.

Verification: Within 15 days of the completion of any work, the project owner shall submit to the CBO, with a copy to the CPM, in the next monthly compliance report, (a) a written notice that the completed work is ready for final inspection, and (b) a signed statement that the work conforms to the final approved plans. After storing the final approved engineering plans, specifications, and calculations described above, the project owner shall submit to the CPM a letter stating both that the above documents have been stored and the storage location of those documents.

Within 90 days of the completion of construction, the project owner shall provide to the CBO three sets of electronic copies of the above documents at the project owner's expense. These are to be provided in the form of "read only" (Adobe .pdf 6.0) files, with restricted (password-protected) printing privileges, on archive quality compact discs.

CIVIL-1 The project owner shall submit to the CBO for review and approval the following:

1. Design of the proposed drainage structures and the grading plan;
2. An erosion and sedimentation control plan;
3. Related calculations and specifications, signed and stamped by the responsible civil engineer; and
4. Soils, geotechnical, or foundation investigations reports required by the ~~2007~~**2010** CBC.

Verification: At least 15 days (or project owner- and CBO-approved alternative time frame) prior to the start of site grading the project owner shall submit the documents described above to the CBO for design review and approval. In the next monthly compliance report following the CBO's approval, the project owner shall submit a written statement certifying that the documents have been approved by the CBO.

CIVIL-2 The resident engineer shall, if appropriate, stop all earthwork and construction in the affected areas when the responsible soils engineer, geotechnical engineer, or the civil engineer experienced and knowledgeable in the practice of soils engineering identifies unforeseen adverse soil or geologic conditions. The project owner shall submit modified plans, specifications, and calculations to the CBO based on these new conditions. The project owner shall obtain approval from the CBO before resuming earthwork and construction in the affected area.

Verification: The project owner shall notify the CPM within 24 hours, when earthwork and construction is stopped as a result of unforeseen adverse geologic/soil conditions. Within 24 hours of the CBO's approval to resume earthwork and construction in the affected areas, the project owner shall provide to the CPM a copy of the CBO's approval.

CIVIL-3 The project owner shall perform inspections in accordance with the ~~2007~~ **2010** CBC. All plant site-grading operations, for which a grading permit is required, shall be subject to inspection by the CBO.

If, in the course of inspection, it is discovered that the work is not being performed in accordance with the approved plans, the discrepancies shall be reported immediately to the resident engineer, the CBO, and the CPM. The project owner shall prepare a written report, with copies to the CBO and the CPM, detailing all discrepancies, non-compliance items, and the proposed corrective action.

Verification: Within five days of the discovery of any discrepancies, the resident engineer shall transmit to the CBO and the CPM a non-conformance report (NCR), and the proposed corrective action for review and approval. Within five days of resolution of the NCR, the project owner shall submit the details of the corrective action to the CBO and the CPM. A list of NCRs, for the reporting month, shall also be included in the following monthly compliance report.

CIVIL-4 After completion of finished grading and erosion and sedimentation control and drainage work, the project owner shall obtain the CBO's approval of the final grading plans (including final changes) for the erosion and sedimentation control work. The civil engineer shall state that the work within his/her area of responsibility was done in accordance with the final approved plans.

Verification: Within 30 days (or project owner- and CBO-approved alternative time frame) of the completion of the erosion and sediment control mitigation and drainage work, the project owner shall submit to the CBO, for review and approval, the final grading plans (including final changes) and the responsible civil engineer's signed statement that the installation of the facilities and all erosion control measures were completed in accordance with the final approved combined grading plans, and that the facilities are adequate for their intended purposes, along with a copy of the transmittal letter to the CPM. The project owner shall submit a copy of the CBO's approval to the CPM in the next monthly compliance report.

STRUC-1 Prior to the start of any increment of construction, the project owner shall submit plans, calculations and other supporting documentation to the CBO for design review and acceptance for all project structures and equipment identified in the CBO-approved master drawing and master specifications lists. The design plans and calculations shall include the lateral force procedures and details as well as vertical calculations.

Construction of any structure or component shall not begin until the CBO has approved the lateral force procedures to be employed in designing that structure or component.

The project owner shall:

1. Obtain approval from the CBO of lateral force procedures proposed for project structures;

2. Obtain approval from the CBO for the final design plans, specifications, calculations, soils reports, and applicable quality control procedures. If there are conflicting requirements, the more stringent shall govern (for example, highest loads, or lowest allowable stresses shall govern). All plans, calculations, and specifications for foundations that support structures shall be filed concurrently with the structure plans, calculations, and specifications;

3. Submit to the CBO the required number of copies of the structural plans, specifications, calculations, and other required documents of the designated major structures prior to the start of on-site fabrication and installation of each structure, equipment support, or foundation;

4. Ensure that the final plans, calculations, and specifications clearly reflect the inclusion of approved criteria, assumptions, and methods used to develop the design. The final designs, plans, calculations, and specifications shall be signed and stamped by the responsible design engineer; and

5. Submit to the CBO the responsible design engineer's signed statement that the final design plans conform to applicable LORS.

Verification: At least 60 days (or project owner- and CBO-approved alternative time frame) prior to the start of any increment of construction of any structure or component listed in the CBO-approved master drawing and master specifications list, the project owner shall submit to the CBO the above final design plans, specifications and calculations, with a copy of the transmittal letter to the CPM.

The project owner shall submit to the CPM, in the next monthly compliance report, a copy of a statement from the CBO that the proposed structural plans, specifications, and calculations have been approved and comply with the requirements set forth in applicable engineering LORS.

STRUC-2 The project owner shall submit to the CBO the required number of sets of the following documents related to work that has undergone CBO design review and approval:

1. Concrete cylinder strength test reports (including date of testing, date sample taken, design concrete strength, tested cylinder strength, age of test, type and size of sample, location and quantity of concrete placement from which sample was taken, and mix design designation and parameters);

2. Concrete pour sign-off sheets;

3. Bolt torque inspection reports (including location of test, date, bolt size, and recorded torques);

4. Field weld inspection reports (including type of weld, location of weld, inspection of non-destructive testing (NDT) procedure and results, welder

qualifications, certifications, qualified procedure description or number (ref: AWS); and

5. Reports covering other structural activities requiring special inspections shall be in accordance with the ~~2007~~**2010** CBC.

Verification: If a discrepancy is discovered in any of the above data, the project owner shall, within five days, prepare and submit an NCR describing the nature of the discrepancies and the proposed corrective action to the CBO, with a copy of the transmittal letter to the CPM. The NCR shall reference the condition(s) of certification and the applicable CBC chapter and section. Within five days of resolution of the NCR, the project owner shall submit a copy of the corrective action to the CBO and the CPM.

The project owner shall transmit a copy of the CBO's approval or disapproval of the corrective action to the CPM within 15 days. If disapproved, the project owner shall advise the CPM, within five days, the reason for disapproval, and the revised corrective action to obtain CBO's approval.

STRUC-3 The project owner shall submit to the CBO design changes to the final plans required by the U.S Energy Information Administration, "Natural Gas Pipelines in the Western Region, ~~2007~~**2010** CBC, including the revised drawings, specifications, calculations, and a complete description of, and supporting rationale for, the proposed changes, and shall give to the CBO prior notice of the intended filing.

Verification: On a schedule suitable to the CBO, the project owner shall notify the CBO of the intended filing of design changes, and shall submit the required number of sets of revised drawings and the required number of copies of the other above-mentioned documents to the CBO, with a copy of the transmittal letter to the CPM. The project owner shall notify the CPM, via the monthly compliance report, when the CBO has approved the revised plans.

STRUC-4 Tanks and vessels containing quantities of toxic or hazardous materials exceeding amounts specified in the ~~2007~~**2010** CBC shall, at a minimum, be designed to comply with the requirements of that chapter.

Verification: At least 30 days (or project owner- and CBO-approved alternate time frame) prior to the start of installation of the tanks or vessels containing the above specified quantities of toxic or hazardous materials, the project owner shall submit to the CBO for design review and approval final design plans, specifications, and calculations, including a copy of the signed and stamped engineer's certification.

The project owner shall send copies of the CBO approvals of plan checks to the CPM in the following monthly compliance report. The project owner shall also transmit a copy of the CBO's inspection approvals to the CPM in the monthly compliance report following completion of any inspection.

MECH-1 The project owner shall submit, for CBO design review and approval, the proposed final design, specifications and calculations for each plant major piping and plumbing system listed in the CBO-approved master drawing and master specifications list. The submittal shall also include the applicable

QA/QC procedures. Upon completion of construction of any such major piping or plumbing system, the project owner shall request the CBO's inspection approval of that construction.

The responsible mechanical engineer shall stamp and sign all plans, drawings, and calculations for the major piping and plumbing systems, subject to CBO design review and approval, and submit a signed statement to the CBO when the proposed piping and plumbing systems have been designed, fabricated, and installed in accordance with all of the applicable laws, ordinances, regulations and industry standards, which may include, but are not limited to:

- American National Standards Institute (ANSI) B31.1 (Power Piping Code);
- ANSI B31.2 (Fuel Gas Piping Code);
- ANSI B31.3 (Chemical Plant and Petroleum Refinery Piping Code);
- ANSI B31.8 (Gas Transmission and Distribution Piping Code);
- NACE R.P. 0169-83;
- NACE R.P. 0187-87;
- NFPA 56;
- Title 24, California Code of Regulations, Part 5 (California Plumbing Code);
- Title 24, California Code of Regulations, Part 6 (California Energy Code, for building energy conservation systems and temperature control and ventilation systems);
- Title 24, California Code of Regulations, Part 2 (California Building Code); and
- San Diego County codes.

The CBO may deputize inspectors to carry out the functions of the code enforcement agency.

Verification: At least 30 days (or project owner- and CBO-approved alternative time frame) prior to the start of any increment of major piping or plumbing construction listed in the CBO-approved master drawing and master specifications list, the project owner shall submit to the CBO for design review and approval the final plans, specifications, and calculations, including a copy of the signed and stamped statement from the responsible mechanical engineer certifying compliance with applicable LORS, and shall send the CPM a copy of the transmittal letter in the next monthly compliance report.

The project owner shall transmit to the CPM, in the monthly compliance report following completion of any inspection, a copy of the transmittal letter conveying the CBO's inspection approvals.

MECH-2 For all pressure vessels installed in the plant, the project owner shall submit to the CBO and California Occupational Safety and Health Administration

(Cal-OSHA), prior to operation, the code certification papers and other documents required by applicable LORS. Upon completion of the installation of any pressure vessel, the project owner shall request the appropriate CBO and/or Cal-OSHA inspection of that installation.

The project owner shall:

1. Ensure that all boilers and fired and unfired pressure vessels are designed, fabricated, and installed in accordance with the appropriate section of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, or other applicable code. Vendor certification, with identification of applicable code, shall be submitted for prefabricated vessels and tanks; and

2. Have the responsible design engineer submit a statement to the CBO that the proposed final design plans, specifications, and calculations conform to all of the requirements set forth in the appropriate ASME Boiler and Pressure Vessel Code or other applicable codes.

Verification: At least 30 days (or project owner- and CBO-approved alternative time frame) prior to the start of on-site fabrication or installation of any pressure vessel, the project owner shall submit to the CBO for design review and approval, the above listed documents, including a copy of the signed and stamped engineer's certification, with a copy of the transmittal letter to the CPM.

The project owner shall transmit to the CPM, in the monthly compliance report following completion of any inspection, a copy of the transmittal letter conveying the CBO's and/or Cal-OSHA inspection approvals.

MECH-3 The project owner shall submit to the CBO for design review and approval the design plans, specifications, calculations, and quality control procedures for any heating, ventilating, air conditioning (HVAC) or refrigeration system. Packaged HVAC systems, where used, shall be identified with the appropriate manufacturer's data sheets.

The project owner shall design and install all HVAC and refrigeration systems within buildings and related structures in accordance with the CBC and other applicable codes. Upon completion of any increment of construction, the project owner shall request the CBO's inspection and approval of that construction. The final plans, specifications and calculations shall include approved criteria, assumptions, and methods used to develop the design. In addition, the responsible mechanical engineer shall sign and stamp all plans, drawings and calculations and submit a signed statement to the CBO that the proposed final design plans, specifications and calculations conform with the applicable LORS.

Verification: At least 30 days (or project owner- and CBO-approved alternative time frame) prior to the start of construction of any HVAC or refrigeration system, the project owner shall submit to the CBO the required HVAC and refrigeration calculations, plans, and specifications, including a copy of the signed and stamped statement from the responsible mechanical engineer certifying compliance with the CBC and other applicable codes, with a copy of the transmittal letter to the CPM.

ELEC-1 Prior to the start of any increment of electrical construction for all electrical equipment and systems 480 Volts or higher (see a representative list, below), with the exception of underground duct work and any physical layout drawings and drawings not related to code compliance and life safety, the project owner shall submit, for CBO design review and approval, the proposed final design, specifications, and calculations. Upon approval, the above listed plans, together with design changes and design change notices, shall remain on the site or at another accessible location for the operating life of the project. The project owner shall request that the CBO inspect the installation to ensure compliance with the requirements of applicable LORS. All transmission facilities (lines, switchyards, switching stations, and substations) are handled in conditions of certification in the **TRANSMISSION SYSTEM ENGINEERING** section of this document.

A. Final plant design plans shall include:

   1. one-line diagrams for the 13.8 kV, 4.16 kV and 480 V systems; and

   2. System grounding drawings.

B. Final plant calculations must establish:

   1. Short-circuit ratings of plant equipment;

   2. Ampacity of feeder cables;

   3. Voltage drop in feeder cables;

   4. System grounding requirements;

   5. Coordination study calculations for fuses, circuit breakers and protective relay settings for the 13.8 kV, 4.16 kV and 480 V systems;

   6. System grounding requirements; and

   7. Lighting energy calculations.

C. The following activities shall be reported to the CPM in the monthly compliance report:

   1. Receipt or delay of major electrical equipment;

   2. Testing or energization of major electrical equipment; and

   3. A signed statement by the registered electrical engineer certifying that the proposed final design plans and specifications conform to requirements set forth in the Energy Commission decision.

Verification: At least 30 days (or project owner- and CBO-approved alternative time frame) prior to the start of each increment of electrical construction, the project owner shall submit to the CBO for design review and approval the above listed documents. The project owner shall include in this submittal a copy of the signed and stamped statement from the responsible electrical engineer attesting compliance with the applicable LORS, and shall send the CPM a copy of the transmittal letter in the next monthly compliance report.

REFERENCES

Solar Millennium 2009a – Solar Millennium (TN 52939). Application for Certification Vol. 1 & 2, dated 8/24/2009

2012 PSEGS – Petition to Amend, 09-AFC-7C dated December 2012.

GEOLOGY AND PALEONTOLOGY

Casey Weaver, CEG

SUMMARY OF CONCLUSIONS

The proposed Palen Solar Electric Generating System is located in a moderately active geologic area of the eastern Mojave Desert geomorphic province in eastern Riverside County in southeastern California. The main geologic hazards at this site include strong ground shaking, hydrocompaction, dynamic compaction, expansive soils, and corrosive soils. These potential hazards can be effectively mitigated through facility design by incorporating recommendations contained in a design-level geotechnical report as required by the California Building Code (CBC 2007) and Condition of Certification **GEO-1.** Conditions of Certification **GEN-1, GEN-5,** and **CIVIL-1** in the **FACILITY DESIGN** section, should also mitigate these impacts to a less than significant level.

The proposed project area is currently not used for mineral production, nor is it under claim, lease, or permit for the production of locatable, leasable, or salable minerals. Sand and gravel resources are present at the site and could potentially be a source of salable resources; however, such materials are present throughout the regional area such that the PSEGS should not have a significant impact on the availability of such resources. There are no other known viable geologic or mineralogic resources at the PSEGS site.

Based on its independent research and review, Energy Commission staff believes that the potential is low for significant adverse impacts to the proposed project from geologic hazards during its design life and to potential geologic and mineralogic, resources from the construction, operation, and closure of the proposed project.

Locally, paleontological resources have been documented within lacustrine sediments in nearby Ford Dry Lake, and regionally in older Quaternary alluvium. Older alluvium and lacustrine deposits may underlie younger Quaternary alluvium at an undetermined, but potentially shallow, depth beneath the site surface. Potential impacts to paleontologic resources would be mitigated through worker training and monitoring by qualified paleontologists, as required by Conditions of Certification, **PAL-1** through **PAL-7** in areas where soils are exposed by conventional excavation operations. In areas where heliostats are to be supported by pylons that are vibro-inserted into the ground, impacts to paleontological resources cannot be determined without thorough characterization of the soil to be penetrated by the pylons. Existing studies indicate the soils beneath the solar field are likely to contain Pleistocene age vertebrate fossils. Based on existing information, the proposed method of construction would create an unmitigable significant impact to paleontological resources in the area where heliostat pylons are proposed.

Staff recommends that site characterization of the paleontological resources be conducted prior to the Final Staff Assessment. The characterization should be planned and conducted under the direction of a qualified paleontologist that is familiar with the site region in accordance with the Bureau of Land Management's (BLM) Potential Fossil Yield Classification (PFYC) system. The results of the characterization would enable staff to make a recommendation to the Committee regarding the extent and abundance of the resources, their significance, whether impacts can be mitigated and the scope of any proposed mitigation. Without site specific characterization, the significance of impact to paleontological resources cannot be determined and, based on existing information, the project would create an unmitigable significant impact. With appropriate characterization and interpretation, it is staff's opinion that the proposed PSEGS facility could be designed and constructed in accordance with all applicable laws, ordinances, regulations, and standards, and in a manner that both protects environmental quality and assures public safety, to the extent practical.

INTRODUCTION

In this section, staff discusses the potential impacts of geologic hazards on the proposed PSEGS site as well as the project's potential impacts to geologic, mineralogic, and paleontologic resources. Staff's objective is to ensure that there will be no consequential adverse impacts to significant geologic and paleontologic resources during the project construction, operation, and closure and that operation of the plant will not expose occupants to high-probability geologic hazards. A brief geologic and paleontologic overview is provided. The section concludes with staff's proposed monitoring and mitigation measures for geologic hazards and geologic, mineralogic, and paleontologic resources, with proposed Conditions of Certification.

METHODOLOGY AND THRESHOLDS FOR DETERMINING ENVIRONMENTAL CONSEQUENCES

The CEQA Guidelines, Appendix G, provide a checklist of questions that lead agencies typically address.

- Section (V) (c) includes guidelines that determine if a project will either directly or indirectly destroy a unique paleontologic resource or site or a unique geologic feature.
- Sections (VI) (a), (b), (c), (d), and (e) focus on whether or not the project would expose persons or structures to geologic hazards.
- Sections (X) (a) and (b) concern the project's effects on mineral resources.

The California Building Standards Code (CBSC) and CBC (2010) provide geotechnical and geologic investigation and design guidelines, which engineers must follow when designing a facility. As a result, the criteria used to assess the significance of a geologic hazard include evaluating each hazard's potential impact on the design and construction of the proposed facility. Geologic hazards include faulting and seismicity, liquefaction, dynamic compaction, hydrocompaction, subsidence, expansive soils, corrosive soils, landslides, tsunamis, and seiches. Of these, dynamic compaction, hydrocompaction, subsidence, corrosive soils, and expansive soils are geotechnical engineering issues, but are not normally associated with concerns for public safety.

Staff has reviewed geologic and mineral resource maps for the surrounding area, as well as site-specific information provided by the applicant of the previously-approved PSPP project ("the PSPP applicant"), to determine if geologic and mineralogic resources exist in the area and to determine if operations could adversely affect geologic and mineralogic resources.

To evaluate whether the proposed project and alternatives would generate a potentially significant impact as defined by CEQA on mineral resources, staff evaluated them against checklist questions posed in the 2006 CEQA Guidelines, Appendix G, *Environmental Checklist established for Mineral Resources*. These questions are:

A. Would the project result in the loss of availability of a known mineral resource that would be of value to the region and residents of the state?

B. Would the project result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan?

Staff reviewed existing paleontologic information and requested records searches from the Natural History Museum of Los Angeles County (NHMLA) and the University of California Museum of Paleontology (UCMP) online database for the site area. Site-specific information generated by the PSPP applicant for the previously-approved PSPP project was also reviewed. All research was conducted in accordance with accepted assessment protocol (SVP 1995) to determine whether any known paleontologic resources exist in the general area. If present or likely to be present, conditions of certification which outline required procedures to mitigate impacts to potential resources are proposed as part of the project's approval.

The Antiquities Act of 1906 (16 United States Code [§§431-433]) requires that objects of antiquity be taken into consideration for federal projects and the CEQA, Appendix G, also requires the consideration of paleontologic resources. The Paleontological Resources Preservation Act of 2009 requires the Secretaries of the United States Department of the Interior and Agriculture to manage and protect paleontologic resources on Federal land using scientific principles and expertise. The potential for discovery of significant paleontologic resources or the impact of surface disturbing activities to such resources is assessed using the Potential Fossil Yield Classification (PFYC) system. This system includes three conditions (Condition 1 [areas known to contain vertebrate fossils]; Condition 2 [areas with exposures of geological units or settings that have high potential to contain vertebrate fossils]; and Condition 3 [areas that are very unlikely to produce vertebrate fossils]). The PFYC class ranges from Class 5 (very high) for Condition 1 to Class 1 (very low) for Condition 3 (USDI 2007).

The existing Conditions of Certification allow the Energy Commission's compliance project manager (CPM) and the project owner to adopt a compliance monitoring scheme ensuring compliance with laws, ordinances, regulations, and standards (LORS) applicable to geologic hazards and the protection of geologic, mineralogic, and paleontologic resources.

Based on the information below, it is staff's opinion that the potential for significant adverse impacts to the project from geologic hazards, and to potential geologic, mineralogic, and paleontologic resources from the proposed project, is low.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS (LORS)

Applicable LORS are listed in the application for certification (AFC) (Solar Millennium 2009a). The following briefly describes the current LORS for both geologic hazards and resources and mineralogic and paleontologic resources.

Geology and Paleontology Table 1
Laws, Ordinances, Regulations, and Standards (LORS)

Applicable LORS	Description
Federal	
Antiquities Act of 1906 (16 United States Code [USC], 431-433)	The proposed PSEGS facility site is located entirely on land currently administered by the Bureau of Land Management (BLM). Although there is no specific mention of natural or paleontologic resources in the Act itself, or in the Act's uniform rules and regulations (Title 43 Part 3, Code of Federal Regulations [43 CFR Part 3], 'objects of antiquity' has been interpreted to include fossils by the Federal Highways Act of 1956, the National Park Service (NPS), the BLM, the Forest Service (USFS), and other Federal agencies.
Federal Land Policy and Management Act (FLPMA) of 1976 (43 USC 1701-1784)	Mandates that the BLM manage public lands under the principles of multiple use and sustained yield unless otherwise specified by law, and to protect the quality scientific, scenic, historical, archeological, and other values, and to develop 'regulations and plans for the protection of public land areas of critical environmental concern', which include 'important historic, cultural or scenic values'. Also charged with the protection of 'life and safety from natural hazards'.
Paleontologic Resources Preservation Act (PRPA) of 2009 (Public Law [PL] 111-011)	Authorizes Departments of Interior and Agriculture Secretaries to manage the protection of paleontologic resources on Federal lands.
National Historic Preservation Act of 1966 (NHPA) (16 USC 470)	Establishes policies for the 'preservation of the prehistoric and historic resources of the United States', under the direction of the Secretary of the Interior and the BLM.
State	
California Building Code (CBC), 2007	The CBC (2007) includes a series of standards that are used in project investigation, design, and construction (including grading and erosion control).
Alquist-Priolo Earthquake Fault Zoning Act, Public Resources Code (PRC), section 2621–2630	Mitigates against surface fault rupture of known active faults beneath occupied structures. Requires disclosure to potential buyers of existing real estate and a 50-foot setback for new occupied buildings. Portions of the site and proposed ancillary facilities are located within designated Alquist-Priolo Fault Zones. The proposed site layout places occupied structures outside of the 50-foot setback zone.
The Seismic Hazards Mapping Act, PRC Section 2690–2699	Areas are identified that are subject to the effects of strong ground shaking, such as liquefaction, landslides, tsunamis, and seiches.
PRC, Chapter 1.7, sections 5097.5 and 30244	Regulates removal of paleontologic resources from state lands, defines unauthorized removal of fossil resources as a misdemeanor, and requires mitigation of disturbed sites.

Applicable LORS	Description
Local	
Riverside County General Plan 2000, Safety Element	Adopts the Uniform Building Code (UBC) (1997), which provides design criteria for buildings and excavations. The UBC is superseded by the CBC (2007). Requires mitigation measures for geologic hazards, including seismic shaking, surface rupture (adopts APEFZ Act), liquefaction, unstable soils and slopes, and flooding.
Local	
Riverside County General Plan 2000, Multipurpose Open Space Element	Provides for ‘preservation of cultural, historical, archaeological, paleontologic, geologic and educational resources’. Also provides a map showing paleontologic sensitivity in the county.
Standards	
Society for Vertebrate Paleontology (SVP), 2010	The “Measures for Assessment and Mitigation of Adverse Impacts to Non-Renewable Paleontological Resources: Standard Procedures” is a set of procedures and standards for assessing and mitigating impacts to vertebrate paleontological resources. The measures were adopted in October 1995 and revised in 2010 by the SVP, a national organization of professional scientists.
Bureau of Land Management (BLM) Instructional Memorandum 2008-009	Provides up-to-date methodologies for assessing paleontological sensitivity and management guidelines for paleontological resources on lands managed by the Bureau of Land Management.

PROPOSED PROJECT

Each solar plant will be constructed using the following specifications:

Spread Footings

For most of the PSEGS project power block and common areas, shallow footings would be on the order of 1’-6” to 4’-0” thick with approximate top of footing set 2 ft +/- below grade requiring between 3’-6” to 6’-0” of excavation.

Slabs and Mat Foundations – Buildings and small equipment

Slabs and mat foundations placed near grade elevation can range from 0’-6” to 4’-0” thick and may be placed at grade level. Over-excavation of poor surface soils to 2’-0” depth that extends up to 5’-0” beyond the slab or mat may be required in accordance with the preliminary geotechnical report.

Large Foundations

Deeper mat foundations for the solar tower and STG are sized based on the preliminary geotechnical report that was prepared and submitted as part of the PSPP. Foundation design site parameters need to be verified with a specific soils investigation that addresses the power block foundation requirements. Note that an increase in the depth of these foundations requires an increase in the footing width to maintain the same contact pressure. The suggested foundation sizes can also be used as a pile supported mat, should further geotechnical investigation indicate the soil supported settlements are greater than currently anticipated.

Solar Tower

At the Solar Tower, the footing size would be 195 ft octagonal diameter (across flats) with a depth of 6'-0" below finish grade and soil disturbance to 8'-6" below grade.

Steam Turbine Generator (STG)

At the STG foundation, the mat will range from 3'-0" thick at the Lube Oil and Excitation Container area to between 6'-6" to 8'-0" thick under the STG and may extend beyond the edges of the STG unit to pick up the adjacent equipment skids.

Heliostats

Each solar plant will use approximately 85,000 heliostats—elevated mirrors guided by a tracking system mounted on a pylon—to focus the sun's rays on a SRSG atop a tower near the center of each solar field. The support pylons for the heliostats will be installed using vibratory technology to insert the pylons into the ground (pre-augering prior to the installation of the pylon may be required). Depths are not expected to be greater than 12 feet. The heliostat assembly (mirrors, support structure and aiming system) will be mounted on the pylon. The majority of the project site will maintain the original grades and natural drainage features and, therefore, construction will require machines that are maneuverable and can negotiate the terrain.

Onsite Electric Transmission System

The onsite electric transmission system would consist of underground cables to convey power from the power blocks to the switchyard. The cables would be routed under the paved access roads. A cable serving Solar Plant #2 will be routed to Solar Plant #1 and the cables will be routed in parallel to the common switchyard before transitioning to overhead structures and exiting the site. The installation of the transmission system would involve trenching to accommodate the underground electric transmission lines. The trench depth is expected to be up to 10 feet. Manholes located at intervals of approximately 1,000 to 2,000 feet may require excavation up to depths of 12 feet.

Generation Tie-line

A slight re-routing of the generation tie-line near the western end of the route and around the newly constructed Red Bluff Substation is proposed. The purpose of this re-routing is to align the PSEGS generation tie-line route immediately adjacent to the NextEra Desert Sunlight generation tie-line to minimize crossings over Interstate-10 and to ensure easy entry into the Red Bluff Substation nearest the PSEGS breaker position.

Setting and Existing Conditions

Depending on the published reference, the project site is located in either the southeastern portion of the Mojave Desert geomorphic province (CGS 2002a), or the northeastern quarter of the Colorado Desert geomorphic province (Norris and Webb 1990), in the Mojave Desert of southern California near the Arizona border. Geologically and geographically the area is more characteristic of the Mojave Desert geomorphic province. The Mojave Desert is a broad interior region of isolated mountain ranges which separate vast expanses of desert plains and interior drainage basins. The physiographic province is wedge-shaped, and separated from the Sierra Nevada and Basin and Range geomorphic provinces by the northeast-striking Garlock Fault on the northwest side. The northwest-striking San Andreas fault defines the southwestern boundary, beyond which lie the Transverse Ranges. The Colorado Desert geomorphic province lies to the south and east of the project area. The topography and structural fabric in the Mojave Desert is predominately southeast to northwest, and is associated with mid-Miocene to recent faulting oriented similar to the San Andreas Fault. A secondary east to west orientation correlates with structural trends in the Transverse Ranges geomorphic province.

The site is situated on a broad alluvial plain within the northwest-trending Chuckwalla Valley between the Chuckwalla Mountains to the southwest, and the Palen Mountains to the northeast. Overall the proposed site slopes at very shallow grades north and northeast toward the local topographic low at Palen Dry Lake.

Quaternary age alluvial, lacustrine and eolian sedimentary deposits are mapped in the vicinity of the proposed PSEGS site (CDMG 1967; USGS 1989; USGS 1990). The local stratigraphy as interpreted by different authors, is presented in **Geology and Paleontology Table 2**.

Geology and Paleontology Table 2
Correlation and Ages of Stratigraphic Units

Age	Unit/Description	Jennings (CDMG 1967)	Stone & Pelka (USGS 1989)	Stone (USGS 1990)
Holocene	Eolian sands	Qs	Qs	Qs
	Younger alluvium	Qal	Qya	Qta
	Playa lake deposits	Ql	Qp	Qp
Pleistocene	Older alluvium	Qc	Qia	Qta
			Qoa	

Holocene units, which include eolian sands, younger alluvium, and playa lake deposits, are mapped over nearly the entire site surface. Eolian sands consist of unconsolidated deposits of well sorted, windblown sand in dunes and sheets. Younger alluvium is composed of sand, pebbly sand and sandy pebble-gravel, and is generally coarser grained closer to mountain ranges. Desert varnish is not well developed in the mostly unconsolidated and undissected sediments. Playa lake deposits are also unconsolidated, and are comprised of clay, silt and sand. Older alluvium is present at the surface along the southwestern edge of the site. The exposures of older alluvium occur as northeast-oriented ridges of material protruding into the site from the southwest, with the intervening areas occupied by drainages filled with younger alluvium. Older alluvium is composed of consolidated gravel and sand that is moderately dissected with moderately developed desert pavement and varnish.

Exploration drilling conducted in 1978 by the U.S. Geological Survey (USGS) resulted in two boreholes in the Palen Dry Lake area, one of which lies within the boundaries of the site. U.S. Geological Survey Borehole PDL#1 was advanced to a depth of 505 feet below ground surface (bgs) near the north-central boundary of Section 27 near the northeast corner of the proposed project. The lithologic log of PDL#1 indicates the subsurface near the northern site boundary is composed of moderately to thickly bedded sands, gravels, and clays to a depth of approximately 55 feet where a transition to overall clay dominated formation takes place and continues to the total depth of the borehole. The interbedded clays, sands, and gravels probably represent periods of primarily lakebed deposition interspersed with episodes of coarse sediment transport from the nearby Chuckwalla and Palen Mountains. A gravel dominated bed present from approximately 90 to 110 feet also attests to a period of clastic deposition during a period of primarily lakebed sedimentation (Simoni Jr. 1981). Water wells 05S17E33N001S and 06S/17E-03M01S, which were drilled in 1958 in what is now the southeast portion of the proposed PSEGS site reportedly had a similar stratigraphic column with coarse alluvium from the surface to between 48 and 102 feet overlying strata which are clay dominated to the bottom of the well borings at depths between 758 feet and 818 feet bgs (PSEGS 2009).

A preliminary geotechnical investigation including 13 exploratory borings and eight test pits has been completed for the general area of the PSEGS site (Kleinfelder 2009). The preliminary geotechnical investigation reveals that the PSEGS site is underlain by alluvial and eolian deposits of Pleistocene through Holocene age, which consist of dune sands, alluvium and lake deposits to the depths explored (approximately 76.5 feet below the existing ground surface). The PSEGS site is generally surfaced with unconsolidated soils due to desiccation and/or wind deposition to a maximum depth of 2 feet below the existing grade. The soils below the surficial materials are generally medium dense to very dense poorly graded sand with varying amounts of silt, silty sand and clayey sand. Firm to very hard sandy clays are locally present as interbedded layers 5 to 10 feet thick at depths generally greater than 25 feet below existing grade. The near surface site soils are primarily granular with no to low swell potential; however, potentially expansive soils were observed at the ground surface in the northeastern portion of the site (Kleinfelder 2009). Loose dune sand was also observed at the ground surface and at depth in the southwestern portion of the site (Kleinfelder 2009). Collapse potential tests indicate the site soils exhibit a collapse potential in the range of 0 to 3.0 percent when inundated with water.

The site is not crossed by any known active faults or designated Alquist-Priolo Earthquake Fault Zone (EFZ, formerly called Special Studies Zones) (CGS 2002b). A number of major, active faults lie within 62 miles of the site. These faults are discussed in detail under the **GEOLOGIC HAZARDS** section later in this section. Several northwest-striking, south-dipping basement thrust faults are mapped at the extreme southern end of the Palen Mountains, and are inferred beneath Quaternary and Tertiary sediments in Chuckwalla Valley (Harding and Coney 1985; CDMG 1967; USGS 1990; USGS 2006). These faults are part of a major Mesozoic terrain-bounding structural zone that was active during late Jurassic time, and are associated with folding and metamorphism in the Palen and McCoy Mountains. The basement faults are no longer active, and are not exposed anywhere on the surface of the proposed site.

Little is known regarding the depth to bedrock beneath the proposed PSEGS site. Gravity investigations indicate the Chuckwalla Valley overlies three alluvium filled sub-basins separated by east to northeast-trending subsurface basement ridges. Gravity data indicate basin fill in Chuckwalla Valley ranges from approximately 650 feet deep across faulted subsurface basement ridges to greater than 6,000 feet deep near the sub-basin centers. Analysis of gravity anomalies indicates the crystalline basement beneath the sediment filled basins is highly faulted and structurally complex (Rotstein et al. 1976). Review of gravity anomaly data suggests the proposed PSEGS site is underlain at an undetermined depth by faulted tertiary non-marine and marine sedimentary, pyroclastic, and volcanic rocks.

The ground water level beneath the site was measured as part of the PSPP applicant's water resources investigation. Depth to water beneath the site in well 06S/17E-03M01S was reportedly 180 feet bgs on May 22, 2009 (PSEGS 2009). Subsurface exploration performed at the site (Kleinfelder 2009) encountered ground water at depths of 68 and 73 feet below existing grade; however, this occurrence of ground water is believed to be associated with perched conditions and not indicative of the true water table.

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

This section considers two types of impacts. The first is geologic hazards, which could impact the proper functioning of the proposed facility and create life/safety concerns. The second is the potential impacts the proposed facility could have on existing geologic, mineralogic, and paleontologic resources in the area.

DIRECT/INDIRECT IMPACTS AND MITIGATION

Ground shaking, hydrocompaction, dynamic compaction, expansive soils, and corrosive soils represent the main geologic hazards at the proposed site. These potential hazards could be effectively mitigated through facility design by incorporating recommendations contained in the project geotechnical evaluation as required by **GEO-1**. Conditions of Certification **GEN-1, GEN-5,** and **CIVIL-1** in the **FACILITY DESIGN** section should also mitigate these impacts to a less than significant level.

The site is currently not used for mineral production, nor is it under claim, lease, or permit for the production of locatable, leasable, or salable minerals. Sand and gravel resources are present at the site; however, such materials are present throughout the regional area such that the PSEGS should not have a significant impact on the availability of such resources. In addition, the potential resource would become available again following decommissioning of the project. Only limited exploration for oil and gas resources has been performed in the area, and no active oil or gas operations are located in the immediate vicinity of the project. As a result, the PSEGS would not impact any current or reasonably foreseeable development of geologic or mineral resources.

Staff has reviewed the paleontologic resources assessment in Section 5.9 and Appendix H of the AFC (Solar Millennium 2009a; SWCA 2009). Staff has also reviewed correspondence from NHMLA (McLeod 2009); UCMP; and the Riverside County Land Information System (RCLIA 2009) for information regarding known fossil localities and stratigraphic unit sensitivity within the proposed project area. All research was conducted in accordance with accepted assessment protocol (SVP 1995) to determine whether any known paleontologic resources exist in the general area. If present or likely to be present, Conditions of Certification which outline required procedures to mitigate impacts to potential resources are included as part of the projects approval.

Based on the above research, SVP criteria, the paleontologic report appended to the AFC (Solar Millennium 2009a) and the confidential paleontologic information filing (Solar Millennium 2009b), staff considers that there is a high probability that paleontologic resources will be encountered during grading and excavation in the older Quaternary age alluvial and lacustrine sediments. Further, deeper excavations in the younger alluvium that will encounter the underlying older Quaternary age alluvial soils will also have a high probability to encounter paleontologic resources. Conditions of Certification **PAL-1** to **PAL-7** are designed to mitigate potential impacts to paleontologic resources to less than significant levels in areas where conventional excavation operations occur. These Conditions of Certification essentially require a worker education program in conjunction with the monitoring of earthwork activities by a qualified professional paleontologist (paleontologic resource specialist [PRS]).

As stated above, existing information indicates that site soils have a high probability of containing fossils. The approved project proposed substantial site grading and excavation. Using conventional excavation methods, fossils encountered during construction would have been uncovered, discovered, collected and recorded thereby contributing to the scientific understanding of the paleoclimate and paleobiology of the area. The proposed project would use a different construction methodology. Rather than parallel rows of mirrors suspended on level linear lattice structures, the proposed project would install 170,000 individual pole structures (pylons) to support heliostat mirrors. The pylons would be installed by vibro-insertion methods. Each pylon would be attached to a specialized piece of equipment that would drive each pylon through the soil column to a final depth of approximately 12 feet below ground surface. This method of construction does not utilize excavation and there is no retrieval of subsurface soils or any fossils contained within those soils. In effect, any fossils that are in the path of pylon insertion would be permanently destroyed with no recovery, discovery or scientific benefit realized.

Under the site's current classification of paleontological sensitivity, it must be concluded that significant adverse impacts to paleontological resources would result from the proposed method of pylon insertion. Under existing conditions, an Energy Commission override of the potential significant adverse impact would be required for the project to be approved.

Because there has been no subsurface characterization of paleontological resources conducted on the site, staff is unable to determine appropriate measures to minimize or compensate for the potential significant adverse impact. Subsurface characterization of the site would allow staff to propose mitigation measures that are both feasible and roughly proportional to the actual impacts of the project. Subsurface characterization could also result in a reduction of the existing paleontogical sensitivity classification, possibly eliminating the need for an override. To be specific, if an appropriately designed and executed subsurface characterization indicated that the site has a low paleontological sensitivity, then the corresponding impact would also be low and potentially less than significant. If, on the other hand, the subsurface characterization demonstrated the site is underlain by a high concentration of rare extinct species, mitigation in the form of establishing some regional educational facility may be appropriate.

The existing Conditions of Certification allow the Energy Commission's CPM and the project owner to adopt a compliance monitoring scheme ensuring compliance with LORS applicable to geologic hazards and the protection of geologic and mineralogic resources.

Geologic Hazards

Review of the AFC (Solar Millennium 2009a) and the site-specific subsurface information (Kleinfelder 2009), coupled with staff's independent research, indicate that the possibility of geologic hazards significantly affecting the operation of the plant site during its practical design life is low. However, geologic hazards must be addressed in a design-level project geotechnical report per CBC (2010) requirements and Condition of Certification **GEO-1**.

Staff's independent research included the review of available geologic maps, reports, and related data of the site. Geologic information was available from the California Geological Survey (CGS), California Division of Mines and Geology (CDMG, now known as CGS), the USGS, the American Geophysical Union, the Geologic Society of America, the Southern California Earthquake Data Center (SCEDC), and other organizations.

Faulting and Seismicity

Energy Commission staff reviewed numerous CGS, CDMG and USGS publications as well as informational websites in order to gather data on the location, timing and type of faulting in the proposed project area. Type A and B faults within 63 miles (100 kilometers) of the site are listed in **Geology and Paleontology Table 3**. Type A faults have slip-rates of $\geq$5 mm per year and are capable of producing an earthquake of magnitude 7.0 or greater. Type B faults have slip-rates of 2 to 5 mm per year and are capable of producing an earthquake of magnitude 6.5 to 7.0. The fault type, potential magnitude, and distance from the site are summarized in **Geology and Paleontology Table 3**. Because of the large size of the proposed site, the distances to faults are measured from a point between the two proposed power blocks within the site.

Geology and Paleontology Table 3
Active Faults Relative to the Proposed Palen Solar Electric Generating System Site

Fault Name	Distance from Site (miles)	Maximum Earthquake Magnitude (Mw)	Fault Type and Strike	Fault Class
Brawley Seismic Zone	37.0	6.4	Right-Lateral Strike Slip (Northwest)	A
San Andreas: Coachella M-1c-5	37.0	7.2	Right-Lateral Strike Slip (Northwest)	A
San Andreas SB-Coachella M-1b-2	37.0	7.7	Right-Lateral Strike Slip (Northwest)	A
San Andreas: Whole	37.0	8.0	Right-Lateral Strike Slip (Northwest)	A
Elmore Ranch	40.6	6.6	Left-Lateral Strike Slip (Northeast)	B
Pinto Mountain	50.8	7.2	Left-Lateral Strike Slip (East-West)	B
Pisgah-Bullion Mountain–Mesquite Lake	54.9	7.3	Right-Lateral Strike Slip (Northwest)	B
Imperial	57.4	7.0	Right-Lateral Strike Slip (Northwest)	A
Superstition Hills	59.0	6.6	Right-Lateral Strike Slip (Northwest)	A
San Jacinto–Anza	60.0	7.2	Right-Lateral Strike Slip (Northwest)	A
Superstition Mtn.	62.1	6.6	Right-Lateral Strike Slip (Northwest)	A

Type C and otherwise undifferentiated faults which are more than 20 miles from the site are not discussed here because they are unlikely to undergo movement or generate seismicity which could affect the project.

Eleven Type A and B faults and fault segments were identified within 63 miles of the site (**Geology and Paleontology Table 3).** Of these, none are within 35 miles of the site. Eight of the faults are Type A right-lateral, northwest-trending strike-slip fault systems that are part of or subparallel to the San Andreas Fault System. Two of the remaining three faults are Type B, are east-west to northeast-striking, and are left-lateral strike-slip faults with characteristics similar to the Garlock Fault, which bounds the northwestern side of the Mojave Desert geomorphic province (CGS 2002a). All fault zones in

Geology and Paleontology Table 3 are subject to the Alquist-Priolo Earthquake Fault Zoning Act of 1972 (CDMG 2003).

The site is located just southwest of the Mojave-Sonoran Belt, a roughly 60-mile-wide structural belt that has been correlated with the southern extension of the Walker Lane Fault Zone (USGS 1991). The western boundary for the structural zone, located 5 to10 miles northeast of the proposed site, is marked by an abrupt termination of north- and northeast-trending mountain ranges and basins to the east that are characteristic of the San Andreas Fault Zone, and northwest-trending strike-slip faulting to the west. The Mojave-Sonoran Belt is notable for its relative lack of seismicity and recent faulting (USGS 1991). The region has experienced a low frequency of Pliocene faulting, and Pleistocene faults are nearly absent. These characteristics are unusual given its proximity to areas of intense faulting and frequent seismicity, such as the Eastern California Shear Zone (Dokka and Travis 1990) to the northwest and the Salton Trough to the southwest.

The close proximity of the site to the Mojave-Sonoran belt and relatively great distance from more seismically active areas to the west and northwest would suggest a relatively low to moderate probability of intense ground shaking in the project area. However, events such as the Landers earthquake (M7.6), which occurred on June 28, 1992 approximately 78 miles from the site (Blake 2000b), demonstrate that the site could be subject to moderate levels of earthquake-related ground shaking in the future.

Preliminary estimates of ground motion based on probabilistic seismic hazard analyses have also been calculated for the project site using the USGS Earthquake Hazards application called the U.S. Seismic “DesignMaps” Web Application (**Geology and Paleontology Table 4**). This application produces seismic hazard curves, uniform hazard response spectra, and seismic design values. The values provided by this application are based upon data from the 2008 USGS National Seismic Hazard Mapping Project. These design parameters are for use with the 2012 International Building Code, the 2010 ASCE-7 Standard, the 2009 NEHRP Provisions, and their respective predecessors.

These parameters are project-specific and, based on PSEG’s location, were calculated using latitude and longitude inputs of 33.691degrees north and 115.198 degrees west, respectively. Other inputs for this application are the site “type” which is based on the underlying geologic materials and the “Structure Risk Category”. The assumed site class for PSEG is “D”, which is applicable to stiff soil. These parameters can be updated as appropriate following the results presented in a project-specific geotechnical investigation report performed for the site. The assumed “Structure Risk Category” is “III”, which is based on its inherent risk to people and the need for the structure to function following a damaging event. Risk categories range from I (non essential) to IV (critical). Examples of risk category I include agriculture facilities, minor storage facilities, etc., while examples of category IV include fire stations, hospitals, nuclear power facilities, etc.

Geology and Paleontology Table 4
Planning Level 2010 CBC Seismic Design Parameters Maximum Considered Earthquake, ASCE 7 Standard

Parameter	Value
Assumed Site Class	D
Structure Risk Category	III - Substantial
SS – Mapped Spectral Acceleration, Short (0.2 Second) Period	0.657 g
S1 – Mapped Spectral Acceleration, Long (1.0 Second) Period	0.289 g
Fa – Site Coefficient, Short (0.2 Second) Period	1.275
Fv – Site Coefficient, Long (1.0 Second) Period	1.823
SDS – Design Spectral Response Acceleration, Short (0.2 Second) Period	0.558 g
SD1 – Design Spectral Response Acceleration, Long (1.0 Second) Period	0.351 g
SMS – Spectral Response Acceleration, Short (0.2 Second) Period	0.837 g
SM1 – Spectral Response Acceleration, Long (1.0 Second) Period	0.526 g

ASCE = American Society of Civil Engineers
Values from USGS 2010b

The ground acceleration values presented are typical for the area. Other developments in the adjacent area will also be designed to accommodate strong seismic shaking. The potential for and mitigation of the effects of strong seismic shaking during an earthquake should be addressed in a project-specific geotechnical report, per CBC 2010 requirements, and Condition of Certification **GEO-1** and Conditions of Certification **FACILITY DESIGN GEN-1**, **GEN-5** and **CIVIL-1**. Compliance with these conditions of certification would ensure the project is built to current seismic standards and potential impacts would be mitigated to insignificant levels in accordance with current standards of engineering practice.

Liquefaction

Liquefaction is a condition in which a saturated cohesionless soil may lose shear strength because of sudden increase in pore water pressure caused by an earthquake. However, the potential for liquefaction of strata deeper than approximately 40 feet below surface is considered negligible due to the increased confining pressure and because geologic strata at this depth are generally too compact to liquefy.

The site is located within an area with low to moderate level of liquefaction potential as delineated by RCLIA (2009). However, the estimated depth to ground water based on measured values in boreholes and wells near the proposed site is greater than 60 feet below existing grade (Kleinfelder 2009; Solar Millennium 2009a). In addition, the typical medium dense to very dense nature of the coarse grain soils encountered in the PSEGS borings (Kleinfelder 2009) indicates that there is no liquefaction potential at the site (Kleinfelder 2009).

Lateral Spreading

Lateral spreading of the ground surface can occur within liquefiable beds during seismic events. Lateral spreading generally requires an abrupt change in slope; that is, a nearby steep hillside or deeply eroded stream bank. Other factors such as distance from the epicenter, magnitude of the seismic event, and thickness and depth of liquefiable layers also affect the amount of lateral spreading. Because the site is not subject to catastrophic liquefaction-induced settlement, the potential for lateral spreading during seismic events would be negligible due to the low relief and very shallow slopes at the site surface.

Dynamic Compaction

Dynamic compaction of soils results when relatively unconsolidated granular materials experience vibration associated with seismic events. The vibration causes a decrease in soil volume, as the soil grains tend to rearrange into a more dense state (an increase in soil density). The decrease in volume can result in settlement of overlying structural improvements. The site is generally underlain by medium-dense to very-dense granular soils. However, loose sand layers are occasionally present at the surface and as buried layers at the site (Kleinfelder 2009). The potential for and mitigation of the effects of dynamic compaction of site soils during an earthquake should be addressed in a project-specific geotechnical report as required by the CBC (2007) and Condition of Certification **GEO-1**. Common mitigation methods include deep foundations (driven piles; drilled shafts) for severe conditions, geogrid-reinforced fill pads for moderate severity and over-excavation and replacement for areas of minimal hazard.

Hydrocompaction

Hydrocompaction (also known as hydro-collapse) is generally limited to young soils that were deposited rapidly in a saturated state, most commonly by a flash flood. The soils dry quickly, leaving an unconsolidated, low density deposit with a high percentage of voids. Foundations built on these types of compressible materials can settle excessively, particularly when landscaping irrigation dissolves the weak cementation that is preventing the immediate collapse of the soil structure. The depositional environment of the Chuck-walla Valley suggests that the soils may be subjected to hydrocompaction. The project geotechnical report indicates that there is a low to moderate hydrocompaction potential based on the geotechnical data and the observation of soil profile in the test pits (Kleinfelder 2009). The potential for and mitigation of the effects of hydrocompaction of site soils should be addressed in a project-specific geotechnical report as required by the CBC (2007) and Condition of Certification **GEO-1**. Typical mitigation measures would include over-excavation/replacement, mat foundations or deep foundations depending on severity and foundation loads.

Subsidence

The Riverside County General Plan indicates the basin fill sediments in Chuckwalla Valley are susceptible to subsidence (RCLIA 2008). Regional ground subsidence is typically caused by petroleum or ground water withdrawal that increases the effective unit weight of the soil profile, which in turn increases the effective stress on the deeper soils. This results in consolidation or settlement of the underlying soils. However, even during the 1980’s and 1990’s when regional ground water extraction was at its historic maximum of approximately 48,000 acre-feet per year (ac-ft/yr) no localized or regional subsidence was recorded. Current ground water withdrawals are reportedly approximately 2,000 ac-ft/yr and even the proposed project demand of an additional 201 ac-ft/yr will not approach historic pumping demands. Additional information with respect to historical and anticipated ground water pumping is contained in the **SOIL AND WATER RESOURCES** section. In addition, no petroleum or natural gas withdrawals are taking place in the proposed site vicinity. Therefore, the potential for local or regional ground subsidence resulting from petroleum, natural gas, or ground water extraction is considered to be very low.

Local subsidence or settlement may also occur when areas containing compressible soils are subjected to foundation or fill loads. The typical medium dense to very dense granular site soils are indicative of low to negligible local subsidence. Clay layers present at depth are typically deeper than the anticipated zone of influence of shallow foundations and would therefore not be subjected to consolidation settlement from surcharge loading from conventional shallow foundations.

Expansive Soils

Soil expansion occurs when clay-rich soils with an affinity for water exist in place at a moisture content below their plastic limit. The addition of moisture from irrigation, precipitation, capillary tension, water line breaks, etc. causes the clay soils to absorb water molecules into their structure, which in turn causes an increase in the overall volume of the soil. This increase in volume can correspond to excessive movement (heave) of overlying structural improvements. The preliminary geotechnical report for the project did encounter potentially expansive clay soils at the ground surface in the northeastern portion of the site (Kleinfelder 2009). However, interbedded layers of clay soils are present in the subsurface soil profile in this area. As a result, there is the potential for expansive soils to be present at the locations of proposed structural improvements. The potential for and mitigation of the effects of expansive site soils should be addressed in a project-specific geotechnical report as required by the CBC (2010) and Condition of Certification **GEO-1**. Typical mitigation measures would include over-excavation/replacement or deep foundations depending on severity and foundation loads.

Corrosive Soils

Fine grain soils with high in-situ moisture contents that contain sulfides can be corrosive to buried metal pipe, which can lead to premature pipe failure and leaking. Such soils are present at this site, and the preliminary geotechnical investigation (Kleinfelder 2009) indicates that site soils could be potentially corrosive to metal pipe. The effects of corrosive soils can be effectively mitigated through final design by incorporating the recommendations of the site-specific project geotechnical report required by the CBC and Condition of Certification **GEO-1**. Mitigation of corrosive soils with respect to metal pipe typically involves cathodic protection or polyethylene encasement of the pipe.

Landslides

Due to the low site gradient and the absence of topographically high ground in the immediate site vicinity, the potential for landslide impacts to the site is considered to be negligible.

Flooding

The PSEGS area has not been mapped by the Federal Emergency Management Agency (FEMA) for flood potential (FEMA 2009). Because the site is topographically higher than Palen Dry Lake to the north, it is staff's opinion that the potential for flooding at the site is limited to infrequent high volume (flash flood) events which may occur due to heavy rainfall in the Chuckwalla Mountains southwest of the site. Storm waters would be carried across the proposed site from roughly southwest to northeast via existing drainages. Site drainage would be modified during project construction and other engineering improvements will also be made to mitigate potential impacts due to catastrophic flooding (Solar Millennium 2009). Additional information is contained in the **SOIL AND WATER RESOURCES** section.

Tsunamis and Seiches

The proposed PSEGS site is not located near any significant surface water bodies, and therefore the potential for impacts due to tsunamis and seiches is considered to be negligible.

Volcanic Hazards

The site is located approximately 40 miles west of the Lavic Lake volcanic hazard area (VHA), an approximately 14-square-mile area within the Mojave Desert comprised of Miocene to Holocene age dacitic to basaltic flows, pyroclastic rocks, and volcaniclastic sediments (Glazner 2000). The Lavic Lake VHA has been designated by the USGS as an area subject to lava flows and tephra deposits associated with basalt or basaltic andesite vents (Miller 1989). The Amboy Crater – Lavic Lake VHS is also considered to be subject to future formation of cinder cones, volcanic ash falls, and phreatic explosions. The recurrence interval for eruptions has not been determined, but is likely to be in the range of one thousand years or more. Because the site is not located within a designated volcanic hazard area, staff considers the likelihood of significant impacts to the project resulting from volcanic activity would be low.

Geologic, Mineralogic, and Paleontologic Resources

Geologic and Mineralogic Resources

Staff has reviewed applicable geologic maps and reports for this area (Blake 2000a and b; CDMG 1990; CDMG 1994a and b; CDMG 1998; CDMG 1999; CDMG 2003; CGS 2002a, b and c; CGS 2007; Jennings and Saucedo 2002; Kleinfelder 2009; SCEDC 2008; USGS 2003; USGS 2008a and b). The site is currently not used for mineral production, nor is it under claim, lease, or permit for the production of locatable, leasable, or salable minerals. Sand and gravel resources are present at the site and could potentially be a source of salable resources; however, such materials are present throughout the regional area such that the PSEGS should not have a significant impact on the availability of such resources.

The proposed PSEGS site is mapped as Mineral Resource Zone (MRZ)-4 (CDMG 1994a). Mineral Resource Zone-4 refers to “areas of no known mineral occurrences where geologic information does not rule out either the presence or absence of industrial mineral resources”.

No economically viable mineral deposits are known to be present at the site (CDMG 1994a; Kohler 2006), and no mines are known to have existed within the proposed project boundaries (USGS 2008b). Many inactive mines and mineral prospects are hosted by metamorphic and intrusive basement rocks within 10 miles of the proposed project boundary, primarily in the Palen and Chuckwalla Mountains. These have produced a number of precious and base metals, including iron (magnetite) and pyrophyllite (CDMG 1994a). Minor gold, silver, copper and uranium prospects are located in the Palen Mountains northeast of the site. The Black Jack Mine in the northern McCoy Mountains about 16 miles northeast of the site is known for the most productive and most extensively worked manganese mine in the southern California. This manganese mine was active during war times and in the 1950s to produce several thousand tons of manganese. This area is within the approximately 1.4-square-mile surface area Ironwood Manganese District. Other mining areas, including the Blue Bird Mine area, St. John Mine area, and George Mine area are also located in the northern McCoy Mountains and have produced manganese, copper, and a small amount of silver and gold in the past (CDMG 1994a). Uranium has been claimed in the southern McCoy Mountains about 22 miles east of the site with reported past production by Caproci-Woock Groups (CDMG 1968). There are several other prospective or claim areas for minerals in the McCoy Mountains including manganese, copper, silver, gold, and uranium (USGS 2009). The Roosevelt and Rainbow group of mines in the Mule Mountain district, also known as the Hodges Mountain district that is located about 26 miles southeast of the site, have produced some gold and copper from the quartz veins in granitic rocks (CDMG 1998).

The nearest oil and gas fields are located more than 150 miles west of site in the Los Angeles Sedimentary basin (CDC 2001). The nearest geothermal field is located at Brawley just south of the Salton Sea in the Imperial Valley basin about 40 miles southwest of site (CDC 2000; CDC 2001).

Several gravel borrow pits are present along Interstate 10 (I-10) south of the site, and the presence of alluvial fan materials at the proposed project location means that the property could potentially be accessed and developed as a source of salable sand and gravel resources. During construction, the project owner may need or desire to move sand and gravel either off-site, or between the different units of the facility. Should this occur, the project owner would be required to comply with BLM regulations in 43 CFR Part 3600, which regulates the production and use of sand and gravel from public lands. Use of sand and gravel or other mineral materials within the boundaries of an authorized ROW is permitted; however, removal of these materials from an authorized ROW would require payment to the United States of the fair market value of those materials.

Paleontologic Resources

Staff has reviewed the paleontologic resources assessment in Section 5.9 of the AFC (Solar Millennium 2009a). Staff has also reviewed the paleontologic literature and records search conducted by NHMLA (McCleod, 2009); UCMP; and RCLIA (2009) for information regarding known fossil localities and stratigraphic unit sensitivity within the proposed project area. Site-specific information generated by the applicant for the PSPP was also reviewed (SWCA 2009).

Near-surface geology beneath the site consists primarily of Quaternary alluvium, eolian and lacustrine sediments which increases in age with depth from Holocene at the surface to Pleistocene and older at depth (CDMG 1967; USGS 1989; USGS 1990; USGS 2006). Coarse-grained sediments grade laterally and are interbedded with lakebed deposits of similar ages. Pleistocene age older alluvium, which is exposed along the southwestern boundary of the site, underlies younger alluvium and lacustrine sediments. Older alluvium would likely be buried at progressively deeper depths beneath Holocene sediments to the northeast across the site.

The information reviewed indicates there are no recorded fossil collection sites within the proposed project boundaries or within a one-mile radius. Three vertebrate fossil collection areas have been documented in the proposed project area within the same or similar sedimentary units which underlie the site. One location east-southeast of the site between I-10 and Ford Dry Lake contained fossil remains of a pocket mouse. Another site northwest of the proposed project site in the northern Chuckwalla Valley yielded fossil remains of tortoise, horse, camel, llama and, most recently, saber tooth cat.

The results of a site-specific comprehensive surficial field survey recorded one non-significant fossil occurrence that yielded a non-diagnostic vertebrate material within the project limits (Solar Millennium 2009b). The specimen was discovered *ex-situ* (i.e. removed from its original place of fossilization) on the ground surface as a lag deposit transported an unknown distance and re-deposited on top of alluvial sediments (Solar Millennium 2009a). As a result, the fossil resource discovered on the surface within the limits of the project is not considered significant.

The Riverside County Transportation and Land Management Agency (TLMA) has produced a paleontological sensitivity map of the county (RCLIS 2009). The mapping indicates that areas underlain by playa lake, eolian and younger alluvial deposits within and around the Palen Dry Lake basin have a high paleontological sensitivity rating. Younger alluvium upslope from the lake bed has a low sensitivity rating, and older alluvium is assigned an undetermined sensitivity rating, according to the TLMA.

Based on the above information, the paleontological resource sensitivity of undisturbed Quaternary alluvium and lacustrine sediments varies from low at depths less than 1.5 feet to high at depths below 1.5 feet. Since the depth to Pleistocene age sediments beneath Holocene deposits is unknown, staff concludes that all sediments beneath disturbed ground should initially be treated as highly sensitive. Where these units are mapped at the surface or may be present near the surface adjacent to these mapped areas, specifically along the northern and southern borders of the site, paleontological monitoring should be conducted during any excavation activity. Since the depth to Pleistocene age alluvial and lacustrine deposits is undetermined at present for the remainder of the site, any excavations that penetrate below 1.5 feet of the existing ground surface should be treated as having a high potential for impacting significant paleontological resources and would require paleontological monitoring. This depth is based on observations of possible older alluvium encountered in excavations advanced for the geomorphic reconnaissance report (Solar Millennium 2009a). This depth would likely increase from the northern and southern boundaries towards the center of the proposed PSEGS site. After subsurface field exploration, and monitoring of grading and trenching activities during proposed construction of the site, a qualified professional paleontologist could determine the appropriate depth above which the coarse and fine grained soils are Holocene in age, have a low sensitivity, and low potential for adverse impacts on paleontological resources. Where pylons are driven into soils with high sensitivity, the potential for adverse impacts on paleontological resources is undetermined.

These conclusions are based on SVP criteria, the Paleontologic Resource Assessments in the AFC (Solar Millennium 2009a), and the independent records searches and paleontologic review provided by McLeod (2009), the UCMP (2009); and RCLIA (2009). Existing Conditions of Certification **PAL-1** to **PAL-7** are designed to mitigate paleontologic resource impacts resulting from conventional excavation operations, as discussed above, to less than significant levels. These conditions would essentially require a worker education program in conjunction with the monitoring of earthwork activities by the PRS assigned to the project.

In areas where heliostats are to be supported by pylons that are vibro-inserted into the ground, impacts to paleontological resources cannot be determined without thorough characterization of the soil to be penetrated by the pylons. Based on existing information, the proposed method of construction would create an unmitigable significant impact to paleontological resources in the area where heliostat pylons are proposed.

Staff recommends that site characterization of the paleontological resources be conducted prior to the Final Staff Assessment. The results of the characterization would enable staff to make a recommendation to the Committee regarding the breadth and depth of the resources, their significance, and whether impacts can be mitigated. Without site specific characterization, the significance of impact to paleontological resources cannot be determined and, based on existing information, the project would create an unmitigable significant impact. With appropriate characterization and interpretation, it is staff's opinion that the proposed PSEGS facility could be designed and constructed in accordance with all applicable laws, ordinances, regulations, and standards, and in a manner that both protects environmental quality and assures public safety, to the extent practical.

CONSTRUCTION IMPACTS AND MITIGATION

The design-level geotechnical evaluation, required for the project by the CBC (2010) and existing Condition of Certification **GEO-1,** should provide standard engineering design recommendations for mitigation of earthquake ground shaking; excessive settlement due to dynamic compaction and hydrocompaction; and potentially expansive soils.

Construction of the proposed project would directly remove approximately 3,794 acres from potential use for sand and gravel production under BLM's salable mineral program. In general, sand and gravel resources are widely available throughout the region. The primary consideration in the economic viability of sand and gravel operations is the transportation cost, which is driven by the proximity of the operation to its point of use. Although there is likely to be widespread development in the Chuckwalla Valley that would require sand and gravel resources, the site represents a small fraction of the total sand and gravel resource available within the valley such that removal of the 3,794-acre area from potential production is not expected to have any significant impact on potential future development. As a result, the PSEGS would not impact any current or reasonably foreseeable development of geologic resources. However, during construction, the project owner may need or desire to move sand and gravel either off-site or between the different units of the facility. Should this occur, the project owner would be required to comply with BLM regulations in 43 CFR Part 3600, which regulates the production and use of sand and gravel from public lands. Use of sand and gravel or other mineral materials within the boundaries of an authorized ROW is permitted; however, removal of these materials from an authorized ROW would require payment to the United States of the fair market value of those materials.

The proposed project would not have any direct or indirect impact on the production of locatable or leasable minerals outside of the proposed project boundaries. Although mineral occurrences have been claimed in the vicinity of the PSEGS site, there are no indications that these could become economic commercial operations. If they become economic operations, the existence of the proposed facility is not expected to interfere with the ability of the claimant to access those minerals. The only potential conflict would occur if the claimant or another person locates a new claim within the project boundaries. This could potentially occur, as the proposed project location has not been withdrawn from mineral entry. The potential for this scenario is expected to be low. If it did occur, conflicts between the surface use of the land for solar energy production and access to the subsurface minerals would be addressed in accordance with federal and Riverside County land use regulations. Therefore, the PSEGS would not impact any current or reasonably foreseeable development of mineral resources.

Significant paleontologic resources have been documented in the same or similar older alluvium deposits that are present in the general area of the project. Existing studies indicate the soils beneath the solar field are likely to contain Pleistocene age vertebrate fossils. Construction of the proposed project will include grading, foundation excavation, utility trenching, pylon insertion and possibly drilled shafts. Staff considers the probability of encountering paleontologic resources to be generally high on portions of the site based on the soils profile, SVP assessment criteria, and the near surface occurrence of the sensitive geologic units. The potential for encountering fossils hosted in Quaternary alluvium will increase with the depth of cut. Excavations for ancillary facilities and new pipelines and on-site excavations that penetrate surficial Holocene age alluvium will have a higher probability of encountering potentially high sensitivity materials, although sensitive materials could occur nearer the surface. The proposed mitigation cannot avoid or reduce fossil disturbance associated with pylon insertion or drilled shaft foundations. Conditions of Certification **PAL-1** to **PAL-7** are designed to mitigate any paleontologic resource impacts, as discussed above, to a less than significant level. Essentially, Conditions of Certification **PAL-1** to **PAL-7** would require a worker education program in conjunction with monitoring of conventional earthwork activities by qualified professional paleontologists (PRS). Earthwork would be halted any time potential fossils are recognized by either the paleontologist or the worker. For finds deemed significant by the PRS, earthwork cannot restart until all fossils in that strata, including those below the design depth of excavation, are collected. When properly implemented, the Conditions of Certification would yield a net gain to the science of paleontology since fossils that would not otherwise have been discovered can be collected, identified, studied, and properly curated. A PRS would be retained, for the project by the project owner, to produce a monitoring and mitigation plan, conduct the worker training, and oversee the monitoring.

During the excavation monitoring, the PRS can and often does petition the Energy Commission for a change in the monitoring protocol. Most commonly, this is a request for less monitoring after sufficient monitoring has been performed to ascertain that there is little chance of finding significant fossils. In other cases, the PRS can propose increased monitoring due to unexpected fossil discoveries or in response to repeated out-of-compliance incidents by the earthwork contractor. In the case of the PSEGS site, the PRS would determine an appropriate depth above which undisturbed alluvial deposits are Holocene in age, have a low paleontologic sensitivity, and have little chance of containing significant fossils. The PRS could then recommend decreased monitoring for excavations above that depth. Paleontologic sensitivity of Pleistocene age sediments below the determined depth would remain high and would require continued monitoring. Based upon the literature and archives search, field surveys, and compliance documentation for the proposed PSEGS, the project owner has proposed monitoring and mitigation measures to be followed during the excavation stage of project construction. Staff believes that the facility can be designed and constructed to minimize the effect of geologic hazards and impacts to potential paleontologic resources at the site during project design life.

Conversely, where heliostat pylons are vibro-inserted in soils with high paleontological sensitivity, fossils will be destroyed with no opportunity for discovery or recovery. There is no mitigation available for the destruction of undiscovered fossils. This destruction is an unmitigable significant impact.

It is undetermined how PSEGS intends to avoid significant impact to paleontological resources in areas where heliostat pylons will penetrate Pleistocene soils.

Under the site’s current classification of paleontological sensitivity, it must be concluded that significant adverse impacts to paleontological resources would result from the proposed method of pylon insertion.

In areas where heliostats are to be supported by pylons that are vibro-inserted into the ground, impacts to paleontological resources cannot be determined without thorough characterization of the soil to be penetrated by the pylons. Based on existing information, the proposed method of construction would create an unmitigable significant impact to paleontological resources in the area where heliostat pylons are proposed. Under existing conditions, a commission override of the potential significant adverse impact would be required for the project to be approved.

Staff recommends that site characterization of the paleontological resources be conducted prior to the Final Staff Assessment. The characterization should be planned and conducted under the direction of a qualified paleontologist that is familiar with the site region in accordance with the Bureau of Land Management’s (BLM) Potential Fossil Yield Classification (PFYC) system. The results of the characterization would enable staff to make a recommendation to the Committee regarding the extent and abundance of the resources, their significance, whether impacts can be mitigated and the proportional scope of any proposed mitigation. Without site specific characterization, the significance of impact to paleontological resources cannot be determined and, based on existing information, the project would create an unmitigable significant impact.

With appropriate characterization and interpretation, it is staff’s opinion that the proposed PSEGS facility could be designed and constructed in accordance with all applicable laws, ordinances, regulations, and standards, and in a manner that both protects environmental quality and assures public safety, to the extent practical.

OPERATION IMPACTS AND MITIGATION

Operation of the proposed project should not have any adverse impact on geologic, mineralogic, or paleontologic resources because significant additional ground disturbance would not occur. Since the CBC (2010) requires that the facility be designed to withstand strong ground shaking, impacts due to seismic events should not significantly impact the structural integrity or operation of the facility.

PROJECT CLOSURE AND DECOMMISSIONING

The future decommissioning and closure of the project should not negatively affect geologic, mineralogic, or paleontologic resources since the ground disturbed during plant decommissioning and closure would have been already disturbed, and mitigated as required, during construction and operation of the project.

CUMULATIVE IMPACTS

The **EXECUTIVE SUMMARY** section provides information on the potential cumulative solar and other development projects in the project area. Together, these existing, proposed and potential projects comprise the cumulative scenario which forms the basis of the cumulative impact analysis for the proposed project. In summary, these projects are:

- Existing projects on BLM, State, and private lands, as shown on **Executive Summary Figure 1** and in **Executive Summary Table 1.** Forseeable renewable energy projects on BLM, state, and private lands, as shown on **Executive Summary Figure 1** and in **Executive Summary Tables 2 and 3**. 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.
- Projects submitted and on-hold as shown on **Executive Summary Figure 1**, and **Executive Summary Table- 4** presents projects submitted, but that are on hold.

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 the **EXECUTIVE SUMMARY** have not yet completed the required environmental processes, they were considered in this cumulative impact analysis.

GEOGRAPHIC SCOPE OF ANALYSIS

The geographic extent of potential impact to geologic, mineralogic, and paleontologic resources would be generally limited to the PSEGS site. Potential cumulative effects, as they pertain to geologic hazards, are essentially limited to regional subsidence due to ground water withdrawal. Impacts associated with strong ground shaking and dynamic compaction are not cumulative in nature and would not add to potential cumulative impacts to the facility.

EFFECTS OF PAST AND PRESENT PROJECTS

Historic ground water withdrawals on the order of 48,000 ac-ft/yr and associated impacts to ground water levels did not result in any documented subsidence in the proposed project area even with increases in effective stress on clay layers present at depth. During operation. the proposed PSEGS would consume approximately 201 ac-ft/yr, which is not expected to significantly affect regional subsidence in the geographic area. Additional groundwater information is contained in the **SOIL AND WATER RESOURCES** section.

Paleontologic resources have been documented in the general area of the project. As the value of paleontologic resources is associated with their discovery within a specific geologic host unit, the potential impacts to paleontologic resources due to conventional excavation construction activities will be mitigated as required by Conditions of Certification **PAL-1** through **PAL-7**. Implementation of these conditions should result in a net gain to the science of paleontology by allowing fossils that would not otherwise have been found to be recovered, identified, studied, and preserved. Cumulative impacts, in consideration with other nearby similar projects, should be either neutral (no fossils encountered) or positive (fossils encountered, preserved, and identified). Construction associated with past and present projects could add to fossil discoveries which would enhance our understanding of the prehistoric climate, geology, and geographic setting of the region for the benefit of current and future generations.

EFFECTS OF REASONABLY FORESEEABLE FUTURE PROJECTS

Foreseeable Projects in the Project Area

Several future foreseeable projects identified in **Executive Summary Tables 2 and 3** are located within the Chuckwalla Valley. Such projects would most likely include ground water pumping of similar magnitude to the PSEGS; however, the combined effect of these projects would still result in much less than the historic rate of 48,000 ac-ft/yr, which did not result in any documented regional subsidence, such that significant impacts to regional subsidence would not be expected. Therefore, there would be no significant cumulative contribution to regional subsidence from foreseeable renewable projects in the Chuckwalla Valley. Additional information on ground water withdrawal is contained in the **SOIL AND WATER RESOURCES** section.

Foreseeable Renewable Projects in the California Desert

Several future foreseeable renewable projects in the California Desert, as shown in **Executive Summary Tables 2 and 3**, would be located within the Chuckwalla Valley. Such projects would most likely include ground water pumping of similar magnitude to the PSEGS; however, the combined effect of these projects would still result in much less than the historic rate of 48,000 ac-ft/yr, which did not result in any documented regional subsidence, such that significant impacts to regional subsidence would not be expected. Therefore, there would be no significant cumulative contribution to regional subsidence from foreseeable renewable projects in the California Desert. Additional information on ground water withdrawal is contained in the **SOIL AND WATER RESOURCES** section.

Contribution of the Palen Solar Electric Generating System to Cumulative Analysis

Construction

The construction of the PSEGS is not expected to require any significant amount of ground water pumping such that impacts to regional subsidence are not expected.

Sand and gravel resources are present at the site and could be used during construction to minimize importation of such materials from other commercially available sources in the area, thereby minimizing impacts to current commercially available sand and gravel resources. In addition, sand and gravel resources are present throughout the regional area. Therefore, construction of the PSEGS would not impact any reasonably foreseeable development of sand and gravel resources.

The construction of the PSEGS would include excavation and grading at the site. Proper monitoring of excavations at the proposed PSEGS facility during construction could result in fossil discoveries, which would enhance our understanding of the prehistoric climate, geology, and geographic setting of the region for the benefit of current and future generations.

Existing studies indicate the soils beneath the solar field are likely to contain Pleistocene age vertebrate fossils. Potential impacts to paleontologic resources would be mitigated through worker training and monitoring by qualified paleontologists, as required by Conditions of Certification, **PAL-1** through **PAL-7** in areas where soils are exposed by conventional excavation operations. In areas where heliostats are to be supported by pylons that are vibro-inserted into the ground, impacts to paleontological resources cannot be determined without thorough characterization of the soil to be penetrated by the pylons.

Conversely, where heliostat pylons are vibro-inserted in soils with high paleontological sensitivity, fossils will be destroyed with no opportunity for discovery or recovery. There is no mitigation available for the destruction of undiscovered fossils. This destruction is an immitigable significant impact.

It is undetermined how PSEGS intends to avoid significant impact to paleontological resources in areas where heliostat pylons will penetrate Pleistocene soils.

Under the site’s current classification of paleontological sensitivity, it must be concluded that significant adverse impacts to paleontological resources would result from the proposed method of pylon insertion.

In areas where heliostats are to be supported by pylons that are vibro-inserted into the ground, impacts to paleontological resources cannot be determined without thorough characterization of the soil to be penetrated by the pylons. Based on existing information, the proposed method of construction would create an immitigable significant impact to paleontological resources in the area where heliostat pylons are proposed. Under existing conditions, a commission override of the potential significant adverse impact would be required for the project to be approved.

Staff recommends that site characterization of the paleontological resources be conducted prior to the Final Staff Assessment. The characterization should be planned and conducted under the direction of a qualified paleontologist that is familiar with the site region in accordance with the Bureau of Land Management's (BLM) Potential Fossil Yield Classification (PFYC) system. The results of the characterization would enable staff to make a recommendation to the Committee regarding the extent and abundance of the resources, their significance, whether impacts can be mitigated and the proportional scope of any proposed mitigation. Without site specific characterization, the significance of impact to paleontological resources cannot be determined and, based on existing information, the project would create an immitigable significant impact.

With appropriate characterization and interpretation, it is staff's opinion that the proposed PSEGS facility could be designed and constructed in accordance with all applicable laws, ordinances, regulations, and standards, and in a manner that both protects environmental quality and assures public safety, to the extent practical.

Operation

The operation of the PSEGS is expected to result in increased annual ground water pumping in the geographic area, from the current 2,000 ac-ft/yr to approximately 2,200 ac-ft/yr. Historic ground water withdrawals on the order of 48,000 ac-ft/yr did not result in any documented subsidence in the proposed project area. Since operation of the PSEGS would only contribute a minor amount of additional ground water withdrawal to the overall amount in the Chuckwalla Valley and since this cumulative amount is only a fraction of historic pumping levels that did not result in any documented subsidence, operation of the PSEGS is not expected to impact regional subsidence in the Chuckwalla Valley.

Operation of the PSEGS is not expected to require any significant excavation or grading such that impacts to geologic, mineralogic, and paleontologic resources are expected.

Decommissioning

The decommissioning of the PSEGS is not expected to require any significant amount of ground water pumping such that impacts to regional subsidence are not expected. In addition, potential sand and gravel resources would become available again following decommissioning of the project.

Decommissioning and closure of the project should not negatively affect geologic, mineralogic, or paleontologic resources since the ground disturbed during plant decommissioning and closure would have been already disturbed, and mitigated as required, during construction and operation of the project. As a result, decommissioning of the PSEGS would not contribute to cumulative impacts to geologic, mineralogic, and paleontologic resources, but rather would make existing sand and gravel resources available, and would allow for potential procurement of paleontologic resources that would otherwise remain unknown.

OVERALL CONCLUSION

Based on its independent research and review, Energy Commission staff believes that the potential is low for significant adverse impacts to the proposed project from geologic hazards during its design life and to potential geologic and mineralogic, resources from the construction, operation, and closure of the proposed project.

The proposed project area is currently not used for mineral production, nor is it under claim, lease, or permit for the production of locatable, leasable, or salable minerals. Sand and gravel resources are present at the site and could potentially be a source of salable resources; however, such materials are present throughout the regional area such that the PSEGS should not have a significant impact on the availability of such resources. There are no other known viable geologic or mineralogic resources at the PSEGS site.

Potential impacts to paleontologic resources would be mitigated through worker training and monitoring by qualified paleontologists, as required by Conditions of Certification, **PAL-1** through **PAL-7** in areas where soils are exposed by conventional excavation operations. In areas where heliostats are to be supported by pylons that are vibro-inserted into the ground, impacts to paleontological resources cannot be determined without thorough characterization of the soil to be penetrated by the pylons. Existing studies indicate the soils beneath the solar field are likely to contain Pleistocene age vertebrate fossils. Based on existing information, the proposed method of construction would create an unmitigable significant impact to paleontological resources in the area where heliostat pylons are proposed.

Staff recommends that site characterization of the paleontological resources be conducted prior to the Final Staff Assessment. The characterization should be planned and conducted under the direction of a qualified paleontologist that is familiar with the site region in accordance with the Bureau of Land Management's (BLM) Potential Fossil Yield Classification (PFYC) system. The results of the characterization would enable staff to make a recommendation to the Committee regarding the extent and abundance of the resources, their significance, whether impacts can be mitigated and the proportional scope of any proposed mitigation. Without site specific characterization, the significance of impact to paleontological resources cannot be determined and, based on existing information, the project would create an unmitigable significant impact. With appropriate characterization and interpretation, it is staff's opinion that the proposed PSEGS facility could be designed and constructed in accordance with all applicable laws, ordinances, regulations, and standards, and in a manner that both protects environmental quality and assures public safety, to the extent practical. Compliance with LORS

Federal, state, or local/county laws, ordinances, regulations, and standards applicable to the proposed project were detailed in **Geology and Paleontology Table 1**. Staff anticipates that the project would be able to comply with applicable LORS.

NOTEWORTHY PUBLIC BENEFITS

The science of paleontology is advanced by the discovery, study and curation of new fossils. These fossils can be significant if they represent a new species, verify a known species in a new location and/or if they include parts of similar specimens that had not previously been found preserved. In general, most fossil discoveries are the result of excavations, either purposeful in known or suspected fossil localities or as the result of excavations made during earthwork for civil improvements or mineral extraction. Proper monitoring of excavations at the proposed PSEGS facility, in accordance with an approved Paleontological Monitoring and Mitigation Plan, could result in fossil discoveries which would enhance our understanding of the prehistoric fossil record, or the climate, geology, and geographic setting of the region for the benefit of current and future generations. In addition, subsurface paleontological characterization of site soils could also yield beneficial information and become the basis of significance determination of adverse impact in areas penetrated by heliostat pylons.

RESPONSE TO AGENCY AND PUBLIC COMMENTS

No comments regarding geology or paleontology were received from agencies or from the public.

CONCLUSIONS

The project owner could comply with applicable LORS, provided that the existing Conditions of Certification are implemented and followed. The design and construction of the project, as amended, should have no adverse impact with respect to geologic, mineralogic, and paleontologic resources. Staff proposes to ensure compliance with applicable LORS through the adoption of the conditions of certification listed below.

CONDITIONS OF CERTIFICATION

Staff proposes no changes to the existing Conditions of Certification.

GEO-1 The Soils Engineering Report required by Section 1802A of the 2007 CBC should specifically include laboratory test data, associated geotechnical engineering analyses, and a thorough discussion of potential hydro-compaction or dynamic compaction; the presence of expansive clay soils; and the presence of corrosive soils. The report should also include recommendations for ground improvement and/or foundation systems necessary to mitigate these potential geologic hazards, if present.

Verification: The project owner shall include in the application for a grading permit a copy of the Soils Engineering Report which addresses the potential for liquefaction; settlement due to compressible soils, ground water withdrawal, hydro-compaction, or dynamic compaction; and the possible presence of expansive clay soils, and a summary of how the results of the analyses were incorporated into the project foundation and grading plan design for review and comment by the Chief Building Official (CBO). A copy of the Soils Engineering Report, application for grading permit and any comments by the CBO are to be provided to the CPM at least 30 days prior to grading.

PAL-1 The project owner shall provide the compliance project manager (CPM) with the resume and qualifications of its paleontological resource specialist (PRS) for review and approval. If the approved PRS is replaced prior to completion of project mitigation and submittal of the Paleontological Resources Report, the project owner shall obtain CPM approval of the replacement PRS. The project owner shall keep resumes on file for qualified paleontological resource monitors (PRMs). If a PRM is replaced, the resume of the replacement PRM shall also be provided to the CPM.

The PRS resume shall include the names and phone numbers of references. The resume shall also demonstrate to the satisfaction of the CPM the appropriate education and experience to accomplish the required paleontological resource tasks.

As determined by the CPM, the PRS shall meet the minimum qualifications for a vertebrate paleontologist as described in the Society of Vertebrate Paleontology (SVP) guidelines of 1995. The experience of the PRS shall include the following:

1. Institutional affiliations, appropriate credentials, and college degree;
2. Ability to recognize and collect fossils in the field;
3. Local geological and biostratigraphic expertise;
4. Proficiency in identifying vertebrate and invertebrate fossils; and
5. At least three years of paleontological resource mitigation and field experience in California and at least one year of experience leading paleontological resource mitigation and field activities.

The project owner shall ensure that the PRS obtains qualified paleontological resource monitors to monitor as he or she deems necessary on the project. Paleontologic resource monitors (PRMs) shall have the equivalent of the following qualifications:

- BS or BA degree in geology or paleontology and one year of experience monitoring in California; or
- AS or AA in geology, paleontology, or biology and four years’ experience monitoring in California; or
- Enrollment in upper division classes pursuing a degree in the fields of geology or paleontology and two years of monitoring experience in California.

Verification:

(1) At least 60 days prior to the start of ground disturbance, the project owner shall submit a resume and statement of availability of its designated PRS for on-site work.

(2) At least 20 days prior to ground disturbance, the PRS or project owner shall provide a letter with resumes naming anticipated monitors for the project, stating that the

identified monitors meet the minimum qualifications for paleontological resource monitoring required by the condition. If additional monitors are obtained during the project, the PRS shall provide additional letters and resumes to the CPM. The letter shall be provided to the CPM no later than one week prior to the monitor's beginning on-site duties.

(3) Prior to the termination or release of a PRS, the project owner shall submit the resume of the proposed new PRS to the CPM for review and approval.

PAL-2 The project owner shall provide to the PRS and the CPM, for approval, maps and drawings showing the footprint of the power plant, construction lay-down areas, and all related facilities. Maps shall identify all areas of the project where ground disturbance is anticipated. If the PRS requests enlargements or strip maps for linear facility routes, the project owner shall provide copies to the PRS and CPM. The site grading plan and plan and profile drawings for the utility lines would be acceptable for this purpose. The plan drawings should show the location, depth, and extent of all ground disturbances and be at a scale between 1 inch = 40 feet and 1 inch = 100 feet. If the footprint of the project or its linear facilities changes, the project owner shall provide maps and drawings reflecting those changes to the PRS and CPM.

If construction of the project proceeds in phases, maps and drawings may be submitted prior to the start of each phase. A letter identifying the proposed schedule of each project phase shall be provided to the PRS and CPM. Before work commences on affected phases, the project owner shall notify the PRS and CPM of any construction phase scheduling changes.

At a minimum, the project owner shall ensure that the PRS or PRM consults weekly with the project superintendent or construction field manager to confirm area(s) to be worked the following week and until ground disturbance is completed.

Verification:

(1) At least 30 days prior to the start of ground disturbance, the project owner shall provide the maps and drawings to the PRS and CPM.

(2) If there are changes to the footprint of the project, revised maps and drawings shall be provided to the PRS and CPM at least 15 days prior to the start of ground disturbance.

(3) If there are changes to the scheduling of the construction phases, the project owner shall submit a letter to the CPM within 5 days of identifying the changes.

PAL-3 The project owner shall ensure that the PRS prepares, and the project owner submits to the CPM for review and approval, a paleontological resources monitoring and mitigation plan (PRMMP) to identify general and specific measures to minimize potential impacts to significant paleontological resources. Approval of the PRMMP by the CPM shall occur prior to any ground disturbance. The PRMMP shall function as the formal guide for monitoring, collecting, and sampling activities and may be modified with CPM approval. This document shall be used as the basis of discussion when on-site decisions or changes are proposed. Copies of the PRMMP shall reside with the PRS, each monitor, the project owner's on-site manager, and the CPM.

The PRMMP shall be developed in accordance with the guidelines of the Society of Vertebrate Paleontology (SVP 1995) and shall include, but not be limited, to the following:

1. Assurance that the performance and sequence of project-related tasks, such as any literature searches, pre-construction surveys, worker environmental training, fieldwork, flagging or staking, construction monitoring, mapping and data recovery, fossil preparation and collection, identification and inventory, preparation of final reports, and transmittal of materials for curation will be performed according to PRMMP procedures;

2. Identification of the person(s) expected to assist with each of the tasks identified within the PRMMP and the conditions of certification;

3. A thorough discussion of the anticipated geologic units expected to be encountered, the location and depth of the units relative to the project when known, and the known sensitivity of those units based on the occurrence of fossils either in that unit or in correlative units;

4. An explanation of why, how, and how much sampling is expected to take place and in what units. Include descriptions of different sampling procedures that shall be used for fine-grained and coarse-grained units;

5. A discussion of the locations of where the monitoring of project construction activities is deemed necessary, and a proposed plan for monitoring and sampling;

6. A discussion of procedures to be followed in the event of a significant fossil discovery, halting construction, resuming construction, and how notifications will be performed;

7. A discussion of equipment and supplies necessary for collection of fossil materials and any specialized equipment needed to prepare, remove, load, transport, and analyze large-sized fossils or extensive fossil deposits;

8. Procedures for inventory, preparation, and delivery for curation into a retrievable storage collection in a public repository or museum, which meet the Society of Vertebrate Paleontology's standards and requirements for the curation of paleontological resources;

9. Identification of the institution that has agreed to receive data and fossil materials collected, requirements or specifications for materials delivered for curation and how they will be met, and the name and phone number of the contact person at the institution; and

10. A copy of the paleontological Conditions of Certification.

<u>Verification:</u> At least 30 days prior to ground disturbance, the project owner shall provide a copy of the PRMMP to the CPM. The PRMMP shall include an affidavit of authorship by the PRS and acceptance of the PRMMP by the project owner evidenced by a signature.

PAL-4 Prior to ground disturbance and for the duration of construction activities involving ground disturbance, the project owner and the PRS shall prepare and conduct weekly CPM-approved training for the following workers: project managers, construction supervisors, foremen, and general workers involved with or who operate ground-disturbing equipment or tools. Workers shall not excavate in sensitive units prior to receiving CPM-approved worker training. Worker training shall consist of an initial in-person PRS training or may utilize a CPM-approved video or other presentation format during the project kick off for those mentioned above. Following initial training, a CPM-approved video or other approved training presentation/materials, or in-person training may be used for new employees. The training program may be combined with other training programs prepared for cultural and biological resources, hazardous materials, or other areas of interest or concern. No ground disturbance shall occur prior to CPM approval of the Worker Environmental Awareness Program (WEAP), unless specifically approved by the CPM.

The WEAP shall address the possibility of encountering paleontological resources in the field, the sensitivity and importance of these resources, and legal obligations to preserve and protect those resources.

The training shall include:

1. A discussion of applicable laws and penalties under the law;
2. Good quality photographs or physical examples of vertebrate fossils for project sites containing units of high paleontologic sensitivity;
3. Information that the PRS or PRM has the authority to halt or redirect construction in the event of a discovery or unanticipated impact to a paleontological resource;
4. Instruction that employees are to halt or redirect work in the vicinity of a find and to contact their supervisor and the PRS or PRM;
5. An informational brochure that identifies reporting procedures in the event of a discovery;
6. A WEAP certification of completion form signed by each worker indicating that he/she has received the training; and
7. A sticker that shall be placed on hard hats indicating that environmental training has been completed.

Verification:

(1) At least 30 days prior to ground disturbance, the project owner shall submit the proposed WEAP, including the brochure, with the set of reporting procedures for workers to follow.

(2) At least 30 days prior to ground disturbance, the project owner shall submit the training program presentation/materials to the CPM for approval if the project owner is planning to use a presentation format other than an in-person trainer for training.

(3) If the owner requests an alternate paleontological trainer, the resume and qualifications of the trainer shall be submitted to the CPM for review and approval prior to installation of an alternate trainer. Alternate trainers shall not conduct training prior to CPM authorization.

(4) In the monthly compliance report (MCR), the project owner shall provide copies of the WEAP certification of completion forms with the names of those trained and the trainer or type of training (in-person or other approved format) offered that month. The MCR shall also include a running total of all persons who have completed the training to date.

PAL-5 The project owner shall ensure that the PRS and PRM(s) monitor consistent with the PRMMP all construction-related grading, excavation, trenching, and augering in areas where potential fossil-bearing materials have been identified, both at the site and along any constructed linear facilities associated with the project. In the event that the PRS determines full-time monitoring is not necessary in locations that were identified as potentially fossil bearing in the PRMMP, the project owner shall notify and seek the concurrence of the CPM.

The project owner shall ensure that the PRS and PRM(s) have the authority to halt or redirect construction if paleontological resources are encountered. The project owner shall ensure that there is no interference with monitoring activities unless directed by the PRS. Monitoring activities shall be conducted as follows:

1. Any change of monitoring from the accepted schedule in the PRMMP shall be proposed in a letter or email from the PRS and the project owner to the CPM prior to the change in monitoring and will be included in the monthly compliance report. The letter or email shall include the justification for the change in monitoring and be submitted to the CPM for review and approval.

2. The project owner shall ensure that the PRM(s) keep a daily monitoring log of paleontological resource activities. The PRS may informally discuss paleontological resource monitoring and mitigation activities with the CPM at any time.

3. The project owner shall ensure that the PRS notifies the CPM within 24 hours of the occurrence of any incidents of non-compliance with any paleontological resources conditions of certification. The PRS shall

recommend corrective action to resolve the issues or achieve compliance with the conditions of certification.

4. For any significant paleontological resources encountered, either the project owner or the PRS shall notify the CPM within 24 hours, or Monday morning in the case of a weekend event, where construction has been halted because of a paleontological find.

The project owner shall ensure that the PRS prepares a summary of monitoring and other paleontological activities placed in the monthly compliance reports. The summary will include the name(s) of PRS or PRM(s) active during the month; general descriptions of training and monitored construction activities; and general locations of excavations, grading, and other activities. A section of the report shall include the geologic units or subunits encountered, descriptions of samplings within each unit, and a list of identified fossils. A final section of the report will address any issues or concerns about the project relating to paleontologic monitoring, including any incidents of non-compliance or any changes to the monitoring plan that have been approved by the CPM. If no monitoring took place during the month, the report shall include an explanation in the summary as to why monitoring was not conducted.

Verification: The project owner shall ensure that the PRS submits the summary of monitoring and paleontological activities in the MCR. When feasible, the CPM shall be notified 10 days in advance of any proposed changes in monitoring different from the plan identified in the PRMMP. If there is any unforeseen change in monitoring, the notice shall be given as soon as possible prior to implementation of the change.

PAL-6 The project owner, through the designated PRS, shall ensure that all components of the PRMMP are adequately performed including collection of fossil materials, preparation of fossil materials for analysis, analysis of fossils, identification and inventory of fossils, the preparation of fossils for curation, and the delivery for curation of all significant paleontological resource materials encountered and collected during project construction.

Verification: The project owner shall maintain in his/her compliance file copies of signed contracts or agreements with the designated PRS and other qualified research specialists. The project owner shall maintain these files for a period of three years after project completion and approval of the CPM-approved paleontological resource report (see Condition of Certification **PAL-7**). The project owner shall be responsible for paying any curation fees charged by the museum for fossils collected and curated as a result of paleontological mitigation. A copy of the letter of transmittal submitting the fossils to the curating institution shall be provided to the CPM.

PAL-7 The project owner shall ensure preparation of a Paleontological Resources Report (PRR) by the designated PRS. The PRR shall be prepared following completion of the ground-disturbing activities. The PRR shall include an analysis of the collected fossil materials and related information and submit it to the CPM for review and approval. The report shall include, but is not limited to, a description and inventory of recovered fossil materials; a map showing the location of paleontological resources encountered; determinations of sensitivity and significance; and a statement by the PRS that project impacts to paleontological resources have been mitigated below the level of significance.

Verification: Within 90 days after completion of ground-disturbing activities, including landscaping, the project owner shall submit the PRR under confidential cover to the CPM.

Certification of Completion
Worker Environmental Awareness Program
Palen Solar Electric Generating System (09-AFC-7)

This is to certify these individuals have completed a mandatory California Energy Commission–approved Worker Environmental Awareness Program (WEAP). The WEAP includes pertinent information on cultural, paleontological, and biological resources for all personnel (that is, construction supervisors, crews, and plant operators) working on site or at related facilities. By signing below, the participant indicates that he/she understands and shall abide by the guidelines set forth in the program materials. Include this completed form in the Monthly Compliance Report.

No.	Employee Name	Title/Company	Signature
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Cultural Trainer: ______________ Signature: _________________ Date: _/_/__

Paleo Trainer: ________________ Signature: _________________ Date: _/_/__

Biological Trainer: ____________ Signature: _________________ Date: _/_/__

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POWER PLANT EFFICIENCY

Edward Brady

SUMMARY OF CONCLUSIONS

The Palen Solar Electric Generating System (PSEGS), if constructed and operated as proposed, would use solar energy to generate a minimum 98 percent of its annual electrical energy production. Fossil fuel, in the form of natural gas, would be used only to reduce startup time and to keep the temperature of the steam generation system above freezing temperatures. Compared to the project's expected overall production rate of approximately 1,412,300 megawatt-hours (MWh) per year, and compared to a typical fossil fuel-fired power plant of equal capacity, the amount of the annual power production from fossil fuel is insignificant at less than 2 percent (Palen 2012a, § 2.1-1).

The project would decrease dependence on fossil fuel, and would increase renewable energy generation. It would not create significant adverse effects on fossil fuel energy supplies or resources, would not require additional sources of energy supply, and would not consume fossil fuel energy in a wasteful of inefficient manner. No efficiency standards apply to this project. Staff therefore concludes that this project would present no significant adverse impacts on fossil fuel energy resources.

The modified PSEGS would occupy approximately 7.6 acres per megawatt (MW) of capacity, which approximates other solar power technologies.

INTRODUCTION

The proposed modified PSEGS would generate 500 MW (nominal net output) of electricity. PSEGS would be a solar thermal power plant built on an approximately 3,794-acre site in Riverside County, California. The project would use the solar thermal power tower technology to produce electrical power using steam turbine generators fed from solar steam generators. Fossil fuel, in the form of natural gas, would be used to reduce startup time and to keep the temperature of the steam generation system above freezing.

METHODOLOGY AND THRESHOLDS FOR DETERMINING ENVIRONMENTAL CONSEQUENCES

FOSSIL FUEL USE EFFICIENCY

One of the responsibilities of the Energy Commission is to make findings on whether the energy use by a power plant, including the proposed PSEGS, would result in significant adverse impacts on the environment, as defined in the California Environmental Quality Act. If the Energy Commission finds that the proposed modified project's energy consumption creates a significant adverse impact, it must further determine if there are feasible mitigation measures that could eliminate or minimize that impact, and then, require implementation of those mitigation measures.

In order to develop the Energy Commission’s findings, this analysis will:

- examine whether the facility would likely present any adverse impacts upon energy resources; and if so,
- examine whether these adverse impacts are significant; and if so,
- examine if there are feasible mitigation measures or alternatives that could eliminate those adverse impacts or reduce them to a level of less-than-significance; and if so,
- recommend that the project implement those mitigation measures.

Solar Land Use Efficiency

Solar thermal power plants typically consume much less fossil fuel (usually in the form of natural gas) than other types of thermal power plants. Therefore, common measures of power plant efficiency such as those described above are less meaningful. So far as Energy Commission staff can determine, methods for determining the efficiency of a solar power plant have yet to be standardized; research has uncovered no meaningful attempt to quantify efficiency. The solar power industry appears to have begun discussing the issue, but a consensus has not emerged. In the absence of accepted standards, staff proposes the following approach.

Solar thermal power plants convert the sun’s energy into electricity in three basic steps:

- Mirrors and/or collectors capture the sun’s rays.
- This solar energy is converted into heat.
- This heat is converted into electricity, typically in a heat engine such as a steam turbine generator.

The effectiveness of each of these steps depends on the specific technology employed; the product of these three steps determines the power plant’s overall solar efficiency. The greater the project’s solar efficiency, the less land the plant must occupy to produce a given power output.

The most significant environmental impacts caused by solar power plants result from occupying large expanses of land. The extent of these impacts is likely in direct proportion to the number of acres affected. For this reason, staff evaluates the land use efficiency of proposed solar power plant projects. This efficiency is expressed in terms of power produced, or MW per acre, and in terms of energy produced, or annual MW-hours per acre. Specifically:

- For land use efficiency, the solar industry uses the ratio of acreage and nominal power output (acres/MW) and its reciprocal (MW/acre) interchangeably to compare land utilization of solar powered electrical generation systems.
- Energy-based solar land use efficiency is calculated by dividing the annual net electrical energy production in MW-hours per year by the total number of acres impacted by the power plant, which accounts for the fraction of energy production, morning start-up and nighttime freeze control utilizing non-renewable fuel sources such as natural gas and propane.

- Acreage is defined in the capacity and energy factors above as the area used directly as solar fields plus the common service area, but excluding access roads, transmission rights-of-way and utility corridors, and any mitigation areas.
- Where the method for maintaining start-up status is not otherwise identified, refer to **APPENDIX A** for a list of proxy combined cycle baseload generation facilities to calculate an equivalent start-up fuel factor and derive a "solar only" net annual energy generation.

See **Efficiency Table 1** below for a comparison of various solar and conventional electric power generation facilities in terms of land utilization, power generation efficiency and net energy generation efficiency.

PROPOSED MODIFIED PROJECT

The Final Decision describes the PSEGS as a solar thermal project using parabolic trough technology. Under the modified PSEGS, the troughs and associated heat transfer fluid (HTF) will be eliminated and PSEGS will be reconfigured to utilize BrightSource's solar tower technology consisting of two solar towers, associated power blocks, and heliostat fields. Power plant efficiency impacts from the modified project are expected to be similar to the approved project (see analysis below).

SETTING AND EXISTING CONDITIONS

The applicant proposes to build and operate PSEGS, a solar thermal power plant producing a total of 500 MW (nominal net output) and employing the power tower solar thermal technology. The project would consist of two units, each comprised of arrays of approximately 85,000 heliostat mirrors, solar steam generator heat exchangers, one steam turbine generator, and an air cooled condenser (Palen 2012a, § 2.2.1). Each 250 MW power tower would be surrounded by a circular array of heliostats with the closest radial array about 250 feet from the base of the 720-foot-tall tower and the farthest approximately 750 feet from the base of this tower. What would appear to be random spacing and partial rows would be designed to accommodate the topography of the site and minimize panel-to-panel shading as the sun runs a celestial chord across the hemispheric array (Palen 2012a, § 2.2.1.3).The project's power cycle would be based on a steam cycle (also known as the Rankine cycle). The solar receiver steam generator (SRSG) at the top of the 750-foot-tall tower structure would feed the steam turbine generators which would produce electric power.

Each unit of the project would utilize a natural gas-fired auxiliary boiler with 249 million Btu per hour (mmBtu/hr) thermal input to accelerate startup and have the solar system warm at first sunlight. A second nighttime restoration boiler with 10 mmBtu/hr thermal input would provide overnight freeze protection.

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

PROJECT ENERGY REQUIREMENTS AND ENERGY USE EFFICIENCY

PSEGS would consume insignificant amounts of fossil fuel for power generation. It would consume fossil fuel only to reduce startup time and provide nighttime freeze protection.

The project would consume natural gas at a maximum annual rate of 742,000 mmBtu (Palen 2012a, Table 2.2-2). Compared to a typical fossil fuel-fired power plant of equal capacity, and compared to the relatively considerable resources of fossil fuel in California (see below in **Adverse Effects on Energy Supplies and Resources**), this rate is not significant. Natural gas is comparable in efficiency to common fossil fuels,[1] with a heat rate that is 1.8 percent higher than propane and 9.2 percent higher than diesel fuel.

The applicant estimates a full load thermodynamic efficiency of 43.6 percent for the proposed modified project (Palen 2012a, Figure 2.2-3A). There are currently no legal or industry standards for measuring the efficiency of solar thermal power plants. Staff compares the steam cycle efficiency of PSEGS to the average efficiency of contemporary fossil fuel steam turbines currently available in the market. The efficiency figures for these turbines range from 35 to 45 percent. The project's thermal efficiency of 43.6 percent is comparable to this industry range. Coupled with the 2 percent restriction on the use of natural gas for energy generation (Palen 2012a, § 2.2.1, Table 2.2-1), the solar-driven thermal steam cycle efficiency provides a simple, work-proven method of electric power generation, eliminating the heat exchange losses of an intermediate HTF circuit.

Therefore, staff considers the impact of the project's fuel consumption on energy supplies and energy efficiency to be less than significant.

ADVERSE EFFECTS ON ENERGY SUPPLIES AND RESOURCES

The applicant has described its sources of natural gas for the project PSEGS 2012a, § 2.3) The project has access to an abundance of natural gas through the 200 psig gas transmission line that runs along Interstate Highway 10 (I-10). Owned by Southern California Gas Company, this pipeline is connected to natural gas resources from the Rocky Mountains, Canada and the southwest. The gas transmission system, of which the I-10 pipeline is part, has the capability of carrying up to 258.33 million cubic feet per hour ($mmft^3/hr$) from production areas in the Permian Basin of west Texas and the San Juan Basin of southern Colorado. The maximum natural gas demand from the project would be 0.53 $mmft^3/hr$; approximately 0.2 percent of this capacity. Therefore, it would be highly unlikely that the project would create a substantial increase in fossil fuel demand.

[1] Source: **APPENDIX A**, Biomass Energy Databook – 2011 – http://cta.orni.gof/bedb. LHV rates for natural gas (20,267 Btu/lbm/983 Btuh/CF), propane (19,904 Btu/lbm) fuel oil/diesel (18,397 Btu/lbm).

ADDITIONAL ENERGY SUPPLY REQUIREMENTS

There appears to be no real likelihood that PSEGS would require the development of additional energy supply capacity (see above in **Adverse Effects on Energy Supplies and Resources**).

COMPLIANCE WITH ENERGY STANDARDS

No standards apply to the efficiency of PSEGS or other non-cogeneration projects.

ALTERNATIVES TO REDUCE WASTEFUL, INEFFICIENT, AND UNNECESSARY ENERGY CONSUMPTION

Staff typically evaluates the project alternatives to determine if alternatives exist that could reduce the project's fuel use. The evaluation of alternatives to the project (that could reduce wasteful, inefficient, or unnecessary energy consumption) requires the examination of the project's energy consumption.

Efficiency of Alternatives to the Project

Please see the project alternatives discussed below.

Alternative Generating Technologies

Alternative generating technologies for PSEGS are considered in PSEGS 2012a Petition to Amend. For purposes of this analysis, natural gas, oil, coal, nuclear, geothermal, biomass, hydroelectric, wind and solar photovoltaic technologies were all considered. Because this project would consume insignificant amounts of fossil fuel for power production, staff believes that the proposed modified project would not constitute a significant adverse impact on fossil fuel energy resources compared to feasible alternatives.

The solar insolation radiating on the earth's surface can be regarded as an energy resource. Since this energy is relatively inexhaustible, its consumption does not illicit the concerns endemic to fossil fuel consumption. What is of concern, however, is the extent of land area required to convert this solar energy into electricity. Setting aside hundreds or thousands of acres of land for solar power generation removes it from alternative uses.

As discussed above, Energy Commission staff is unaware of any accepted standards for evaluating the efficiency of a solar power plant such as PSEGS. As a substitute, staff tabulates the land use efficiency of the project (described above) and compares it to similar measures for other solar power plant projects that have passed through, or are passing through the Energy Commission's siting process; see **Efficiency Table 1**, below. It has not been determined how great a difference in land use would constitute a significant difference. The solar land use efficiency for a typical natural gas-fired combined cycle power plant is shown only for comparison.

A solar power project that occupies more land than another project holds the potential to produce more environmental impacts. PSEGS would produce power at the rate of

500 MW net, and would generate energy at the rate of 1,412,300 MW-hours net per year, while occupying 3,794 acres (Palen 2012a, Figures 1 and 2.1-4, Table 2.2-1).

Staff calculates the comparative land use and energy-based efficiencies below:

Land Use Efficiency: 500 MW ÷ 3,794 acres = **0.13 MW/acre**; or
3,794 acres ÷ 500 MW = **7.6 acres/MW**

Energy-Based Land Use Efficiency: 1,412,300 MWh/hr ÷ 3,794 acres = **372 MWh/year**

Alternatives to Reduce Solar Land Use Impacts

Building and operating a natural gas-fired combined cycle power plant would yield much greater land use efficiency than any solar power plant; see **Efficiency Table 1**. However, this would not achieve the basic project objective, to generate electricity from the renewable energy of the sun.

As seen in **Efficiency Table 1**, PSEGS, employing BrightSource's power tower technology, is slightly less efficient in the use of land than Hidden Hills SEGS which uses BrightSource's power tower technology as well, but more efficient than Ivanpah SEGS which also employs BrightSource's power tower technology. PSEGS is slightly more land-use-efficient than the original Calico Solar project, a Stirling Engine solar project. PSEGS's land use efficiency is in the midrange of the efficiency figures listed in **Efficiency Table 1**. Also, compared to the other projects listed in this table, PSEGS would burn more fossil fuel per acre of land and per MW; see the last two columns.

Efficiency Table 1
Solar Land Use Efficiency[1]

Projects	Generating Capacity (MW net)	Annual Energy (mmBtu) net	Annual Fuel Consumption (mmBtu, lower heating value [LHV[1]])	Footprint (Acres)	Land Use Efficiency (MW/acre)	Land Use Efficiency (Energy–Based) (MWh/acre-year)	
						Total	Solar Only[2]
Palen Solar (09-AFC-7C)	**500**	**1,401,900**	**742,000**	**3,794**	**0.13**	**372**	**342**
Beacon Solar (08-AFC-2)	250	600,000	36,000	1,240	0.20	484	480
Hidden Hills SEGS (11-AFC-04)	500	1,412,000	94,907	3,097	0.16	463	458
Ivanpah SEGS (07-AFC-5)	400	960,000	432,432	3,744	0.11	256	238
Imperial Valley Solar (08-AFC-5)	750	1,620,000	0	6,500	0.12	249	249

Projects	Generating Capacity (MW net)	Annual Energy (mmBtu) net	Annual Fuel Consumption (mmBtu, lower heating value [LHV[1]])	Footprint (Acres)	Land Use Efficiency (MW/acre)	Land Use Efficiency (Energy–Based) (MWh/acre-year)	
						Total	Solar Only[2]
Calico Solar (08-AFC-13)	850	1,840,000	0	8,200	0.11	224	224
Avenal Energy (08-AFC-1)[3]	600	3,023,000	24,792,786	25	24.0	120, 936	N/A

Notes:
1. LHV is Low Heating Value, or a measurement of the energy content of a fuel correcting for post-combustion water vapor.
2. Net energy output is reduced by natural gas-fired combined cycle proxy energy output; see **Efficiency Appendix A**.
3. Example natural gas-fired combined cycle plant.

Alternative Heat Rejection System

The applicant proposes to employ a dry cooling system (air-cooled condensers) as the means for rejecting power cycle heat from the steam turbines (Palen 2012a, § 2.2.1.4). An alternative heat rejection system would utilize evaporative cooling towers.

The local climate in the project area is characterized by high temperatures and low relative humidity (low wet-bulb temperature). In low temperatures and high relative humidity (low dry-bulb temperature), the air-cooled condenser performs relatively efficiently compared to the evaporative tower. However, at the project area (low wet-bulb temperature and high dry-bulb temperature) the air-cooled condenser performance is relatively poor compared to that of an evaporative cooling tower. Furthermore, the performance of the heat rejection system affects the performance of the steam turbine, which affects turbine efficiency and the net power output. However, an air cooled condensers uses a relatively small amount of water than an evaporative cooling tower. Although power production is marginally reduced by the use of an air cooled condenser, the benefit of reducing water consumption countervails the impact on power production at a desert site. Even though evaporative cooling could offer greater power production, resulting in higher efficiency, staff believes the applicant’s selection of dry cooling is a reasonable tradeoff because it would prevent potentially significant environmental impacts that could result from consumption of the large quantities of water required by wet cooling.

CUMULATIVE IMPACT ANALYSIS

There are no nearby power plant projects or other projects consuming large amounts of fossil fuel that hold the potential for cumulative energy consumption impacts when aggregated with the project. This project controls its own use of natural gas by specifying 2 percent annual energy production as a limit (Palen 2012a, § 2.2.1). Where solar tower resources share regional locales, their unimpeded access to solar radiation does not place them in competition with other solar (or non-solar) facilities within their proximate.

As a renewable energy source, solar energy would have an influence on the daily power demand profile and technologies such as multi-stage generation that would have to emerge to enhance the efficient utilization of solar power. In the long term, these trends will serve to improve the power generation mix and provide the electricity grid system with accessible methods of managing and controlling generation facilities within their purview.

More immediately, staff believes that the construction and operation of the project would not create indirect impacts (in the form of additional fuel consumption) that would not have otherwise occurred without this project. Because the proposed modified project would consume significantly less fossil fuel than a typical fossil fuel-fired power plant, it should compete favorably in the California power market and replace older fossil fuel burning power plants. The project would therefore cause a positive impact on the cumulative amount of fossil fuel consumed for power generation.

COMPLIANCE WITH LORS

No federal, state, or local/county laws, ordinances, regulations, and standards (LORS) apply to the efficiency of this project.

NOTEWORTHY PUBLIC BENEFITS

PSEGS would employ an advanced solar thermal technology. Solar energy is renewable and unlimited. The project would have a less than significant adverse impact on nonrenewable energy resources. Consequently, the project would help in reducing California's dependence on fossil fuel-fired power plants.

RESPONSE TO PUBLIC AND AGENCY COMMENTS

To date, there have been no public comments relating to Power Plant Efficiency.

CONCLUSIONS

LAND USE

The modified PSEGS project would occupy approximately 7.6 acres per MW of power output, or 0.13 MW/acre; in the midrange of efficiency figures that include several other solar thermal power plant projects (see **Efficiency Table 1**).

FOSSIL FUEL ENERGY USE

The modified PSEGS project would use solar energy to generate most of its capacity, consuming insignificant amounts of fossil fuel for power production. The project would decrease reliance on fossil fuel, and would increase reliance on renewable energy resources. It would not create significant adverse effects on energy supplies or resources, would not require additional sources of energy supply, and would not consume energy in a wasteful or inefficient manner. No energy standards apply to this project.

Staff therefore concludes that this project would present no significant adverse impacts on energy resources. No cumulative impacts on energy resources are likely. Facility closure would not likely present significant impacts on electric system efficiency.

PROPOSED CONDITIONS OF CERTIFICATION/MITIGATION MEASURES

No conditions of certification are proposed.

REFERENCES

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EFFICIENCY APPENDIX A
SOLAR POWER PLANT EFFICIENCY CALCULATION
GAS-FIRED PROXY

In calculating the efficiency of a solar power plant, it is desired to subtract the effect of natural gas burned for morning startup, cloudy weather augmentation and freeze protection. As an alternative, staff would use an average efficiency based on several recent baseload combined cycle power plant projects in the Energy Commission siting process. Baseload combined cycles were chosen because their intended dispatch most nearly mirrors the intended dispatch of solar plants, that is, operate at full load in a position high on the dispatch authority's loading order.

Examples of base load combined cycle "proxy" systems include:

Colusa Generating Station (06-AFC-9)

- Nominal 660 MW 2-on-1 Combined Cycle with GE Frame 7FA CGTs
- Air cooled condenser, evaporative inlet air cooling
- Efficiency with duct burners on: 666.3 MW @ 52.5% LHV
- Efficiency with duct burners off: 519.4 MW @ 55.3% LHV
- Efficiency (average of these two): **53.9% LHV**

San Gabriel Generating Station (07-AFC-2)

- Nominal 696 MW 2-on-1 Combined Cycle with Siemens 5000F CGTs
- Air cooled condenser, evaporative inlet air cooling
- Efficiency with duct burners on: 695.8 MW @ 52.1% LHV
- Efficiency with duct burners off: 556.9 MW @ 55.1% LHV
- Efficiency (average of these two): **53.6% LHV**

Avenal Energy (08-AFC-1)

- Nominal 600 MW 2-on-1 Combined Cycle with GE Frame 7FA CGTs
- Air cooled condenser, inlet air chillers
- Efficiency with duct burners on: 600.0 MW @ 50.5% LHV
- Efficiency with duct burners off: 506.5 MW @ 53.4% LHV
- Efficiency (average of these two): **52.0% LHV**

Average of these four power plants: **53.2% LHV**

POWER PLANT RELIABILITY

Edward Brady

SUMMARY OF CONCLUSIONS

Based on a review of the Petition to Amend, staff concludes that, similar to the approved project, the modified project, referred to as the Palen Solar Electric Generating System (PSEGS) would be built and would operate in a manner consistent with industry norms for reliable operation. The project owner predicts an equivalent availability factor of between 92 and 98 percent for the modified project, which staff believes is achievable and comparable to the original unamended system proposed for Palen. (The equivalent availability factor of a power plant is the percentage of time it is available to generate power, accounting for both planned and unplanned outages.) No conditions of certification are proposed.

INTRODUCTION

In this analysis, California Energy Commission (Energy Commission) staff addresses the reliability issues of PSEGS to determine if the power plant is likely to be built in accordance with typical industry norms for reliable power generation. Staff uses this norm as a benchmark because it ensures that the resulting project would not be likely to degrade the overall reliability of the electric system it serves (see the “Setting” subsection, below).

The scope of this power plant reliability analysis covers:

- equipment availability;
- plant maintainability;
- fuel and water availability; and
- power plant reliability in relation to natural hazards.

Staff examined the project design criteria to determine if the project is likely to be built in accordance with typical industry norms for reliable power generation. While the project owner has predicted an availability factor of between 92 to 98 percent for PSEGS (Palen 2012a, § 3.1.4.1), staff has used industry norms as the benchmark, rather than the project owner’s projection, to evaluate the project’s reliability.

METHODOLOGY AND THRESHOLDS FOR DETERMINING ENVIRONMENTAL CONSEQUENCES

METHOD FOR DETERMINING RELIABILITY

The Energy Commission must make findings as to how a project is designed, sited, and operated in order to ensure its safe and reliable operation (Title 20, CCR § 1752[c]). Staff takes the approach that a project is acceptable if it does not degrade the reliability of the utility system to which it is connected. This is likely the case if a project is at least as reliable as other power plants on that system.

The equivalent availability factor is the percentage of time the power plant is available to generate power, accounting for both planned (maintenance) and unplanned outages (extreme inclement weather). For a solar power plant, the availability factor is a percentage of only daytime hours because the technology does not produce electricity at night. Measures of power plant reliability are based upon both the plant's actual ability to generate power when it is considered to be available and upon starting failures and unplanned (or forced) outages. For practical purposes, reliability can be considered a combination of these two industry measures, making a reliable power plant one that is available when called upon to operate. Throughout its intended 30-year life, PSEGS is expected to operate reliably (Palen 2012a, § 3.1.4). Power plant systems must be able to operate for extended periods without shutting down for maintenance or repairs. Achieving this reliability requires adequate levels of equipment availability, plant maintainability with scheduled maintenance outages, fuel and water availability, and resistance to natural hazards. Staff examines these factors for the project and compares them to industry norms. If the factors compare favorably for this project, staff may then conclude that PSEGS would be as reliable as other power plants on the electric system and would not degrade system reliability.

PROPOSED MODIFIED PROJECT

The Final Decision describes the approved project as a solar thermal project using parabolic trough technology. Under the modified project, the troughs and associated HTF will be eliminated and the PSEGS would be reconfigured to utilize BrightSource's solar tower technology consisting of two solar towers and associated power blocks and heliostat fields.

SETTING AND EXISTING CONDITIONS

In the restructured competitive electric power industry, the responsibility for maintaining system reliability falls largely to the state's control area operators, such as the California Independent System Operator (California ISO), that purchase, dispatch, and sell electric power throughout the state. Determining how the California ISO and other control area operators would ensure system reliability has been an ongoing effort. Protocols that allow sufficient reliability to be maintained under the competitive market system have been developed and put in place. "Must-run" power purchase agreements and "participating generator" agreements are two mechanisms that have been employed to ensure an adequate supply of reliable power.

The California ISO's mechanisms to ensure adequate power plant reliability apparently were devised under the assumption that the individual power plants that compete to sell power into the system will each exhibit a level of reliability similar to that of power plants of past decades. However, there has been valid cause to believe that, under free market competition, financial pressures on power plant owners to minimize capital outlays and maintenance expenditures may act to reduce the reliability of many power plants, both existing and newly constructed (McGraw-Hill 1994).[1] It is possible that, if significant numbers of power plants were to exhibit individual reliability sufficiently lower

[1] pg.11, Sanden, Gary et al., "Operational Experience in Competitive Electric Generation, McGraw-Hill's Independent Audit of US Non-Utility Powerplants", McGraw Hill Inc. (New York, 1994).

than this historical level, the assumptions used by California ISO to ensure system reliability would prove invalid, with potentially disappointing results. Accordingly, staff has recommended that power plant owners continue to build and operate their projects to the level of reliability to which all in the industry are accustomed.

As part of its plan to provide needed reliability, the project owner proposes to operate the 500-megawatt (MW) (net power output) PSEGS, a solar thermal power plant facility employing advanced solar power technology. This project, using renewable solar energy, would provide dependable power to the grid, generally during the hours of peak power consumption by the interconnecting utility(s). This project would help serve the need for renewable energy in California.

The project owner has indicated it expects the modified project to achieve an availability factor of between 92 and 98 percent (Palen 2012a, § 2.12). The project is anticipated to operate at an annual capacity factor of approximately 32 percent.[2]

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

EQUIPMENT AVAILABILITY

Equipment availability would be ensured by adoption of appropriate quality assurance/ quality control (QA/QC) programs during the design, procurement, construction, and operation of the plant and by providing for adequate maintenance and repair of the equipment and systems discussed below.

Quality Control Program

The project owner describes a QA/QC program (Palen 2012a, § 3.1.4.5) that is typical of the power industry. Equipment would be purchased from qualified suppliers based on technical and commercial evaluations. Suppliers' personnel, production capability, past performance, QA programs, and quality history would be evaluated. The project owner would perform receipt inspections, test components, and administer independent testing contracts. Staff expects that implementation of this program would result in typical reliability of design and construction. To ensure this implementation, staff has proposed appropriate conditions of certification in the section of this document entitled **FACILITY DESIGN**.

PLANT MAINTAINABILITY

Equipment Redundancy

The PESGS project would be able to operate only when the sun is shining. Maintenance or repairs could be done when the plant is shut down at night. This would help to enhance the project's reliability. The fact that the project would consist of two separate units operating separately provides inherent reliability. A single equipment failure cannot disable more than one unit, thus allowing the plant to continue to generate (at reduced output). The nature of solar thermal generating technology also provides inherent redundancy; the singular nature of the heliostats would allow for

[2] Derived from PSEGS Petition, Table 2.2.1: 1,412,300 MWh (500 MW x 8760 hours) = 0.322/32.2%.

reduced output generation if one heliostat, or even hundreds of heliostats, was to require service or repair. This redundancy would allow service or repair to be done during sunny days when the plant is in operation, if required. Major plant systems are designed with adequate redundancy to ensure their continued operation if equipment fails (Palen 2012a, § 3.1.4.2, Table 3.1-1). Approximately 85,000 heliostats per unit would provide an excess of reflective surface area to accommodate the queuing of heliostats through a standby position before focusing them on the solar receiver steam generator (SRSG) at the top of the power tower (Palen 2012a, §§ 2.2.1.2, 2.2.1.3). The requirement for providing excess reflective surface is based on the information provided by BrightSource for Hidden Hills Solar Electric Generating Systems and Rio Mesa Solar Electric Generating System projects, which have unit areas that provide the identical nominal capacity of 250 MW as PSEGS. In each case, the heliostats would be located to accommodate 1) specific topographical conditions for each unit site; 2) efficiency factors which account for panel shadowing, tower blockage, mirror spillage, transmittance characteristics of the mirrors and SRSG, and the characteristic cosine effect; 3) standby factor for bringing heliostats on- and off-line; and 4) panel reserves for handling offline maintenance and repair.

Maintenance Program

Equipment manufacturers provide maintenance recommendations for their products, and the project owner would most likely base the project's maintenance program on those recommendations. Such a program would encompass both preventive and predictive maintenance techniques. Maintenance outages would probably be planned for periods of low electricity demand. Staff expects that the project would be adequately maintained to ensure an acceptable level of reliability.

FUEL AND WATER AVAILABILITY

The long-term availability of fuel and of water for cooling or process use is necessary to ensure the reliability of any power plant. The need for reliable sources of fuel and water is obvious; lacking long-term availability of either source, the service life of the plant could be curtailed, threatening both the power supply and the economic viability of the plant.

Fuel Availability

The project owner has described its sources of natural gas for the modified project (Palen 2012a, § 2.3). The project has access to an abundance of natural gas through the 200 psig gas transmission line that runs along Interstate Highway 10. Owned by SoCal Gas, this pipeline is connected to natural gas resources spanning the Rocky Mountains, Canada and the southwest. The gas transmission system, of which the I-10 pipeline is a part, is an existing infrastructure that has the capability of carrying up to 6.2 billion cubic feet per day from production areas in the Permian Basin of west Texas and the San Juan Basin of southern Colorado.[3] The maximum possible natural gas demand from the project is 0.53 million cubic feet per hour, constituting about 2 percent of this

[3] U.S Energy Information Administration, "Natural Gas Pipelines in the Western Region, http://www.eia.gov/pub/oil_gas/analysis_publications/ngpipeline/western.html.

capacity. Therefore, it would be highly unlikely that the project would create a substantial increase in fossil fuel demand. Staff believes that there will be adequate fuel supply to meet the project's needs.

Water Supply Reliability

PSEGS has proposed to use well water for domestic and industrial water needs, including steam cycle makeup, mirror washing, service water and fire protection water. The project would be dry cooled, so no water would be required for power plant cooling. The quantities of water to be consumed by the project are relatively small compared to the capacity of the resource available, and it seems feasible to physically draw out the water for delivery to the project site. Thus, this source of water supply seems adequate. Therefore, staff concludes that this source of water supply is a reliable source of water for the project (see the **SOIL AND WATER RESOURCES** section of this document for a further discussion of water supply).

POWER PLANT RELIABILITY IN RELATION TO NATURAL HAZARDS

Natural forces can threaten the reliable operation of a power plant. Tsunamis (tidal waves) and seiches (waves in inland bodies of water) are not likely to present hazards for this project, but seismic shaking (earthquakes), flooding and high winds could present credible threats to the project's reliable operation (Solar Millennium 2009a, AFC §§ 2.5.6, 5.5.2, 5.17.2.9, Palen 2012a, § 3.1.3.4).

Seismic Shaking

No active faults are present within the project boundaries or within a 2.5 mile radius of the site (Palen 2012a, § 3.1.3.4); see the "Faulting and Seismicity" portion of the **GEOLOGY AND PALEONTOLOGY** section of this document. The project will be designed and constructed to the latest applicable LORS (Solar Millennium 2009a, AFC Appendix C). Compliance with current seismic design LORS represents an upgrading of performance during seismic shaking compared to older facilities since these LORS have been continually upgraded. Because it would be built to the latest seismic design LORS, this project would likely perform at least as well as, and perhaps better than, existing plants in the electric power system. Staff has proposed conditions of certification to ensure this; see the section of this document entitled **FACILITY DESIGN**. In light of the general historical performance of California power plants and the electrical system in seismic events, staff has no special concerns with the power plant's functional reliability during earthquakes.

Flooding

Portions of the site lie within a 100-year or 500-year flood plain (Solar Millennium 2009a, AFC § 5.17.1.3). Project features would be designed and built to provide adequate levels of flood resistance. Staff believes there are no special concerns with power plant functional reliability due to flooding. For further discussion, see **WATER RESOURCES** and **GEOLOGY AND PALEONTOLOGY**.

High Winds

High winds are common in the region of the site, which could potentially cause damage to the solar mirrors. Project features would be built to withstand wind loading; however, mirror arrays would have to be stowed during high winds to protect the mirrors. Design would be in accordance with applicable LORS, including the 2010 California Building Code (**Facility Design**). Staff believes there are no special concerns with power plant functional reliability due to wind.

COMPARISON WITH EXISTING FACILITIES

The North American Electric Reliability Corporation (NERC) maintains industry statistics for availability factors (as well as other related reliability data). The NERC regularly polls North American utility companies on their project reliability through its Generating Availability Data System (GADS) and periodically summarizes and publishes those statistics on the Internet at <http://www.nerc.com>. Energy Commission staff typically compares the project owner's claims for reliability to the statistical reliability of similar power plants. Because solar technology is relatively new and the technologies employed so varied, no NERC statistics are available for solar power plants. Staff's typical side-by-side comparison with other existing facilities thus does not apply. The project's power cycle is based on steam cycle, but the NERC data can be used as a benchmark.

Because natural gas is the primary type of fossil fuel used in California, staff finds it reasonable to compare the project's availability factor to the average availability factor of natural gas-fired fossil fuel units. Also, because the project's total net power output would be 500 MW, staff uses the NERC statistics for 400–599 MW units. The NERC reported an equivalent availability factor of 81.4 percent as the generating unit average during the years 2007 through 2011 for natural gas units of 400–599 MW (NERC 2012). The availability factor, which does not account for unplanned outages, comes in at 82.8 percent in the same period sample.

The PSEGS project would use triple-pressure (high, intermediate and low) condensing steam turbine technology. Steam turbines incorporating this technology have been on the market for many years and are expected to exhibit typically high availability. Also, because solar-generated steam is cleaner than combusted fossil fuel (i.e., natural gas), the PSEGS steam cycle units would likely require less frequent maintenance than units that burn fossil fuel, when subject to the same operating conditions. Therefore, the project owner's expectation of an annual availability factor of 92 to 98 percent (Palen 2012a, §§ 2.12, 3.1.4.1) appears reasonable when compared with the NERC figures throughout North America. In fact, these machines can be expected to outperform the fleet of various turbines (mostly older and smaller) that make up NERC statistics.

A concentrated solar power plant (CSP) is limited to daytime operation when the sun is shining. From a maintenance standpoint, scheduled short-term repairs can be made on a daily basis because of the diurnal nature of the solar energy supply. This feature would factor planned outages out of the availability calculations, leaving only unplanned outages as the singular event within the solar production day. The NERC data presented above reflects the downward trend of availability caused by the aging of the database sample used. Comparing the NERC data to a new facility does not fully reflect the benefits of current steam system technology to the determination of plant availability.

Counterpoint to high end availability would be operating conditions unique to CSP operation: 1) accommodation of planned maintenance that would necessarily extend longer than a nighttime period cycle; 2) the daily start-up cycle that would thermally stress the steam generation cycle system components more than continuous baseline operation; and 3) the interruption of power generation due to unforeseeable natural events such as cloud cover, wind storms and ground fog.

Rather than attempt derivation, staff looked at several existing CSPs with similar steam generation systems in duty and size: The Luz/NextEra Solar Electric Generating Systems SEGS III through IX.[4] Developed by Luz in the late 1990's and currently operated by NextEra, SEGS is located near Kramer Junction and Hinkley, California on the same desert plateau as PSEGS. The 2012 annual report for the SEGS project included availability factors which ranged from 86 percent to 92 percent.[5] Since these availability values are derived from real-time operation, the percentages already reflect the effects of extended planned maintenance, daily duty cycling and natural weather occurrences. By factoring out the intermediate HTF circuit and taking advantage of lessons learned from 10-15 years of CSP commercial experience, the project owner's 6 percent jump in availability range for PSEGS, i.e., 86-92 percent to 92-98 percent would not be unreasonable.

PROJECT-RELATED FUTURE ACTIONS

The Southern California Edison (SCE) Red Bluff Substation is expected to be operational in December, 2013. Staff concludes that there won't be any overlap of construction phase of SCE Red Bluff Substation and the PSEGS. The Red Bluff Substation would not impact the reliability of any power plant, including the proposed PSEGS, and therefore, no analysis is required.

NOTEWORTHY PUBLIC BENEFITS

This project, if successful, would help serve the need for renewable energy in California.

RESPONSE TO PUBLIC AND AGENCY COMMENTS

Staff has received no public or agency comments which relate to power plant reliability.

[4] SEGS III thru VII: Production Data in Compliance Report transmitted from Robert Fimbres/NextEra to Dale Rundquist/CEC dated 2/26/13. SEGS VIII and IX: Annual Compliance Report, SEGS VII & IX. Submitted to CEC, prepared by NextEra Energy Operation Services, LLC to Luz Solar Partners VIII & IX, Harper Lake, California.

[5] Discounting the January data, the plant's availability range and average would be 86-92 percent and 89 percent respectively. (This range is actually 81-92 percent, but the 81 percent low end value of this range includes a mid-winter January shutdown of all seven solar plants to install a design retrofit on the parabolic collector portion of the system and not related to the steam generation cycle.)

CONCLUSIONS

The project owner predicts an equivalent availability factor of between 92 and 98 percent, which staff believes is achievable and consistent with its own analyses. Based on a review of the proposal, staff concludes that the modified PSEGS would be built and would operate in a manner consistent with industry norms for reliable operation. No conditions of certification are proposed.

PROPOSED CONDITIONS OF CERTIFICATION

No Conditions of Certification are proposed.

REFERENCES

NERC (North American Electric Reliability Council). 2012. 2007–2011 Generating Availability Report.

Palen 2012a – Palen Solar Holdings, LLC/Galati Blek, Scott Galati (TN 68910). Palen Solar Holdings LLC's Petition for Amendment, dated December 17, 2012. Submitted to CEC/C. Stora on December 18, 2012.

Solar Millennium 2009a – Solar Millennium (TN 52937). Application for Certification Vol. 1 & 2, dated 8/24/2009.

TRANSMISSION SYSTEM ENGINEERING

Laiping Ng and Mark Hesters

SUMMARY OF CONCLUSIONS

The proposed Palen Solar Electric Generating System (PSEGS) amendment project has no substantial changes to Transmission System Engineering (TSE) compared to the original licensed Palen Solar Power Project (PSPP). Except for the change in generation technology, the generation output and the interconnection facilities remain unchanged. No new conditions or changes to conditions of certification are required.

The proposed interconnection facilities including the PSEGS 230 kV project switchyard, the 230 kV overhead generator tie-line, and its termination at the new Southern California Edison (SCE) Red Bluff substation, are acceptable and would comply with applicable laws, ordinances, regulations and standards (LORS).

The California Independent System Operator's (California ISO) approved PSEGS's conversion to solar tower from the original PSPP parabolic trough field technology. The California ISO's Transition Cluster Phase I and Phase II Interconnection Study Reports for the PSPP are applicable to the PSEGS.

The California ISO Transition Cluster Phase II Study Report – Group Report in SCE's Eastern Bulk System (Phase II Group Study) indicates the reliable interconnection and delivery of projects in the Eastern bulk system, which includes the PSEGS, would require the following upgrades to the existing or planned SCE transmission system:

- Replacement or upgrade of many circuit breakers at substations in the SCE system. Circuit breaker replacement generally occurs within the fence line of existing substation facilities.
- The use of new or expanded Special Protection Systems (SPS). These are essentially operating procedures that reduce the output of generators under specific conditions in order to avoid overloading transmission equipment.
- Reconductor of the drops of the Mira Loma–Vista 220 kV transmission line at the Vista substation. The "drops" are the portion of the line that comes into the substation.
- The West of Devers upgrades, including reconductoring and relocation of four 220 kV transmission lines west of the Devers substation, have been identified in SCE transmission plans for several years starting in 2007 as needed to reliably serve future loads in the SCE service area and would therefore be needed to maintain system reliability even if the Eastern Bulk System generators were not constructed. Also, based on the SCE Devers-Palo Verde #2 Project upgrade timeline, the construction of the Red Bluff substation and looping the 2nd Colorado River–Devers 500 kV transmission line into the proposed Red Bluff substation is expected to be operational by 3rd quarter of 2013.

INTRODUCTION

STAFF ANALYSIS

The Transmission System Engineering (TSE) analysis examines whether or not the facilities associated with the proposed interconnection conform to all applicable LORS required for safe and reliable electric power transmission. Staff's analysis evaluates the power plant switchyard, outlet line, termination facilities, and downstream facilities identified by the applicant. Additionally, under the California Environmental Quality Act (CEQA), the Energy Commission must conduct an environmental review of the "whole of the action," which may include facilities not licensed by the Energy Commission (California Code of Regulations, title 14, §15378). Therefore, the Energy Commission must identify the system impacts and necessary new or modified downstream transmission facilities (beyond the first point of the proposed interconnection) that are required for interconnection.

Energy Commission staff analyzes studies performed by the interconnecting authority, in this case the California ISO, to determine the impacts on the transmission grid from the proposed generator interconnection. Staff's analysis also identifies new or modified facilities downstream of the first point of interconnection that may be required as mitigation measures. The proposed project would connect to the SCE transmission network and requires analysis by SCE and approval of the California ISO.

CHANGING GENERATION TECHNOLOGY

On December 6, 2012, the Applicant filed a Modification Request to the California ISO for the change of the generation technology from parabolic trough field to solar tower. A response letter dated April 22, 2013, was sent to Chifong Thomas, Senior Director of the Transmission and Strategy for Brightsoruce Energy, Inc. from the California ISO. The California ISO letter stated that: "the ISO has not found a material impact on this change in generation technology; therefore, the conversion to solar tower is approved. Southern California Edison ("SCE") concurs with this analysis and the ISO will work with SCE and Brightsource to incorporate these modifications for the Project in an amendment to the LGIA".

As the change in generation technology has no material impact, and the total generation output remaining 500 MW, and the PSEGS interconnection would still be to the Red Bluff substation, therefore, the existing California ISO Phase I and Phase II Interconnection Studies are applicable to the new plant generation technology and configuration.

SOUTHERN CALIFORNIA EDISON'S ROLE

SCE is responsible for ensuring electric system reliability on its transmission system with the addition of the proposed transmission modifications, and determines both the standards necessary to ensure reliability and whether the proposed transmission modifications conform to existing standards. The California ISO will provide analysis in its Phase I and Phase II Interconnection Studies, and its approval for the facilities and changes required in its system for addition of the proposed transmission modifications.

CALIFORNIA ISO'S ROLE

The California ISO is responsible for dispatching generating units in California, ensuring electric system reliability for all participating transmission owners and for developing the standards and procedures necessary to maintain system reliability. The California ISO will also determine the reliability impacts of the proposed transmission modifications on the SCE transmission system in accordance with all applicable reliability criteria. According to the California ISO Tariff, it will determine the need for transmission additions or upgrades downstream from the interconnection point to ensure reliability of the transmission grid. The California ISO will, therefore, perform the Phase I Interconnection Study and provide its analysis, conclusions, and recommendations. The Phase II Interconnection Study includes the California ISO conclusions and recommendations. If necessary, the California ISO will provide written and verbal testimony on its findings at the Energy Commission hearings.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

- California Public Utilities Commission (CPUC) General Order 95 (GO-95), "Rules for Overhead Electric Line Construction," formulates uniform requirements for construction of overhead lines. Compliance with this order ensures adequate service and safety to persons engaged in the construction, maintenance and operation or use of overhead electric lines and to the public in general.
- California Public Utilities Commission (CPUC) General Order 128 (GO-128), "Rules for Construction of Underground Electric Supply and Communications Systems," formulates uniform requirements and minimum standards to be used for underground supply systems to ensure adequate service and safety to persons engaged in the construction, maintenance and operation or use of underground electric lines and to the public in general.
- The National Electric Safety Code, 1999 provides electrical, mechanical, civil and structural requirements for overhead electric line construction and operation.
- NERC/WECC Planning Standards: The Western Electricity Coordinating Council (WECC) Planning Standards are merged with the North American Electric Reliability Council (NERC) Planning Standards and provide the system performance standards used in assessing the reliability of the interconnected system. These standards require the continuity of service to loads as the first priority and preservation of interconnected operation as a secondary priority. Certain aspects of the NERC/WECC standards are either more stringent or more specific than the NERC standards alone. These standards provide planning for electric systems so as to withstand the more probable forced and maintenance outage system contingencies at projected customer demand and anticipated electricity transfer levels, while continuing to operate reliably within equipment and electric system thermal, voltage and stability limits. These standards include the reliability criteria for system adequacy and security, system modeling data requirements, system protection and control, and system restoration. Analysis of the WECC system is based to a large degree on Section I.A of the standards, "NERC and WECC Planning Standards with Table I and WECC Disturbance-Performance Table" and on Section I.D, "NERC and WECC Standards for Voltage Support and Reactive Power". These standards

require that the results of power flow and stability simulations verify defined performance levels. Performance levels are defined by specifying the allowable variations in thermal loading, voltage and frequency, and loss of load that may occur on systems during various disturbances. Performance levels range from no significant adverse effects inside and outside a system area during a minor disturbance (loss of load or a single transmission element out of service) to a level that seeks to prevent system cascading and the subsequent blackout of islanded areas during a major disturbance (such as loss of multiple 500 kV lines along a common right of way, and/or multiple generators). While controlled loss of generation or load or system separation is permitted in certain circumstances, their uncontrolled loss is not permitted (WECC 2006).

- North American Reliability Council (NERC) Reliability Standards for the Bulk Electric Systems of North America provide national policies, standards, principles and guidelines to assure the adequacy and security of the electric transmission system. The NERC Reliability Standards provide for system performance levels under normal and contingency conditions. With regard to power flow and stability simulations, while these Reliability Standards are similar to NERC/WECC Standards, certain aspects of the NERC/WECC Standards are either more stringent or more specific than the NERC Standards for Transmission System Contingency Performance. The NERC Reliability Standards apply not only to interconnected system operation but also to individual service areas (NERC 2006).
- California ISO Planning Standards also provide standards and guidelines to assure the adequacy, security and reliability in the planning of the California ISO transmission grid facilities. The California ISO Grid Planning Standards incorporate the NERC/WECC and NERC Reliability Planning Standards. With regard to power flow and stability simulations, these Planning Standards are similar to the NERC/WECC or NERC Reliability Planning Standards for Transmission System Contingency Performance. However, the California ISO Standards also provide some additional requirements that are not found in the WECC/NERC or NERC Standards. The California ISO Standards apply to all participating transmission owners interconnecting to the California ISO controlled grid. They also apply when there are any impacts to the California ISO grid due to facilities interconnecting to adjacent controlled grids not operated by the California ISO (California ISO 2002a).
- California ISO/FERC Electric Tariff provides guidelines for construction of all transmission additions/upgrades (projects) within the California ISO controlled grid. The California ISO determines the "Need" for the proposed modified project where it will promote economic efficiency or maintain system reliability. The California ISO also determines the Cost Responsibility of the proposed modified project and provides an Operational Review of all facilities that are to be connected to the California ISO grid (California ISO 2007a).

PROJECT DESCRIPTION

Palen Solar I, LLC originally proposed to construct, own and operate the PSPP. The original proposed project would be a concentrated solar thermal electric generating facility with two adjacent solar plants. Each solar generating plant would use a 300 MVA steam turbine generating unit for a combined net output of 530 MW. The project's planned operational date is summer 2013.

Generating Unit 1 requires a 9,200 foot long transmission line to the PSPP switchyard and Generating Unit 2 requires a 4,000 foot long transmission line. Each line would be connected to a common bus segment at the PSPP switchyard. The PSPP power would be transmitted from the PSPP switchyard to the SCE Red Bluff substation via an 8 mile long double circuit 230 kV transmission line. (PSPP 2009b, section 1.0, 2.6 and Figures 2.9, 2-14, 2-15, 2-16)

Palen Solar Holdings, LLC currently proposes to amend the original licensed PSPP and change the name to PSEGS. The proposed PSEGS project would be a solar thermal electric generating facility with two solar plants. Each solar generating plant would consist of a solar field and a power block. The PSEGS would uses heliostats to focus sun rays on a solar receiver steam generator (SRSG). The steam turbine generator (STG) will receive steam from the SRSG to generate electricity.

Each solar generating plant would have a steam turbine unit rated at 317 MVA with a power factor of 0.90, resulting in a maximum power output of 285 MW. For two solar generating plants, the maximum output would be 570 MW. Approximately 22 MW of the generating power would be used for auxiliary load. Thus, although the project owner has applied to the California ISO and the Energy Commission for only 500 MW of generation, the PSEGS could generate up to 548 MW power output to the transmission interconnection. The project's planned operational date will approximately be the end of June 2016.

The STG would be connected through a 21 kV 10,000-ampere generator circuit breaker via a short 10,000-ampere isolated phase bus duct to the low side of its dedicated 190/253/315 MVA generator step-up (21/230 kV) transformer. The auxiliary power for each unit would be provided through its dedicated back-fed transformer (21/4.16/13.8 kV) which is connected between the STG circuit breaker and the low side of the step-up transformer through 10,000-ampere isolated phase bus duct.

For each generating unit, the 230 kV side of its step-up transformer would be connected through a 230 kV, 1,200 ampere disconnect switch and a 230 kV underground cable (XLPE copper cable between 1,250 kcmil and 1,750 kcmil) to the 230 kV project switchyard. Generating Unit 1 requires a 6,234 foot long underground cable to the project switchyard and Generating Unit 2 requires a 14,586 foot long underground cable. Each line would be connected to a common bus segment at the Palen project switchyard. The proposed Palen switchyard would consist of a 2,000 amps 230 kV circuit breaker, two 2,000 amps 230 kV disconnect switches and protection circuits (Palen 2012 A, section 2.1.3, 2.2.2, section 3.2.2 Figure 3.2-1, Figures 3.2-2, Palen 2013l).

SWITCHYARDS AND INTERCONNECTION FACILITIES

Power generated by the PSEGS would be transmitted from the project switchyard to the proposed SCE 500/230 kV Red Bluff substation via a 6.9 mile long single circuit 230 kV transmission line. The single circuit line would be built with twin-bundled, 795 kcmil conductors which are capable of carrying 1,814 amps at 75 degrees centigrade. The proposed overhead generator transmission line is rated to carry the full capacity of the 548 MW PSEGS. The 230 kV transmission line would be supported by mono-pole structures at approximately 1,100 feet intervals, and the final pole height would be determined during the detailed design phase of the transmission facilities. The applicant has proposed to extend the bus work within the breaker-and–a-half Red Bluff substation to interconnect the solar plant. The modification of the Red Bluff substation would consist of one new 230 kV, 3,000 amps circuit breaker, and two 230 kV 3,000 amps disconnect switches. SCE and the applicant agreed to connect the PSEGS switchyard to the proposed Red Bluff 500/230 kV substation. Power would be distributed to the grid via transmission lines connected to the Red Bluff substation (Palen 2012 A, section 2.1.3, 2.2.2, Figures 3.2-2, Palen 2013l, Palen 2013n).

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

For the interconnection of a proposed generating unit or transmission facility to the grid, the interconnecting utility and the control area operator are responsible for ensuring grid reliability. For the PSEGS, SCE and the California ISO are responsible for ensuring grid reliability.

The California ISO's generator interconnection study process is in transition from a serial process to an interconnection window cluster study process. The PSPP was studied under the window cluster process and the transmission reliability impacts of the proposed modified project were studied in the Phase I and Phase II Studies. The Phase I Study is similar to the former System Impact Study except it is now performed for a group of projects in the same geographical area of a utility that apply for interconnection in the same request window. The Phase II Study (former Facilities Study) is performed after generators in each cluster meet specific milestones required to stay in the generator interconnection queue. The Phase II Study is then performed based on the number of generators left in each cluster.

The Phase I and Phase II Studies for projects in the transition cluster were conducted to determine the preferred and alternative generator interconnection methods, and to identify any mitigation measures required to ensure system conformance with utility reliability criteria, NERC planning standards, WECC reliability criteria, and California ISO reliability criteria. Staff relies on the studies and any review conducted by the responsible agencies to determine the effect of the projects on the transmission grid and to identify any necessary downstream facilities or indirect project impacts required to bring the transmission network into compliance with applicable reliability standards (NERC 2006, WECC 2006, California ISO 2002a, 2007a & 2009a).

The Phase II Study analyzed the grid with and without the generator or generators in the cluster under conditions specified in the planning standards and reliability criteria. The standards and criteria defined the assumptions used in the study and established the thresholds by which grid reliability was determined. The studies must analyze the impact of the projects for their proposed first year(s) of operation and thus were based on a forecast of loads, generation and transmission. Load forecasts were developed by the interconnected utility, which was SCE in this case. Generation and transmission forecasts were based on the interconnection queue. The studies focused on thermal overloads, voltage deviations, system stability (excessive oscillations in generators and transmission system, voltage collapse, loss of loads or cascading outages), short circuit duties and substation evaluation.

Under the new California ISO LGIP, generators are able to choose between either “full capacity” or “energy only”, depending on whether or not the generator wants to have the right to generate energy 24 hours per day. A generator that chooses the full capacity option will be required to pay for transmission network upgrades that are needed to allow the generator to operate under virtually any system conditions and as such could sign contracts that allowed them to provide capacity to utilities. Energy only generators would not pay for network transmission upgrades, and essentially would have access to as available transmission capacity, and would likely not be able to sign capacity contracts.

If the studies show that the interconnection of the project or cluster of projects causes the grid to be out of compliance with reliability standards, the study will then identify mitigation alternatives or ways in which the grid could be brought into compliance with reliability standards. If the interconnecting utility determines that the only feasible mitigation includes transmission modifications or additions which require CEQA review as part of the “whole of the action,” the Energy Commission must analyze those modifications or additions according to CEQA requirements. Where the Phase II Study identifies transmission modifications required for the reliable interconnection of a cluster of generators, staff will analyze the proposed generating project’s impact on individual reliability criteria violations to determine whether or not the identified mitigation measures are a reasonably foreseeable consequence of the proposed modified project.

SCOPE OF THE TRANSITION CLUSTER PHASE I AND PHASE II INTERCONNECTION STUDIES

The July 28, 2009, Transition Cluster Phase I Interconnection Study was prepared by the California ISO in coordination with SCE. Fifteen queue generation projects, including the proposed 500 MW PSPP in the Eastern Riverside County area with a total of 9,690 MW net generation output, were included in this cluster study. As of December 4, 2009 only five projects (2,200 MW) of the original 15 projects remained in the interconnection queue. Reducing the size of the cluster by 10 projects and over 7,000 MW meant the Phase 1 Study results for the cluster were not a reasonable forecast of the reliability impacts of the proposed modified project.

Generally staff relies on the California ISO Phase I/SIS to determine whether or not the proposed generation project will likely comply with reliability and to identify the transmission facilities required for reliable interconnection. For the Transition Cluster projects, the Phase I Study did not provide an accurate forecast of impacts of the PSPP on the SCE transmission grid. Therefore, staff has relied on the Phase II Group Study that was completed on July 8, 2010 and received on July 23, 2010, to determine the PSEGS impact on grid reliability and identify transmission upgrades for reliable interconnection.

The changes between the Transition Cluster Phase I and Phase II Studies for the Eastern Bulk System, included the withdrawal of ten generation projects totaling 7,490 MW, changing the point of interconnection of one generation project, and a reduction of 350 MW of generation from two projects. For study purposes, five generation projects totaling a maximum output of 2,200 MW were included in the SCE Transition Cluster base cases. During the study, three of these projects, PSPP, the Blythe Solar Power Project and the Genesis Solar Energy Project were seeking licenses from the California Energy Commission.

The Phase II Group Study modeled the PSPP with a net output of 500 MW. The base case was developed from WECC's 2013 Peak load and 2013 Off-Peak load base case series and included all major SCE transmission projects, and all proposed higher queued generation projects that will be operational by 2013. The Phase II Group Study pre-project base cases were modeled to include the Devers–Colorado River project (DCR), which is the California portion of Devers–Palo Verde 2 (DPV2), and the proposed 500 kV switchyard at Colorado River substation. The power flow studies were conducted with and without the proposed Transition Cluster Phase II projects connected to the SCE grid at each project's interconnection switchyard. The detailed study assumptions were described in the study. The power flow study assessed the Transition Cluster Phase II projects impact on thermal loading of the transmission lines and equipments. Transient and post-transient studies were conducted using the Peak load full loop base case to determine whether the Transition Cluster Phase II projects would create instability in the system following certain selected outages. Short circuit studies were conducted to determine if the Transition Cluster Phase II projects would overstress existing substation facilities. (Cal ISO 2010a)

PHASE II STUDY RESULTS FOR TRANSITION CLUSTER PROJECTS

Power Flow Study Results and Mitigation Measures

The Phase II Group Study identified pre-project overload criteria violations under 2013 Summer Peak and Off-Peak study condition. Pre-project overloads are caused by either existing system conditions or by projects with higher positions in the SCE's generator interconnection queue. The study concluded that the addition of the Phase II Transition Cluster projects would cause a number of pre-existing normal and /or emergency overloads to increase and would cause some new normal and emergency overloads (Cal ISO 2010a).

Results of the Phase II Group Study are detailed below. Where potential overloads were identified, mitigation was proposed to eliminate the potential reliability impact.

Normal Overloads (N-0): The power flow study indicated that the Phase II Transition Cluster projects would cause three normal overloads under 2013 Peak load conditions and Off-Peak load conditions. The predicted overload facilities were the same for both Peak and Off-Peak load conditions.

Overloaded Transmission Facilities:

- Devers–San Bernardino 220 kV No. 1 line
- Devers–San Bernardino 220 kV No. 2 line
- Devers-Vista 220 kV No. 1 line

Recommended Mitigation:

A combination of congestion management for base case and contingency overloads, the West-of-Devers upgrade project, and the looping the 2nd Colorado River–Devers 500 kV transmission line into the Red Bluff substation are required to mitigate the power flow impacts caused by the project. The detailed electrical facilities needed to mitigate the overload criteria violations have been addressed and selected in the group report in SCE's Eastern Bulk System.

<u>Category B (N-1):</u> The power flow study indicated that the Phase II Transition Cluster projects would cause four N-1 overloads under 2013 Peak load conditions and Off-Peak load conditions. The predicted overload facilities were the same for both Peak and Off-Peak load conditions.

Overloaded Transmission Facilities:

- Devers–San Bernardino 230 kV No. 1 line
- Devers–San Bernardino 230 kV No. 2 line
- Devers-Vista 230 kV No. 1 line
- Devers-Vista 230 kV No. 2 line

Recommended Mitigation:

A combination of congestion management for base case and contingency overloads, the West-of-Devers upgrade project, and the looping the 2nd Colorado River–Devers 500 kV transmission line into the Red Bluff substation are required to mitigate the power flow impacts caused by the project. The detailed electrical facilities needed to mitigate the overload criteria violations have been addressed and selected in the group report in SCE's Eastern Bulk System.

<u>Category C (N-2):</u> The power flow study indicated that the Phase II Transition Cluster projects would cause five new N-2 overloads under 2013 Peak load conditions and Off-Peak load conditions. The three predicted overload facilities were the same for both Peak and Off-Peak load conditions. Additionally one new overload was revealed.

Overloaded Transmission Facilities:

- Devers–San Bernardino 220 kV No. 1 line
- Devers–San Bernardino 220 kV No. 2 line
- Devers-Vista 220 kV line No. 1 line
- Devers-Vista 220 kV No. 2 line
- Mira Loma–Vista 220 kV No. 2 line

Recommended Mitigation:

A combination of congestion management, the West-of-Devers upgrade project, and the looping the 2nd Colorado River–Devers 500 kV transmission line into the Red Bluff substation are required to mitigate the power flow impacts caused by the project. The detailed electrical facilities needed to mitigate the overload criteria violations have been addressed and selected in the group report in SCE's Eastern Bulk System.

Transient Stability Study Results and Mitigation Measures

Transient stability studies were conducted using the full loop base cases to ensure that the transmission system remained in operating equilibrium, as well as operating in a coordinated fashion, through abnormal operating conditions after the Phase II Transition Cluster projects became operational. Disturbance simulations were performed for a study period of 10 seconds to determine whether the Phase II Transition Cluster projects would create any system instability during line and generator outages. All outage cases were evaluated with the assumption that existing Special Protection Systems (SPS) or Remedial Action Schemes (RAS) would operate as designed. The most critical single contingency and double contingency outage conditions in the east and west of Devers area within the overall SCE Eastern Bulk System were evaluated. The transient study identified system instability during the N-2 outages. Therefore, an SPS has been proposed as a mitigation measure that will curtail the 1,400 MW of generation of the Phase II Transition Cluster projects. The proposed PSEGS project has been included in rearming the SPS. (Transition Cluster Phase II Interconnection Study Report, SCE's Eastern Bulk System, Appendix F Dynamic Stability Plots)

Reactive Power Deficiency Analysis Results

Reactive power deficiency analysis was performed in the group study. The reactive power deficiency analysis included power flow sensitivity analysis in the Eastern Bulk System. The study found no reactive deficiency from this PSEGS project to the SCE bulk system.

Short Circuit Study Results and Mitigation Measures

Short circuit studies were performed to determine the degree to which the addition of the Phase II Transition Cluster projects would increase fault duties at SCE's substations, adjacent utility substations, and the other 115 kV, 230 kV and 500 kV busses within the study area. The fault duties were calculated with and without the Phase II Transition Cluster projects to identify any equipment overstress conditions. All bus locations where the Phase II Transition Cluster projects increased the short circuit duty by 0.1 kA or more and where the short circuit duty was in excess of 60% of the minimum breaker nameplate rating are listed in Appendix H of the Transition Cluster Phase II Interconnection Study Report, SCE's Eastern Bulk System. With the addition of the Transition Cluster Phase II projects, the following overstressed circuit breakers were identified at the following substations: Vincent 500 kV substation – 11 breakers, Kramer 220 kV substation – 5 breakers, Windhub 220 kV substation – 9 breakers, and Antelope 66 kV substation – 2 breakers. Mitigation measures included the following:

- Vincent 500 kV substation: replace seven circuit breakers and upgrade four circuit breakers
- Kramer 220 kV substation: replace five circuit breakers
- Windhub 220 kV substation: sectionalize 220 kV bus
- Antelope 66 kV substation: operating procedure to reduce short circuit duty

CUMULATIVE IMPACTS

Staff has reviewed the list of existing and foreseeable projects as presented in the Cumulative Scenario section of this analysis. Staff's review considers whether the interconnection of PSEGS to SCE's transmission system along with other existing and foreseeable generation projects would conform to all LORS required for safe and reliable electric power transmission. The analysis described above under the heading Scope of the Transition Cluster Phase I and Phase II Interconnection Studies is conducted in coordination with, and with the approval of, the California ISO to consider existing and proposed generator interconnections to the transmission grid and the potential safety and reliability impacts under a number of conservative contingency conditions.

The cumulative marginal impacts to the safe and reliable operation of the transmission system due to the PSPP project, as identified in the Phase II Study, would be mitigated with the Energy Commission's and BLM's incorporation of the mitigation measures and Conditions of Certification set forth in this section.

COMPLIANCE WITH LORS

The proposed interconnection facilities including the PSEGS 230 kV project switchyard, generator 230 kV overhead tie line to the new SCE Red Bluff 230 kV substation, and its termination at the new 230 kV substation are adequate in accordance with industry standards and good utility practices, and are acceptable to staff. Staff believes that existing Conditions of Certification TSE-1 through TSE-7 will ensure the proposed PSEGS complys with applicable LORS:

1. Condition of Certification TSE-1 will ensure that the preliminary equipment is in place for construction of the transmission facilities of the proposed project to comply with applicable LORS.

2. Condition of Certification TSE-2 will ensure that the proper personnel are ready to manage and monitor the construction of the transmission facilities for the proposed project to comply with applicable LORS.

3. Condition of Certification TSE-3 will ensure that any changes to the proposed transmission facilities would comply with applicable LORS.

4. Condition of Certification TSE-4 will ensure that the final design of the proposed transmission facilities would comply with applicable LORS.

5. Condition of Certification TSE-5 will ensure that the proposed project would be properly interconnected to the transmission grid. TSE-5 also ensures that the generator output would be properly delivered to the transmission system.

6. Condition of Certification TSE-6 will ensure that the project would synchronize with the existing transmission system and the operation of the facilities would comply with applicable LORS.

7. Condition of Certification TSE-7 will ensure that the proposed project has been built to required specifications and the operation of the facilities would comply with applicable LORS.

The Phase II Interconnection Study indicates that the project interconnection would comply with all NERC/WECC planning standards and California ISO reliability criteria as long as the identified Reliability Network Upgrades are implemented.

RESPONSE TO AGENCY AND PUBLIC COMMENTS

No agency or public comments related to the TSE have been received.

CONCLUSIONS

The proposed PSEGS amendment project has no substantial changes to TSE compared to the original licensed PSPP. Except for the change in generation technology, the generation output and the interconnection facilities remain unchanged. No new conditions or changes to conditions of certification are required.

The proposed interconnection facilities including the PSEGS 230 kV project switchyard, the 230 kV overhead generator tie-line, and its termination at the new SCE Red Bluff substation, are acceptable and would comply with applicable LORS.

California ISO approved PSEGS's conversion to solar tower from the original PSPP parabolic trough field technology. The California ISO's Transition Cluster Phase I and Phase II Interconnection Study Reports for the PSPP are applicable to the PSEGS.

The California ISO Phase II Study Report – Group Report in SCE's Eastern Bulk System indicates the reliable interconnection and delivery of projects in the Eastern bulk system, which includes the PSEGS, would require the following upgrades to the existing or planned SCE transmission system:

- Replacement or upgrade of many circuit breakers at substations in the SCE system. Circuit breaker replacement generally occurs within the fence line of existing substation facilities.
- The use of new or expanded SPS. These are essentially operating procedures that reduce the output of generators under specific conditions in order to avoid overloading transmission equipment.
- Reconductor of the drops of the Mira Loma–Vista 220 kV transmission line at the Vista substation. The "drops" are the portion of the line that comes into the substation.
- The West of Devers upgrades, including reconductoring and relocation of four 220 kV transmission lines west of the Devers substation, have been identified in SCE transmission plans for several years starting in 2007 as needed to reliably serve future loads in the SCE service area and would therefore be needed to maintain system reliability even if the Eastern Bulk System generators were not constructed. Also, based on the SCE Devers-Palo Verde #2 Project upgrade timeline, the construction of the Red Bluff substation and looping the 2nd Colorado River–Devers

500 kV transmission line into the proposed Red Bluff substation is expected to be operational by 3rd quarter of 2013.

PROPOSED CONDITIONS OF CERTIFICATIONS

Staff has no proposed changes to the existing Conditions of Certification as provided below.

TSE-1 The project owner shall furnish to the CPM and to the CBO a schedule of transmission facility design submittals, a Master Drawing List, a Master Specifications List, and a Major Equipment and Structure List. The schedule shall contain a description and list of proposed submittal packages for design, calculations, and specifications for major structures and equipment. To facilitate audits by Energy Commission staff, the project owner shall provide designated packages to the CPM when requested.

Verification: Prior to the start of construction of the transmission facilities, the project owner shall submit the schedule, a Master Drawing List, and a Master Specifications List to the CBO and to the CPM. The schedule shall contain a description and list of proposed submittal packages for design, calculations, and specifications for major structures and equipment (see a list of major equipment below). Additions and deletions shall be made to the table only with CPM and CBO approval. The project owner shall provide schedule updates in the Monthly Compliance Report.

Breakers
Step-up transformer
Switchyard
Busses
Surge arrestors
Disconnects
Take-off facilities
Electrical control building
Switchyard control building
Transmission pole/tower
Grounding system

TSE-2 Before the start of construction, the project owner shall assign to the project an electrical engineer and at least one of each of the following:

a) a civil engineer;

b) a geotechnical engineer or a civil engineer experienced and knowledgeable in the practice of soils engineering;

c) a design engineer who is either a structural engineer or a civil engineer and fully competent and proficient in the design of power plant structures and equipment supports; or

d) a mechanical engineer (Business and Professions Code Sections 6704 et seq. require state registration to practice as either a civil engineer or a structural engineer in California).

The tasks performed by the civil, mechanical, electrical, or design engineers may be divided between two or more engineers as long as each engineer is responsible for a particular segment of the project, e.g., proposed earthwork, civil structures, power plant structures, or equipment support. No segment of the project shall have more than one responsible engineer. The transmission line may be the responsibility of a separate California registered electrical engineer. The civil, geotechnical, or civil and design engineer, assigned as required by **Facility Design** Condition **GEN-5**, may be responsible for design and review of the TSE facilities.

The project owner shall submit to the CBO, for review and approval, the names, qualifications, and registration numbers of all engineers assigned to the project. If any one of the designated engineers is subsequently reassigned or replaced, the project owner shall submit the name, qualifications, and registration number of the newly assigned engineer to the CBO for review and approval. The project owner shall notify the CPM of the CBO's approval of the new engineer. This engineer shall be authorized to halt earth work and require changes; if site conditions are unsafe or do not conform to the predicted conditions used as the basis for design of earth work or foundations.

The electrical engineer shall:

1. be responsible for the electrical design of the power plant switchyard, outlet, and termination facilities; and

2. sign and stamp electrical design drawings, plans, specifications, and calculations.

Verification: Prior to the start of rough grading, the project owner shall submit to the CBO for review and approval, the names, qualifications, and registration numbers of all the responsible engineers assigned to the project. The project owner shall notify the CPM of the CBO's approvals of the engineers within five days of the approval.

If the designated responsible engineer is subsequently reassigned or replaced, the project owner has five days in which to submit the name, qualifications, and registration number of the newly assigned engineer to the CBO for review and approval. The project owner shall notify the CPM of the CBO's approval of the new engineer within five days of the approval.

TSE-3 If any discrepancy in design and/or construction is discovered in any engineering work that has undergone CBO design review and approval, the project owner shall document the discrepancy and recommend corrective action (2001 California Building Code, Chapter 1, section 108.4, approval required; Chapter 17, section 1701.3, *Duties and Responsibilities of the Special Inspector;* Appendix Chapter 33, section 3317.7, *Notification of Noncompliance*). The discrepancy documentation shall become a controlled document and shall be submitted to the CBO for review and approval and refer to this condition of certification.

Verification: The project owner shall submit a copy of the CBO's approval or disapproval of any corrective action taken to resolve a discrepancy to the CPM within 15 days of receipt. If disapproved, the project owner shall advise the CPM, within five days, the reason for the disapproval, along with the revised corrective action required to obtain the CBO's approval.

TSE-4 For the power plant switchyard, outlet line and termination, the project owner shall not begin any construction until plans for that increment of construction have been approved by the CBO. These plans, together with design changes and design change notices, shall remain on the site for one year after completion of construction. The project owner shall request that the CBO inspect the installation to ensure compliance with the requirements of applicable LORS. The following activities shall be reported in the monthly compliance report:

a) receipt or delay of major electrical equipment;

b) testing or energization of major electrical equipment; and

c) the number of electrical drawings approved, submitted for approval, and still to be submitted.

Verification: Prior to the start of each increment of construction, the project owner shall submit to the CBO for review and approval the final design plans, specifications and calculations for equipment and systems of the power plant switchyard, and outlet line and termination, including a copy of the signed and stamped statement from the responsible electrical engineer verifying compliance with all applicable LORS, and send the CPM a copy of the transmittal letter in the next monthly compliance report.

TSE-5 The project owner shall ensure that the design, construction, and operation of the proposed transmission facilities will conform to all applicable LORS, and the requirements listed below. The project owner shall submit the required number of copies of the design drawings and calculations, as determined by the CBO. Once approved, the project owner shall inform the CPM and CBO of any anticipated changes to the design, and shall submit a detailed description of the proposed change and complete engineering, environmental, and economic rationale for the change to the CPM and CBO for review and approval.

a) The power plant outlet line shall meet or exceed the electrical, mechanical, civil, and structural requirements of CPUC General Order 95 or National Electric Safety Code (NESC); Title 8 of the California Code and Regulations (Title 8); Articles 35, 36 and 37 of the *High Voltage Electric Safety Orders*, California ISO standards, National Electric Code (NEC) and related industry standards.

b) Breakers and busses in the power plant switchyard and other switchyards, where applicable, shall be sized to comply with a short-circuit analysis.

c) Outlet line crossings and line parallels with transmission and distribution facilities shall be coordinated with the transmission line owner and comply with the owner's standards.

d) The project conductors shall be sized to accommodate the full output of the project.

e) Termination facilities shall comply with applicable SCE interconnection standards.

f) The project owner shall provide to the CPM:

   i) The Special Protection System (SPS) sequencing and timing if applicable,

   ii) A letter stating that the mitigation measures or projects selected by the transmission owners for each reliability criteria violation, for which the project is responsible, are acceptable, and

   iii) A copy of the executed LGIA signed by the California ISO and the project owner.

Verification: Prior to the start of construction or start of modification of transmission facilities, the project owner shall submit to the CBO for approval:

1. Design drawings, specifications, and calculations conforming with CPUC General Order 95 or National Electric Safety Code (NESC); Title 8 of the California Code and Regulations (Title 8); Articles 35, 36 and 37 of the *High Voltage Electric Safety Orders*, California ISO standards, National Electric Code (NEC) and related industry standards, for the poles/towers, foundations, anchor bolts, conductors, grounding systems, and major switchyard equipment;

2. For each element of the transmission facilities identified above, the submittal package to the CBO shall contain the design criteria, a discussion of the calculation method(s), a sample calculation based on "worst case conditions"[1] and a statement signed and sealed by the registered engineer in responsible charge, or other acceptable alternative verification, that the transmission element(s) will conform with CPUC General Order 95 or National Electric Safety Code (NESC); Title 8 of the California Code and Regulations (Title 8); Articles 35, 36 and 37 of the *High Voltage Electric Safety Orders*, California ISO standards, National Electric Code (NEC), and related industry standards;

3. Electrical one-line diagrams signed and sealed by the registered professional electrical engineer in charge, a route map, and an engineering description of the equipment and configurations covered by requirements **TSE-5** a) through f);

4. The Special Protection System (SPS) sequencing and timing if applicable shall be provided concurrently to the CPM.

[1] Worst-case conditions for the foundations would include for instance, a dead-end or angle pole.

5. A letter stating that the mitigation measures or projects selected by the transmission owners for each reliability criteria violation, for which the project is responsible, are acceptable, and

6. A copy of the executed LGIA signed by the California ISO and the project owner.

Prior to the start of construction of or modification of transmission facilities, the project owner shall inform the CBO and the CPM of any anticipated changes to the design that are different from the design previously submitted and approved and shall submit a detailed description of the proposed change and complete engineering, environmental, and economic rationale for the change to the CPM and CBO for review and approval.

TSE-6 The project owner shall provide the following Notice to the California Independent System Operator (California ISO) prior to synchronizing the facility with the California Transmission system:

1. At least one week prior to synchronizing the facility with the grid for testing, provide the California ISO a letter stating the proposed date of synchronization; and

2. At least one business day prior to synchronizing the facility with the grid for testing, provide telephone notification to the California ISO Outage Coordination Department.

Verification: The project owner shall provide copies of the California ISO letter to the CPM when it is sent to the California ISO one week prior to initial synchronization with the grid. The project owner shall contact the California ISO Outage Coordination Department, Monday through Friday, between the hours of 0700 and 1530 at (916) 351-2300 at least one business day prior to synchronizing the facility with the grid for testing. A report of conversation with the California ISO shall be provided electronically to the CPM one day before synchronizing the facility with the California transmission system for the first time.

TSE-7 The project owner shall be responsible for the inspection of the transmission facilities during and after project construction, and any subsequent CPM and CBO approved changes thereto, to ensure conformance with CPUC GO-95 or NESC, Title 8, CCR, Articles 35, 36 and 37 of the, “High Voltage Electric Safety Orders”, applicable interconnection standards, NEC and related industry standards. In case of non-conformance, the project owner shall inform the CPM and CBO in writing, within 10 days of discovering such non-conformance and describe the corrective actions to be taken.

Verification: Within 60 days after first synchronization of the project, the project owner shall transmit to the CPM and CBO:

1. “As built” engineering description(s) and one-line drawings of the electrical portion of the facilities signed and sealed by the registered electrical engineer in responsible charge. A statement attesting to conformance with CPUC GO-95 or NESC, Title 8, California Code of Regulations, Articles 35, 36 and 37 of the “High Voltage Electric Safety Orders”, and applicable interconnection standards, NEC, related industry standards.

2. An “as built” engineering description of the mechanical, structural, and civil portion of the transmission facilities signed and sealed by the registered engineer in responsible charge or acceptable alternative verification. “As built” drawings of the electrical, mechanical, structural, and civil portion of the transmission facilities shall be maintained at the power plant and made available, if requested, for CPM audit as set forth in the “Compliance Monitoring Plan”.

3. A summary of inspections of the completed transmission facilities, and identification of any nonconforming work and corrective actions taken, signed and sealed by the registered engineer in charge.

REFERENCES

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CA ISO Transition cluster Phase 1 Interconnection Study Report dated August 05, 2009. Submitted on 10-09.

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Palen 2012 A – Palen Solar Holdings, LLC/Galati Blek, Scott Galati (TN 68910). Palen Solar Holdings LLC's Petition for Amendment, Dated December 17, 2012. Submitted to CEC/C. Stora on December 18, 2012

Palen 2013l – Galati Blek/Scott A. Galati (TN 70785). Palen Solar Holdings, LLC's Response to Workshop Queries, dated May 13, 2013. Submitted to CEC/C. Stora on May 13, 2013

Palen 2013n – Galati Blek/M. Fleming (TN 70980). Additional Tranmission System Engineering Information Related to SCE's Red Bluff Substation, date May 28, 2013. Submitted to CEC/Docket Unit on May 28, 2013

PSEGS 2009a – Palen Solar Energy Project. Application for Certification (AFC) for the PSEGS, Submitted on 08-30-2009.

PSEGS 2009b – Solar Millennium (tn: 54008). Data Adequacy Supplement, dated 10/26/2009

WECC (Western Electricity Coordinating Council) 2006 – NERC/WECC Planning Standards, August 2006.

DEFINITION OF TERMS

ACSR.......................... Aluminum cable steel reinforced.

AAC .... All Aluminum conductor.

ACSS .... Aluminum conductor steel-supported.

Ampacity.................... Current-carrying capacity, expressed in amperes, of a conductor at specified ambient conditions, at which damage to the conductor is nonexistent or deemed acceptable based on economic, safety, and reliability considerations.

Ampere....................... The unit of current flowing in a conductor.

Kiloampere (kA)......... 1,000 Amperes

Bundled...................... Two wires, 18 inches apart.

Bus .... Conductors that serve as a common connection for two or more circuits.

Conductor .... The part of the transmission line (the wire) that carries the current.

Congestion .... Congestion management is a scheduling protocol, which provides that

Management .... dispatched generation and transmission loading (imports) would not violate criteria.

Emergency Overload. See Single Contingency. This is also called an L-1.

Hertz .... The unit for System Frequency.

Kcmil or KCM............. Thousand circular mil. A unit of the conductor's cross sectional area, when divided by 1,273, the area in square inches is obtained.

Kilovolt (kV) .... A unit of potential difference, or voltage, between two conductors of a circuit, or between a conductor and the ground. 1,000 Volts.

Loop .... An electrical cul de sac. A transmission configuration that interrupts an existing circuit, diverts it to another connection and returns it back to the interrupted circuit, thus forming a loop or cul de sac.

MVAR or..................... Megavolt Ampere-Reactive. One million Volt-Ampere-Reactive.

Megavars.................... Reactive power is generally associated with the reactive nature of motor loads that must be fed by generation units in the system.

Megavolt..................... A unit of apparent power, equals the product of the line voltage

Ampere (MVA) .... in kilovolts, current in amperes, the square root of 3, and divided by 1000.

Megawatt (MW) .... A unit of power equivalent to 1,341 horsepower.

Normal Operation/Normal Overload

When all customers receive the power they are entitled to without interruption and at steady voltage, and no element of the transmission system is loaded beyond its continuous rating.

N-1 Condition............. See Single Contingency.

Outlet.......................... Transmission facilities (circuit, transformer, circuit breaker, etc.) linking generation facilities to the main grid.

Power Flow Analysis . A power flow analysis is a forward looking computer simulation of essentially all generation and transmission system facilities that identifies overloaded circuits, transformers and other equipment and system voltage levels.

Reactive Power.......... Reactive power is generally associated with the reactive nature of inductive loads like motor loads that must be fed by generation units in the system. An adequate supply of reactive power is required to maintain voltage levels in the system.

Remedial Action .... A remedial action scheme is an automatic control provision,

Scheme (RAS) .... which, for instance, would trip a selected generating unit upon a circuit overload.

SSAC .... Steel Supported Aluminum Conductor.

SF6.............................. Sulfur hexafluoride is an insulating medium.

Single .... Also known as emergency or N-1 condition, occurs when one

Contingency .... major transmission element (circuit, transformer, circuit breaker, etc.) or one generator is out of service.

Solid Dielectric .... Copper or aluminum conductors that are insulated by solid

Cable polyethylene type insulation and covered by a metallic shield and outer polyethylene jacket.

SVC............................. Static VAR Compensator: An equipment made of Capacitors and Reactors with electronic controls for producing and controlling Reactive Power in the Power System.

Switchyard................. A power plant switchyard (switchyard) is an integral part of a power plant and is used as an outlet for one or more electric generators.

Thermal rating .... See ampacity.

TSE .... Transmission System Engineering.

TRV............................. Transient Recovery Voltage

Tap.............................. A transmission configuration creating an interconnection through a sort single circuit to a small or medium sized load or a generator. The new single circuit line is inserted into an existing circuit by utilizing breakers at existing terminals of the circuit, rather than installing breakers at the interconnection in a new switchyard.

Undercrossing........... A transmission configuration where a transmission line crosses below the conductors of another transmission line, generally at 90 degrees.

Underbuild .... A transmission or distribution configuration where a transmission or distribution circuit is attached to a transmission tower or pole below (under) the principle transmission line conductors.

VAR............................. Voltage Ampere Reactive, a measure for Reactive power in the power system.

ALTERNATIVES

Jeanine Hinde and Steven Kerr

THIS SECTION WILL BE PROVIDED IN THE

FINAL STAFF ASSESSMENT (FSA)

ALTERNATIVES

Jeanine Hinde and Steven Kerr

INTRODUCTION

Staff is preparing an alternatives analysis for publication in the Final Staff Assessment (FSA) that includes these three alternatives to the proposed PSEGS:

1. Solar Photovoltaic Alternative with Single-Axis Tracking Technology,
2. Parabolic Trough Alternative, and
3. Reduced Acreage Alternative.

The solar Photovoltaic (PV) Alternative would entail construction and operation of a hypothetical utility-scale PV project using single-axis tracking technology at the PSEGS site, with no change to the site boundary. The alternative project using parabolic trough technology would be analyzed as if it were constructed and operated at the PSEGS site.

The Reduced Acreage Alternative would retain the solar tower unit and heliostat array from PSEGS Unit 1 (the western solar field) and the 218-acre common area and construction laydown area adjacent to PSEGS Unit 1. This alternative preliminarily also includes approximately 80 - 100 acres from PSEGS Unit 2 (the eastern solar field). The additional acreage would allow a small expansion of the Unit 1 solar field while avoiding an extensive area of desert dry wash woodland habitat in the PSEGS eastern solar field.

GENERAL CONDITIONS

Eric Veerkamp

COMPLIANCE AND CLOSURE

The project's Compliance Conditions of Certification, including a Compliance Monitoring Plan (Compliance Plan), were established as required by Public Resources Code section 25532. The Compliance Plan, applicable to the Palen Solar Electric Generating System (PSEGS or Project), provides a means for assuring that the facility is constructed, operated, and closed in compliance with public health and safety, environmental, all other applicable laws, ordinances, regulations, and standards (LORS), and the conditions adopted by the Energy Commission and specified in the written Decision on the Amendment, or otherwise required by law.

Compliance with the conditions of certification contained in this PSA is verified through mechanisms such as periodic reports and site visits. The Compliance Plan also contains requirements governing the planned closure, as well as the unexpected temporary and unexpected permanent closure, of the Project.

The Compliance Plan is composed of two broad elements. The first element establishes the "General Conditions," which:

- state the duties and responsibilities of the Compliance Project Manager (CPM), the project owner or operator (project owner), delegate agencies, and others;
- state the requirements for handling confidential records and maintaining the compliance record;
- state procedures for settling disputes and making post-certification changes;
- state the requirements for periodic compliance reports and other administrative procedures necessary to verify the compliance status of all Energy Commission imposed Conditions of Certification;
- establish contingency planning, facility non-operation protocols, and closure requirements; and
- establish a tracking method for the technical area conditions of certification that contain measures required to mitigate potentially adverse project impacts associated with construction, operation, and closure below a level of significance. Each technical condition of certification also includes one or more verification provisions that describe the means of assuring that the condition has been satisfied.

The second general element of the Compliance Plan contains the specific "Conditions of Certification." These are found following the summary and discussion of each individual topic area in this PSA. The individual conditions of certification contain the measures required to mitigate potentially adverse project impacts associated with construction, operation, and closure to levels of insignificance. Each condition of certification also includes a verification provision describing the method of assuring that the condition has been satisfied.

The contents of the Compliance Plan are intended to be implemented in conjunction with any additional requirements contained in the individual conditions of certification.

MODIFICATIONS/REVISIONS TO GENERAL CONDITIONS

As stated above, the Compliance Plan assures the PSEGS facility is constructed and operated according to the conditions of certification approved by the Commission. Compliance responsibilities carried out on recent large solar projects including Ivanpah, and Genesis have highlighted the need to revise and/or modify several conditions, changes which are contained herein. The modifications are comparatively minor in nature; however, the General Conditions contain several modified and/or refined definitions, terms, protocols, and new conditions of certification that are critical to effective compliance enforcement. The bulleted list below summarizes the revisions/modifications contained in this Compliance Plan:

- Definitions for specific terms utilized during compliance monitoring, including “Start of Construction”, “Start of Commercial Operation”, “Non-Operation and Closure”, “Site Assessment and Pre-Construction Activities”, and “Site Mobilization and Construction”, among others;
- A new sub-section and expanded discussion of “Roles and Responsibilities”, and new sections for “Pre-Construction and Pre-Operation Compliance Meeting”, and “Energy Commission Record”;
- New conditions of certification addressing “Non-Operation” and “Facility Closure Plans”.

PROJECT CERTIFICATION

Project certification occurs on the day the Energy Commission dockets its Decision after adopting it at a publically noticed Business Meeting or hearing. At that time, all Energy Commission conditions of certification become binding on the project owner and the proposed facility.

KEY PROJECT DEFINITIONS

The following terms and definitions help determine when various conditions of certification are implemented.

SITE ASSESSMENT AND PRE-CONSTRUCTION ACTIVITIES

Many of the Energy Commission’s Conditions of Certification require compliance submittals and CPM approvals prior to the start of construction. The below-listed site assessment and pre-construction activities may be initiated or completed prior to the start of construction, subject to the CPM’s approval of the specific site assessment or pre-construction activities.

Site assessment and pre-construction activities include the following, but only to the extent the activities are minimally disruptive to soil and vegetation and will not affect listed or special-status species or other sensitive resources:

1. the installation of environmental monitoring equipment;

2. a minimally invasive soil or geological investigation;

3. a topographical survey;

4. any other study or investigation, such as preconstruction surveys and tortoise clearance work determine the environmental acceptability or feasibility of the use of the site for any particular facility; and,

5. any minimally invasive work to provide safe access to the site for any of the purposes specified in 1-4 above.

SITE MOBILIZATION AND CONSTRUCTION

When a condition of certification requires the project owner to take an action or obtain CPM approval prior to the start of construction, or within a period of time relative to the start of construction, that action must be taken, or approval obtained, prior to any site mobilization or construction activities, as defined below.

Site mobilization and construction activities are those necessary to provide site access for construction mobilization and facility installation, including both temporary and permanent equipment and structures, as determined by the CPM.

Site mobilization and construction activities include, but are not limited to:

1. ground disturbance activities like grading, boring, trenching, leveling, mechanical clearing, mowing, grubbing and scraping;

2. site preparation activities, such as access roads, temporary fencing, trailer and utility installation, construction equipment installation and storage, equipment and supply laydown areas, borrow and fill sites, temporary parking facilities, and chemical spraying and controlled burns; and,

3. permanent installation activities for all facility and linear structures, including access roads, fencing (including tortoise fencing), utilities, parking facilities, equipment storage, mitigation and landscaping activities, and other installations, as applicable.

COMMISSIONING

Commissioning activities test the functionality of the installed components and systems to ensure the facility operates safely and reliably. Commissioning provides a multistage, integrated, and disciplined approach to testing, calibrating, and proving all of the project's systems, software, and networks. For compliance monitoring purposes, examples of commissioning activities include interface connection and utility pre-testing, "cold" and "hot" electrical testing, system pressurization and optimization tests, grid synchronization, and combustion turbine "first fire".

START OF COMMERCIAL OPERATION

For compliance monitoring purposes, "commercial operation" or "operation" begins once commissioning activities are complete, the certificate of occupancy has been issued, and the power plant has reached reliable steady-state electrical production. At the start of commercial operation, plant control is usually transferred from the construction manager to the plant operations manager. Operation activities can include a steady state of electrical production, or, for “peaker plants,” a seasonal or on-demand operational regime to meet peak load demands.

NON-OPERATION AND CLOSURE

Non-operation is time-limited and can encompass part or all of a facility. Non-operation can be a planned event, usually for minor equipment maintenance or repair, or unplanned, usually the result of unanticipated events or emergencies.

Closure is a facility shutdown with no intent to restart operation. It may also be the cumulative result of unsuccessful efforts to re-start over an increasingly lengthy period of non-operation, condemned by inadequate means and/or lack of a viable plan. Facility closures can occur due to a variety of factors, including, but not limited to, irreparable damage and/or functional or economic obsolescence.

ROLES AND RESPONSIBILITIES

Provided below is a generalized description of the compliance roles and responsibilities for Energy Commission staff (staff) and the project owner for the construction and operation of the Project:

COMPLIANCE PROJECT MANAGER RESPONSIBILITIES

The Compliance Project Manager (CPM) shall oversee the compliance monitoring and is responsible for:

1. ensuring that the design, construction, operation, and closure of the project facilities are in compliance with the terms and conditions of the Decision;

2. resolving complaints;

3. processing post-certification project amendments for changes to the project description, conditions of certification, ownership or operational control, and requests for extension of the deadline for the start of construction (see **COM-10** for instructions on filing a Petition to Amend or to extend construction start date);

4. documenting and tracking compliance filings; and,

5. ensuring that compliance files are maintained and accessible.

The CPM is the central contact person for the Energy Commission during project pre-construction, construction, emergency response, operation, and closure. The CPM will consult with the appropriate responsible parties when handling compliance issues, disputes, complaints, and amendments.

All project compliance submittals are submitted to the CPM for processing. Where a submittal requires CPM approval, the approval will involve appropriate Energy

Commission technical staff and management. All submittals must include searchable electronic versions (.pdf, MS Word, or equivalent files).

The CPM may accept and approve compliance submittals that provide sufficient detail to allow construction activities to commence. Additional submittals may be required to provide further details as needed concerning construction activities that will be commenced later in time.

Pre-Construction and Pre-Operation Compliance Meeting

The CPM usually schedules pre-construction and pre-operation compliance meetings prior to the projected start-dates of construction, plant operation, or both. These meetings are used to assist the Energy Commission and the project owner's technical staff in the status review of all required pre-construction or pre-operation conditions of certification, and take proper action if outstanding conditions remain. In addition, these meetings ensure, to the extent possible, that the Energy Commission's conditions of certification do not delay the construction and operation of the plant due to last-minute unforeseen issues or a compliance oversight. Pre-construction meetings held during the certification process must be publicly noticed unless they are confined to administrative issues and processes.

Energy Commission Record

The Energy Commission maintains the following documents and information as public records, in either the Compliance files or Dockets files, for the life of the project (or other period as specified):

1. all documents demonstrating compliance with any legal requirements relating to the construction and operation of the facility;

2. all Monthly and Annual Compliance Reports filed by the project owner;

3. all project-related complaints of alleged noncompliance filed with the Energy Commission; and,

4. all petitions for project or Condition of Certification changes and the resulting staff or Energy Commission action.

CHIEF BUILDING OFFICIAL RESPONSIBILITIES

The Chief Building Official (CBO) shall serve as the Energy Commission's delegate to assure the project is designed and constructed in accordance with the Energy Commission's Decision including conditions of certification, California Building Standards Code, local building codes and applicable laws, ordinances, regulations and standards to ensure health and safety. The CBO is typically made-up of a team of specialists covering civil, structural, mechanical and electrical disciplines whose duties include the following:

1. Performing design review and plan checks of all drawings, specifications and procedures;

2. Conducting construction inspection;

3. Functioning as the Energy Commission's delegate including reporting noncompliance issues or violations to the CPM for action and taking any action allowed under the California Code of Regulations, including issuing a Stop Work Order, to ensure compliance;

4. Exercising access as needed to all project owner construction records, construction and inspection procedures, test equipment and test results; and,

5. Providing weekly reports on the status of construction to the CPM.

PROJECT OWNER RESPONSIBILITIES

The project owner is responsible for ensuring that all conditions of certification in the Palen Solar Electric Generating System Decision are satisfied. The project owner will submit all compliance submittals to the CPM for processing unless the conditions specify another recipient. The compliance conditions regarding post-certification changes specify measures that the project owner must take when modifying the project’s design, operation, or performance requirements, or to transfer ownership or operational control. Failure to comply with any of the conditions of certification may result in a correction order, an administrative fine, license revocation, or any combination thereof, as appropriate. A summary of the Compliance Conditions of Certification is included as **Compliance Table 1** at the conclusion of this section.

AMENDMENT

The project owner shall submit a Petition to Amend the Energy Commission Decision, pursuant to Title 20, California Code of Regulations, section 1769(a), when proposing modifications to the design, operation, or performance requirements of the project and/or the linear facilities. If a proposed modification results in an added, changed, or deleted Condition of Certification, or makes changes causing noncompliance with any applicable LORS, the petition will be processed as a formal amendment to the Decision, triggering public notification of the proposal, public review of the Energy Commission staff’s analysis, and approval by the full Energy Commission.

CHANGE OF OWNERSHIP AND/OR OPERATIONAL CONTROL

Change of ownership or operational control also requires that the project owner file a petition pursuant to section 1769(b). This process requires public notice and approval by the full Commission. The petition shall be in the form of a legal brief and fulfill the requirements of section 1769(b).

STAFF APPROVED PROJECT MODIFICATION

Modifications that do not result in additions, deletions, or changes to the conditions of certification, that are compliant with the applicable LORS, and that will not have significant environmental impacts, may be authorized by the CPM as a staff-approved project modification pursuant to section 1769(a)(2). Once the CPM files a Notice of

Determination of the proposed project modifications, any person may file an objection to the CPM's determination within 14 days of service on the grounds that the modification does not meet the criteria of section 1769(a)(2). If there is a valid objection to the CPM's determination, the petition must be processed as a formal amendment to the Decision and must be approved by the full Commission at a publically noticed Business Meeting or hearing.

VERIFICATION CHANGE

Each Condition of Certification (except for the compliance conditions) has one or more means of verifying the project owner's compliance with the provisions of the condition. These verifications specify the actions and deadlines by which a project owner demonstrates compliance with the Energy Commission-adopted conditions. A verification may be modified by the CPM without requesting a Decision amendment if the change does not conflict with any Condition of Certification, does not violate any LORS, and provides an effective alternative means of verification..

CBO DELEGATION AND AGENCY COOPERATION

While monitoring project construction and operation, staff acts as, and has the authority of, the Chief Building Official (CBO), as required by CITE. Staff may delegate CBO responsibility to either an independent third-party contractor or a local building official. However, Staff retains CBO authority when selecting a delegate CBO, including the interpretation and enforcement of state and local codes, and the use of discretion, as necessary, in implementing the various codes and standards.

Energy Commission staff may also seek the cooperation of state, regional, and local agencies that have an interest in public and worker health and safety and environmental quality when conducting project monitoring..

COMPLIANCE ENFORCEMENT

The Energy Commission's legal authority to enforce the terms and conditions of its Decision are specified in Public Resources Code sections 25534 and 25900. The Energy Commission may amend or revoke a project certification and may impose a civil penalty for any significant failure to comply with the terms or conditions of the Decision. The Energy Commission's actions and fine assessments would take into account the specific circumstances of the incident(s).

NONCOMPLIANCE COMPLAINT PROCEDURES

Any person or agency may file a complaint alleging noncompliance with the conditions of certification. Such a complaint will be subject to review by the Energy Commission pursuant to Title 20, California Code of Regulations, section 1237, but, in many instances, the issue(s) can be resolved by using an informal dispute resolution process. Both the informal and formal complaint procedures, as described in current state law and regulations, are summarized below. Energy Commission staff will follow these provisions unless superseded by future law or regulations. The California Office of

Administrative Law provides on-line access to the California Code of Regulations at http://www.oal.ca.gov/.

INFORMAL DISPUTE RESOLUTION PROCESS

The following informal procedure is designed to resolve code and compliance interpretation disputes stemming from the project's conditions of certification and other LORS. The project owner, the Energy Commission, or any other party, including members of the public, may initiate the informal dispute resolution process. Disputes may pertain to actions or decisions made by any party, including the Energy Commission's delegate agents.

This process may precede the formal complaint and investigation procedure specified in Title 20, California Code of Regulations, section 1237, but is not intended to be a prerequisite or substitute for it. This informal procedure may not be used to change the terms and conditions of certification in the Decision, although the agreed-upon resolution may result in a project owner proposing an amendment. The informal dispute resolution process encourages all parties to openly discuss the conflict and reach a mutually agreeable solution. If a dispute cannot be resolved, then the matter must be brought before the full Energy Commission for consideration via the complaint and investigation procedure specified in Title 20, California Code of Regulations, section 1237.

REQUEST FOR INFORMAL INVESTIGATION

Any individual, group, or agency may request the CPM conduct an informal investigation of alleged noncompliance with the Energy Commission's Conditions of Certification. Upon receipt of an informal investigation request, the CPM will promptly provide both verbal and written notification to the project owner of the allegation(s), along with all known and relevant information of the alleged noncompliance. The CPM will evaluate the request and, if the CPM determines that further investigation is necessary, will ask the project owner to promptly conduct a formal inquiry into the matter and provide within seven days a written report of the investigation results, along with corrective measures proposed or undertaken. Depending on the urgency of the matter, the CPM may conduct a site visit and/or request that the project owner provide an initial verbal report within 48 hours.

Request for Informal Meeting

In the event that either the requesting party or Energy Commission staff are not satisfied with the project owner's investigative report or corrective measures, either party may submit a written request to the CPM for a meeting with the project owner. The request shall be made within 14 days of the project owner's filing of the required investigative report. Upon receipt of such a request, the CPM will attempt to:

1. immediately schedule a meeting with the requesting party and the project owner, to be held at a mutually convenient time and place;

2. secure the attendance of appropriate Energy Commission staff and staff of any other agencies with expertise in the subject area of concern, as necessary; and

3. conduct the meeting in an informal and objective manner so as to encourage the voluntary settlement of the dispute in a fair and equitable manner.

After the meeting, the CPM will promptly prepare and distribute to all parties and to the project file, copies of a summary memorandum that fairly and accurately identifies the positions of all parties and any understandings reached. If no agreement was reached, the CPM will direct the complainant to the formal complaint process provided under Title 20, California Code of Regulations, section 1237.

FORMAL DISPUTE RESOLUTION PROCEDURE – COMPLAINTS AND INVESTIGATIONS

Any person may file a complaint with the Energy Commission's Dockets Unit alleging noncompliance with a Commission decision adopted pursuant to Public Resources Code section 25500. Requirements for complaint filings and a description of how complaints are processed are in Title 20, California Code of Regulations, section 1237.

POST-CERTIFICATION CHANGES TO THE ENERGY COMMISSION DECISION

The project owner must petition the Energy Commission pursuant to Title 20, California Code of Regulations, section 1769, to modify the design, operation, or performance requirements of the project and/or the linear facilities, or to transfer ownership or operational control of the facility. **It is the responsibility of the project owner to contact the CPM to determine if a proposed project change should be considered a project modification pursuant to section 1769.** Implementation of a project modification without first securing Energy Commission approval may result in an enforcement action including civil penalties in accordance with Public Resources Code, section 25534.

Below is a summary of the criteria for determining the type of approval process required, and reflects the provisions of Title 20, California Code of Regulations, section 1769, at the time this Compliance Plan was drafted. If the Energy Commission modifies this regulation, the language in effect at the time of the requested change shall apply. Upon request, the CPM can provide sample formats of these submittals.

COMPLIANCE MITIGATION MEASURES/CONDITIONS OF CERTIFICATION

Staff has proposed modifications to the **Compliance** Conditions of Certification as shown below. (**Note:** Deleted text is in ~~strikethrough~~; new text is <u>**bold and underlined**</u>)

<u>**COM-1:**</u> **Unrestricted Access ~~(COMPLIANCE-1)~~**

<u>**The project owner shall take all steps necessary to ensure that the CPM, responsible Energy Commission staff, and delegate agencies or consultants have unrestricted access to the facility site, related facilities, project-related staff, and the records maintained on-site to facilitate audits, surveys, inspections, and general or closure-related**</u>

<u>**site visits. Although the CPM will normally schedule site visits on dates and times agreeable to the project owner, the CPM reserves the right to make unannounced visits at any time, whether such visits are by the CPM in person or through representatives from Energy Commission staff, delegate agencies, or consultants**</u>.~~The CPM, responsible Energy Commission staff, and delegated agencies or consultants shall be guaranteed and granted unrestricted access to the power plant site, related facilities, project-related staff, and the records maintained on-site for the purpose of conducting audits, surveys, inspections, or general site visits. Although the CPM will normally schedule site visits on dates and times agreeable to the project owner, the CPM reserves the right to make unannounced visits at any time.~~

<u>COM-2:</u> Compliance Record ~~(COMPLIANCE-2)~~

<u>**The project owner shall maintain electronic copies of all project files and submittals on-site, or at an alternative site approved by the CPM, for the operational life and closure of the project. The files shall also contain at least one hard copy of:**</u>

1. <u>**the facility's Applications for Certification;**</u>
2. <u>**all amendment petitions and Energy Commission orders;**</u>
3. <u>**all site-related environmental impact and survey documentation;**</u>
4. <u>**all appraisals, assessments, and studies for the project;**</u>
5. <u>**all finalized original and amended structural plans and "as-built" drawings for the entire project;**</u>
6. <u>**all citations, warnings, violations, or corrective actions applicable to the project; and,**</u>
7. <u>**the most current versions of any plans, manuals and training documentation required by the conditions of certification or applicable LORS.**</u>

<u>**Energy Commission staff and delegate agencies shall, upon request to the project owner, be given unrestricted access to the files maintained pursuant to this condition.**</u>~~The project owner shall maintain project files on-site or at an alternative site approved by the CPM for the life of the project, unless a lesser period of time is specified by the conditions of certification. The files shall contain copies of all "as-built" drawings, documents submitted as verification for conditions, and other project-related documents.~~

~~Energy Commission staff and delegate agencies shall, upon request to the project owner, be given unrestricted access to the files maintained pursuant to this condition.~~

COM-3: Compliance Verification Submittals ~~(COMPLIANCE-3)~~

Verification lead times associated with the start of construction may require the project owner to file submittals during the AFC process, particularly if construction is planned to commence shortly after certification. The verification procedures, unlike the conditions, may be modified as necessary by the CPM. The project owner must understand that submitting compliance verifications prior to an Energy Commission decision is at the owner's own risk. Any approval by Energy Commission staff prior to project certification is subject to change based upon the Commission Decision, and early staff compliance approvals do not imply that the Energy Commission will certify the project for actual construction and operation.

A cover letter from the project owner or an authorized agent is required for all compliance submittals and correspondence pertaining to compliance matters. The cover letter subject line shall identify the project by AFC number, the appropriate condition(s) of certification number(s), and a brief description of the subject of the submittal. When submitting supplementary or corrected information, the project owner shall reference the date of the previous submittal and the condition(s) of certification applicable. The project owner shall also identify those submittals not required by a Condition of Certification with a statement such as: "This submittal is for informational purposes only and is not required by a specific Condition of Certification."

All reports and plans required by the project's conditions of certification must be submitted in a searchable electronic format (.pdf, MS Word, or Excel, etc.) and include standard formatting elements such as a table of contents, identifying by title and page number, each section, table, graphic, exhibit, or addendum. All report and/or plan graphics and maps must be adequately scaled and must include a key with descriptive labels, directional headings, a bar scale, and the most recent revision date.

The project owner is responsible for the content and delivery of all verification submittals to the CPM, whether the actions required by the verification were satisfied by the project owner or an agent of the project owner. All submittals must be accompanied by an electronic copy on an electronic storage medium, or by e-mail, as agreed upon by the CPM. If hardcopy submittals are required, please address as follows:

Christine Stora, Compliance Project Manager
PALEN SOLAR ELECTRIC GENERATING SYSTEM (09-AFC-7C)
California Energy Commission
1516 Ninth Street (MS-2000)
Sacramento, CA 95814

~~Each condition of certification is followed by a means of verification. The verification describes the Energy Commission's procedure(s) to ensure post-certification compliance with adopted conditions. The verification procedures, unlike the Conditions, may be modified as necessary by the CPM.~~

~~Verification of compliance with the conditions of certification can be accomplished by the following:~~

1. ~~monthly and/or annual compliance reports, filed by the project owner or authorized agent, reporting on work done and providing pertinent documentation, as required by the specific conditions of certification;~~

2. ~~appropriate letters from delegate agencies verifying compliance;~~

3. ~~Energy Commission staff audits of project records; and/or~~

4. ~~Energy Commission staff inspections of work, or other evidence that the requirements are satisfied.~~

~~Verification lead times associated with start of construction may require the project owner to file submittals during the certification process, particularly if construction is planned to commence shortly after certification.~~

~~A cover letter from the project owner or authorized agent is required for all compliance submittals and correspondence pertaining to compliance matters.~~ **~~The cover letter subject line shall identify the project by AFC number, the appropriate condition(s) of certification by condition number(s), and a brief description of the subject of the submittal~~**~~. The project owner shall also identify those submittals~~ **~~not~~** ~~required by a condition of certification with a statement such as: "This submittal is for information only and is not required by a specific condition of certification." When submitting supplementary or corrected information, the project owner shall reference the date of the previous submittal and Energy Commission submittal number.~~

~~The project owner is responsible for the delivery and content of all verification submittals to the CPM, whether such condition was satisfied by work performed by the project owner or an agent of the project owner.~~

~~All hardcopy submittals shall be addressed as follows:~~

~~Dale Rundquist~~
~~Compliance Project Manager~~
~~(09-AFC-7C)~~
~~California Energy Commission~~
~~1516 Ninth Street (MS-2000)~~
~~Sacramento, CA 95814~~

~~Those submittals shall be accompanied by a searchable electronic copy, on a CD or by e-mail, as agreed upon by the CPM.~~

~~If the project owner desires Energy Commission staff action by a specific date, that request shall be made in the submittal cover letter and shall include a detailed explanation of the effects on the project if that date is not met.~~

<u>COM-4:</u> Pre-Construction Matrix and Tasks Prior to Start of Construction ~~(COMPLIANCE-4)~~

<u>Prior to start of construction, the project owner will submit to the CPM a compliance matrix including only those conditions that must be fulfilled before the start of construction. The matrix will be included with the project owner's first compliance submittal or prior to the first pre-construction meeting, whichever comes first, and will be submitted in a format similar to the description below.</u>

<u>Site mobilization and construction activities will not start until all of the following occur: submittal of the pre-construction matrix and compliance verifications pertaining to all pre-construction conditions of certification, and the CPM has issued an authorization to construct letter to the project owner. The deadlines for submitting various compliance verifications to the CPM allow sufficient staff time to review and comment on, and if necessary, allow the project owner to revise the submittal in a timely manner. These procedures help ensure that project construction proceeds according to schedule. Failure to submit required compliance documents by the specified deadlines may result in delayed authorizations to commence various stages of the project.</u>

<u>If the project owner anticipates site mobilization immediately following project certification, it may be necessary for the project owner to file compliance submittals prior to project certification. In these instances, compliance verifications can be submitted in advance of the required deadlines and the anticipated authorizations to start construction. The project owner must understand that submitting compliance verifications prior to these authorizations is at the owner's own risk. Any approval by Energy Commission staff prior to project certification is subject to change based upon the Commission Decision, and early staff compliance approvals do not imply that the Energy Commission will certify the project for actual construction and operation.</u>~~Prior to commencing construction, a compliance matrix addressing <u>only</u> those conditions that must be fulfilled before the start of construction shall be submitted by the project owner to the CPM. This matrix will be included with the project owner's first compliance submittal or prior to the first pre-construction meeting, whichever comes first. It will be submitted in the same format as the compliance matrix described below.~~

~~Construction shall not commence until the pre-construction matrix is submitted, all pre-construction conditions have been complied with, and the CPM has issued a letter to the project owner authorizing construction. Various lead times for submittal of compliance verification documents to the CPM for Conditions of Certification are established to allow sufficient Staff time to review and comment and, if necessary, allow the project owner to revise the~~

~~submittal in a timely manner. This will ensure that project construction may proceed according to schedule.~~

~~Failure to submit compliance documents within the specified lead-time may result in delays in authorization to commence various stages of project development.~~

~~If the project owner anticipates commencing project construction as soon as the project is certified, it may be necessary for the project owner to file compliance submittals prior to project certification. Compliance submittals should be completed in advance where the necessary lead time for a required compliance event extends beyond the date anticipated for start of construction. The project owner must understand that the submittal of compliance documents prior to project certification is at the owner's own risk. Any approval by Energy Commission staff is subject to change, based upon the Commission Decision.~~

~~Compliance Reporting~~

~~There are two different compliance reports that the project owner must submit to assist the CPM in tracking activities and monitoring compliance with the terms and conditions of the Energy Commission Decision. During construction, the project owner or authorized agent will submit Monthly Compliance Reports. During operation, an Annual Compliance Report must be submitted. These reports, and the requirement for an accompanying compliance matrix, are described below. The majority of the conditions of certification require that compliance submittals be submitted to the CPM in the monthly or annual compliance reports.~~

COM-5: **Compliance Matrix ~~(COMPLIANCE-5)~~**

The project owner will submit a compliance matrix to the CPM with each Monthly and Annual Compliance Report. The compliance matrix is intended to provide the CPM with the current status of all conditions of certification in a spreadsheet format. ~~A compliance matrix shall be submitted by the project owner to the CPM along with each monthly and annual compliance report. The compliance matrix is intended to provide the CPM with the current status of all conditions of certification in a spreadsheet format.~~ The compliance matrix must identify:

1. the technical area;
2. the condition number;
3. a brief description of the verification action or submittal required by the condition;
4. the date the submittal is required (e.g., 60 days prior to construction, after final inspection, etc.);
5. the expected or actual submittal date;

6. the date a submittal or action was approved by the Chief Building Official (CBO), CPM, or delegate agency, if applicable;

7. the compliance status of each condition, e.g., “not started,” “in progress” or “completed” (include the date); and

8. if **the condition was amended, the updated language and the date the amendment was proposed or approved.** ~~if the condition was amended, the date of the amendment.~~

The CPM can provide a template for the compliance matrix upon request. ~~Satisfied conditions shall be placed at the end of the matrix.~~

COM-6: **Monthly Compliance Report/Key Event List** ~~**(COMPLIANCE-6)**~~

The first Monthly Compliance Report is due one month following the docketing of the project’s Decision unless otherwise agreed to by the CPM. The first Monthly Compliance Report will include the AFC number and an initial list of dates for each of the events identified on the Key Events List. The Key Events List form is found at the end of the Compliance Conditions section.

During project pre-construction and construction the project owner or authorized agent will submit an electronic searchable version of the Monthly Compliance Report within ten (10) days after the end of each reporting month, unless otherwise specified by the CPM. Monthly Compliance Reports shall be clearly identified for the month being reported. The searchable electronic copy may be filed on an electronic storage medium or by e-mail, subject to CPM approval. The compliance verification submittal condition provides guidance on report production standards, and the Monthly Compliance Report will contain, at a minimum:~~The first Monthly Compliance Report is due one month following the Energy Commission business meeting date upon which the project was approved, unless otherwise agreed to by the CPM. The first Monthly Compliance Report shall include the AFC number and an initial list of dates for each of the events identified on the **Key Events List** found at the end of this section of the Decision.~~

~~During pre-construction and construction of the project, the project owner or authorized agent shall submit an original and an electronic searchable version of the Monthly Compliance Report within 10 working days after the end of each reporting month. Monthly Compliance Reports shall be clearly identified for the month being reported. The reports shall contain, at a minimum:~~

1. a summary of the current project construction status, a revised/updated schedule if there are significant delays, and an explanation of any significant changes to the schedule;

2. documents required by specific conditions to be submitted along with the Monthly Compliance Report. Each of these items must be identified in the

transmittal letter, as well as the conditions they satisfy and submitted as attachments to the Monthly Compliance Report;

3. an initial, and thereafter updated, compliance matrix showing the status of all conditions of certification;

4. a list of conditions that have been satisfied during the reporting period, and a description or reference to the actions that satisfied the condition;

5. a list of any submittal deadlines that were missed, accompanied by an explanation and an estimate of when the information will be provided;

6. a cumulative listing of any approved changes to **<u>the</u>** conditions of certification;

7. a listing of any filings submitted to, or permits issued by, other governmental agencies during the month;

8. a projection of project compliance activities scheduled during the next two months. The project owner shall notify the CPM as soon as any changes are made to the project construction schedule that would affect compliance with conditions of certification;

9. a listing of the month's additions to the on-site compliance file; and

10. a listing of complaints, notices of violation, official warnings, and citations received during the month, a description of the **<u>actions taken to date to resolve</u>** ~~resolution of the resolved actions,~~ **<u>the issues;</u>** and the status of any unresolved actions.

All sections, exhibits, or addendums shall be separated by tabbed dividers or as acceptable by the CPM.

<u>COM-7</u>: Annual Compliance Report ~~(COMPLIANCE-7)~~

<u>After construction is complete, the project owner shall submit searchable electronic Annual Compliance Reports instead of Monthly Compliance Reports. The reports are for each year of commercial operation and are due each year on a date agreed to by the CPM. Annual Compliance Reports shall be submitted over the life of the project, unless otherwise specified by the CPM. The searchable electronic copy may be filed on an electronic storage medium or by e-mail, subject to CPM approval.</u> ~~After construction is complete, the project owner shall submit Annual Compliance Reports instead of Monthly Compliance Reports. The reports are for each year of commercial operation and are due to the CPM each year at a date agreed to by the CPM. Annual Compliance Reports shall be submitted over the life of the project, unless otherwise specified by the CPM.~~ Each Annual Compliance Report shall include the AFC number, identify the reporting period, and shall contain the following:

1. an updated compliance matrix showing the status of all conditions of certification (fully satisfied conditions do not need to be included in the matrix after they have been reported as completed);
2. a summary of the current project operating status and an explanation of any significant changes to facility operations during the year;
3. documents required by specific conditions to be submitted along with the Annual Compliance Report. Each of these items must be identified in the transmittal letter with the condition it satisfies, and submitted as attachments to the Annual Compliance Report;
4. a cumulative listing of all post-certification changes approved by the Energy Commission or ~~cleared by~~ the CPM;
5. an explanation for any submittal deadlines that were missed, accompanied by an estimate of when the information will be provided;
6. a listing of filings submitted to, or permits issued by, other governmental agencies during the year;
7. a projection of project compliance activities scheduled during the next year;
8. a listing of the year's additions to the on-site compliance file;
9. **an evaluation of the Site Contingency Plan, including amendments and plan updates** ~~an evaluation of the on-site contingency plan for unplanned facility closure, including any suggestions necessary for bringing the plan up to date (see Compliance Conditions for Facility Closure addressed later in this section)~~; and
10. a listing of complaints, notices of violation, official warnings, and citations received during the year, a description of **how the issues were resolved** ~~the resolution of any resolved matters,~~ and the status of any unresolved matters.

COM-8: **Confidential Information** ~~**(COMPLIANCE-8)**~~

Any information that the project owner designates as confidential shall be submitted to the Energy Commission's Executive Director with an application for confidentiality pursuant to Title 20, California Code of Regulations, section 2505 (a). Any information deemed confidential pursuant to the regulations will remain undisclosed as provided for in Title 20, California Code of Regulations, section 2501. ~~Any information that the project owner deems confidential shall be submitted to the Energy Commission's Executive Director with an application for confidentiality pursuant to Title 20, California Code of Regulations, section 2505(a). Any information that is determined to be confidential shall be kept confidential as provided for in Title 20, California Code of Regulations, section 2501, et. seq.~~

COM-9: Annual Energy Facility Compliance Fee

Pursuant to the provisions of Section 25806(b) of the Public Resources Code, the project owner is required to pay an annually adjusted compliance fee. Current compliance fee information is available on the Energy Commission's website http://www.energy.ca.gov/siting/filing_fees.html. The project owner may also contact the CPM for the current fee information. The initial payment is due on the date the Energy Commission dockets its final Decision. All subsequent payments are due by the July 1st of each year in which the facility retains its certification

COM-10: Amendments, Ownership Changes, Staff-Approved Project Modifications, and Verification Changes

The project owner must petition the Energy Commission pursuant to Title 20, California Code of Regulations, section 1769, to modify the design, operation, or performance requirements of the project or linear facilities, or to transfer ownership or operational control of the facility. The CPM will determine whether staff approval will be sufficient or whether Commission approval will be necessary based upon whether or not the proposed amendment(s) result in a changed, added, or deleted Condition of Certification or the changes cause noncompliance with any applicable LORS. It is the project owner's responsibility to contact the CPM to determine if a proposed project change triggers the requirements of section 1769. Section 1769 details the required contents for a Petition to Amend an Energy Commission Decision. The only change that can be requested by means of a letter to the CPM is a request to change the verification method of a Condition of Certification.

Implementation of a project modification without first securing Energy Commission, or Energy Commission staff approval, may result in an enforcement action including civil penalties in accordance with section 25534 of the Public Resources Code. If the Energy Commission's rules regarding amendments are revised, the rules in effect at the time the change is requested shall apply.

COM-11: Reporting Of Complaints, Notices, and Citations ~~(COMPLIANCE-9)~~

Prior to the start of construction, the project owner must send a letter to property owners within one (1) mile of the project, notifying them of a telephone number to contact project representatives with questions, complaints, or concerns. If the telephone is not staffed twenty-four (24) hours per day, it shall include automatic answering with a date and time stamp recording.

The project owner will respond to all recorded complaints within twenty-four (24) hours. The project site will post the telephone number on-site and make it easily visible to passersby during construction and operation. The project owner will provide the contact information to the

CPM who will post it on the Energy Commission's web page at http://www.energy.ca.gov/sitingcases/palen/The project owner must report any disruption to the contact system or telephone number change to the CPM promptly, to allow the CPM to update the Energy Commission's facility webpage accordingly.

In addition to including all complaints, notices and citations included with the Monthly and Annual Compliance Reports, within ten (10) days of receipt, the project owner must report, and provide copies to the CPM, of all complaints, including noise and lighting complaints, notices of violation, notices of fines, official warnings, and citations. Complaints must be logged and numbered. Noise complaints must be recorded on the form provided in the Noise and Vibration Conditions of Certification. All other complaints shall be recorded on the complaint form (Attachment A) at the end of the Compliance Plan.

COM-12: Site Contingency Planning

No less than sixty (60) days prior to the start of commercial operation, (or other date agreed to by the CPM) the project owner shall submit for CPM review and approval, a Site Contingency Plan providing for a coordinated, facility-wide response to an event that results in unplanned, temporary facility non-operational status. The CPM may require updating of the Site Contingency Plan over the life of the facility. The Site Contingency Plan elements include, but are not limited to:

1. a site-specific list and direct contact information for persons, agencies, and responders to be notified for an unanticipated event;

2. a detailed and labeled facility map, including all fences and gates, the windsock location (if applicable), the on- and off-site assembly areas, and the main roads and highways near the site;

3. a detailed and labeled map of population centers, sensitive receptors, and the nearest emergency response facilities;

4. a description of the on-site, first response and backup emergency alert and communication systems, site-specific emergency response protocols, and procedures for maintaining the facility's contingency response capabilities, including a detailed map of interior and exterior evacuations route, and the planned location(s) of all permanent safety equipment;

5. an organizational chart including the name, contact information, and first aid/emergency response certification(s) and renewal date(s) for all personnel regularly on-site;

6. a brief description of reasonably foreseeable site-specific incidents and accident sequences (on- and off-site), including response procedures and protocols and site security measures to maintain twenty-four hour site security; and,

7. **procedures for maintaining contingency response capabilities; and the procedures and implementation sequence for the safe and secure shutdown of all non-critical equipment and removal of hazardous materials and waste (see also specific conditions of certification for the technical areas of Hazardous Materials Management and Waste Management).**

COM-13: Incident Reporting Requirements

Within one (1) hour, the project owner shall notify the CPM or Compliance Office Manager by telephone and e-mail, of any incident at the power plant or appurtenant facilities that results or could result in any of the following:

1. **reduction in the facility's ability to respond to dispatch (excluding forced outages caused by protective equipment or other typically encountered shutdown events);**
2. **health and safety impacts on the surrounding population;**
3. **property damage off-site;**
4. **response by off-site emergency response agencies;**
5. **serious on-site injury;**
6. **serious environmental damage; and/or,**
7. **emergency reporting to any federal, state, or local agency.**

The notice shall describe the circumstances, current status, and expected duration of the incident.

As soon as it is safe and feasible, the project owner shall implement the safe shutdown of any non-critical equipment and removal of any hazardous materials and waste that pose a threat to public health and safety and to environmental quality (also, see specific conditions of certification for the technical areas of Hazardous Materials Management and Waste Management).

Within one (1) week of the occurrence of the incident, the project owner shall submit to the CPM a detailed incident report, which shall include, as appropriate to the incident, the following information:

1. **a brief description of the incident, including its date, time, and location;**
2. **a description of cause of the incident, or likely causes if it is still under investigation;**
3. **the location of any off-site impacts;**

4. **description of any resultant impacts;**

5. **a description of emergency response actions associated with the incident;**

6. **identification of responding agencies;**

7. **identification of emergency notifications made to other federal, state, and/or local agencies;**

8. **identification of any hazardous materials released and an estimate of the quantity released;**

9. **a description of any injuries, fatalities, or property damage that occurred as a result of the incident;**

10. **fines or violations assessed or being processed by other agencies;**

11. **name, phone number, and e-mail address of the appropriate facility contact person having knowledge of the event; and,**

12. **corrective actions to prevent a recurrence of the incident.**

The project owner shall maintain records of all incident report(s) for the life of the project, including closure. After the submittal of the initial report for any incident, the project owner shall submit to the CPM copies of incident reports within twenty-four (24) hours of a request.

COM-14: Non-Operation

If the facility ceases operation temporarily, whether by plan or due to an unplanned incident, for longer than one (1) week (or other CPM-approved date), but less than three (3) months (or other CPM-approved date), the project owner shall notify the CPM, provide a plan and projected date for re-starting, and report periodically during shutdown to the CPM on the status of the facility. Notice shall be given at least two (2) weeks prior to planned non-operation or no later than one (1) week after the start of unplanned non-operation, to the CPM, interested agencies, and nearby property owners.

For any non-operation, a Repair/Restoration Plan for conducting the activities necessary to restore the facility to availability and reliable and/or improved performance shall be submitted to the CPM within one (1) week after notice of non-operation is given. If non-operation is due to an unplanned incident, temporary repairs and/or corrective actions may be undertaken before the Repair/Restoration Plan is submitted. The Repair/Restoration Plan shall include:

1. **identification of operational and non-operational components of the plant;**

2. a detailed description of the repair or restoration activities;

3. a proposed schedule for completing the repair or restoration activities;

4. an assessment of whether or not the proposed activities would require changing, adding, and/or deleting any conditions of certification and/or would cause noncompliance with any applicable LORS; and,

5. planned activities during non-operation, including any measures to ensure continued compliance with all conditions of certification and LORS.

Written updates to the CPM for non-operational periods, until operation resumes, shall include:

1. progress relative to the schedule;

2. developments that delayed or advanced progress or that may delay or advance future progress;

3. any public, agency or media comments or complaints; and,

4. projected date for the resumption of operation.

During non-operation, all applicable conditions of certification and reporting requirements remain in effect. If, after one (1) year from the date of the project owner's last report of productive Repair/Restoration Plan work, the facility does not resume operation or does not provide a plan to resume operation, the Executive Director may assign suspended status to the facility and recommend commencement of permanent closure activities. Within ninety (90) days of the Executive Director's determination, the project owner shall do one of the following:

1. If the facility has a closure plan, the project owner shall update, submit for CPM approval, and initiate the closure activities in the approved plan; or,

2. If the facility does not have a closure plan, the project owner shall submit one consistent with the requirements in this Compliance Plan, for CPM review and approval.

COM-15: Facility Closure Plans

To ensure that a facility's closure and long-term maintenance does not pose a threat to public health and safety and/or to environmental quality, the project owner must coordinate with the Energy Commission to plan and prepare for eventual permanent closure.

Three (3) years prior to initiating a permanent facility closure, the project owner must submit for CPM review and approval, a Final

Closure Plan, which includes any long-term, post-closure site maintenance and monitoring. Final Closure Plan contents include, but are not limited to:

1. **a statement of specific Final Closure Plan objectives;**

2. **a statement of qualifications and resumes of the technical experts proposed to conduct the closure activities, with detailed descriptions of previous power plant closure experience;**

3. **identification of any facility-related installations not part of the Energy Commission license, designation of who is responsible for these, and an explanation of what will be done with them after closure;**

4. **a comprehensive scope of work and itemized budget for permanent plant closure and long-term site maintenance activities, with a description and explanation of methods to be used, broken down by phases, including, but not limited to:**

   a. **dismantling and demolition;**

   b. **recycling and site clean-up;**

   c. **impact mitigation and monitoring;**

   d. **site remediation and/or restoration;**

   e. **post-closure maintenance; and,**

   f. **contingencies.**

5. **a Cost Estimate for all closure activities, by phases, including long-term, post-closure site maintenance costs;**

6. **a schedule projecting all phases of closure activities for the power plant site and all appurtenances constructed as part of the Energy Commission-licensed project;**

7. **an electronic submittal package of all relevant plans, drawings, risk assessments, and maintenance schedules and/or reports, including an above- and below-ground infrastructure inventory map and registered engineer's or delegate CBO's assessment of demolishing the facility; additionally, for any facility that permanently ceased operation prior to submitting a Final Closure Plan and for which only minimal or no maintenance has been done since, a comprehensive condition report focused on identifying potential hazards;**

8. **all information additionally required by the facility's conditions of certification applicable to plant closure;**

9. an equipment disposition plan, including:

   a. recycling and disposal methods for equipment and materials; and,

   b. identification and justification for any equipment and materials that will remain on-site after closure;

10. a site disposition plan, including but not limited to:

    a. proposed rehabilitation, restoration, and/or remediation procedures, as required by the conditions of certification and applicable LORS,

    b. long-term site maintenance activities, and,

    c. anticipated future land-use options after closure;

11. identification and assessment of all potential direct, indirect, and cumulative impacts and proposal of mitigation measures to reduce significant adverse impacts to a less-than-significant level; potential impacts to be considered shall include, but not be limited to:

    a. traffic

    b. noise and vibration

    c. soil erosion

    d. air quality degradation

    e. solid waste

    f. hazardous materials

    g. waste water discharges

    h. contaminated soil

12. identification of all current conditions of certification, LORS, federal, state, regional and local planning efforts applicable to the facility, and proposed strategies for achieving and maintaining compliance during closure;

13. updated mailing list or listserv of all responsible agencies, potentially interested parties, and property owners within one (1) mile of the facility;

14. identification of alternatives to plant closure and assessment of the feasibility and environmental impacts of these; and,

15. **description of and schedule for security measures and safe shutdown of all non-critical equipment and removal of hazardous materials and waste (see conditions of certification for Hazardous Materials Management and Waste Management).**

If a CPM-approved Final Closure Plan is not implemented within five (5) years of its approval date, it must be updated and re-submitted to the CPM for supplementary review and approval.

~~Prior to the start of construction, the project owner must send a letter to property owners living within 1 mile of the project notifying them of a telephone number to contact project representatives with questions, complaints, or concerns. If the telephone is not staffed 24 hours per day, it shall include automatic answering with a date and time stamp recording. All recorded complaints shall be responded to within 24 hours. The telephone number shall be posted at the project site and made easily visible to passersby during construction and operation. The telephone number shall be provided to the CPM who will post it on the Energy Commission's web page at:~~

~~http://www.energy.ca.gov/sitingcases/power_plants_contacts.html.~~

~~Any changes to the telephone number shall be submitted immediately to the CPM, who will update the web page.~~

~~In addition to the monthly and annual compliance reporting requirements described above, the project owner shall report and provide copies to the CPM of all complaint forms, including noise and lighting complaints, notices of violation, notices of fines, official warnings, and citations within 10 days of receipt. Complaints shall be logged and numbered. Noise complaints shall be recorded on the form provided in the **NOISE** Conditions of Certification. All other complaints shall be recorded on the complaint form (Attachment A).~~

~~PLANNED CLOSURE (COMPLIANCE-10)~~

~~In order to ensure that a planned facility closure does not create adverse impacts, a closure process that provides for careful consideration of available options and applicable laws, ordinances, regulations, standards, and local/regional plans in existence at the time of closure will be undertaken. To ensure adequate review of a planned project closure, the project owner shall submit a proposed facility closure plan to the Energy Commission for review and approval at least 12 months (or other period of time agreed to by the CPM) prior to the commencement of closure activities. The project owner shall file 120 copies (or other number of copies agreed upon by the CPM) of a proposed facility closure plan with the Energy Commission.~~

~~The plan shall:~~

1. ~~identify and discuss any impacts and mitigation to address significant adverse impacts associated with proposed closure activities and to address facilities, equipment, or other project related remnants that will remain at the site;~~

2. ~~identify a schedule of activities for closure of the power plant site, transmission line corridor, and all other appurtenant facilities constructed as part of the project;~~

3. ~~identify any facilities or equipment intended to remain on site after closure, the reason, and any future use; and~~

4. ~~address conformance of the plan with all applicable laws, ordinances, regulations, standards, and local/regional plans in existence at the time of facility closure, and applicable conditions of certification.~~

~~Prior to submittal of the proposed facility closure plan, a meeting shall be held between the project owner and the Energy Commission CPM for the purpose of discussing the specific contents of the plan.~~

~~In the event that there are significant issues associated with the proposed facility closure plan's approval, or if the desires of local officials or interested parties are inconsistent with the plan, the CPM shall hold one or more workshops and/or the Energy Commission may hold public hearings as part of its approval procedure.~~

~~As necessary, prior to or during the closure plan process, the project owner shall take appropriate steps to eliminate any immediate threats to public health and safety and the environment, but shall not commence any other closure activities until the Energy Commission approves the facility closure plan.~~

~~UNPLANNED TEMPORARY CLOSURE/ON-SITE CONTINGENCY PLAN (COMPLIANCE-11)~~

~~In order to ensure that public health and safety and the environment are protected in the event of an unplanned temporary facility closure, it is essential to have an on-site contingency plan in place. The on-site contingency plan will help to ensure that all necessary steps to mitigate public health and safety impacts and environmental impacts are taken in a timely manner.~~

~~The project owner shall submit an on-site contingency plan for CPM review and approval. The plan shall be submitted no less than 60 days (or other time agreed to by the CPM) prior to commencement of commercial operation. The approved plan must be in place prior to commercial operation of the facility and shall be kept at the site at all times.~~

~~The project owner, in consultation with the CPM, will update the on-site contingency plan as necessary. The CPM may require revisions to the on-site contingency plan over the life of the project. In the annual compliance reports submitted to the Energy Commission, the project owner will review the on-site contingency plan, and recommend changes to bring the plan up to date. Any changes to the plan must be approved by the CPM.~~

~~The on-site contingency plan shall provide for taking immediate steps to secure the facility from trespassing or encroachment. In addition, for closures of more than 90 days, unless other arrangements are agreed to by the CPM, the plan shall provide for removal of hazardous materials and hazardous wastes, draining of all chemicals from storage tanks and other equipment, and the safe shutdown of all equipment. (Also see specific Conditions Of Certification for the technical areas of~~ ~~**Hazardous Materials Management**~~ ~~and~~ ~~**Waste Management.**~~~~)~~

~~In addition, consistent with requirements under unplanned permanent closure addressed below, the nature and extent of insurance coverage, and major equipment warranties must also be included in the on-site contingency plan. In addition, the status of the insurance coverage and major equipment warranties must be updated in the annual compliance reports.~~

~~In the event of an unplanned temporary closure, the project owner shall notify the CPM, as well as other responsible agencies, by telephone, fax, or e-mail, within 24 hours and shall take all necessary steps to implement the on-site contingency plan. The project owner shall keep the CPM informed of the circumstances and expected duration of the closure.~~

~~If the CPM determines that an unplanned temporary closure is likely to be permanent, or for a duration of more than 12 months, a closure plan consistent with the requirements for a planned closure shall be developed and submitted to the CPM within 90 days of the CPM's determination (or other period of time agreed to by the CPM).~~

~~UNPLANNED PERMANENT CLOSURE/ON-SITE CONTINGENCY PLAN (COMPLIANCE-12)~~

~~The on-site contingency plan required for unplanned temporary closure shall also cover unplanned permanent facility closure. All of the requirements specified for unplanned temporary closure shall also apply to unplanned permanent closure.~~

~~In addition, the on-site contingency plan shall address how the project owner will ensure that all required closure steps will be successfully undertaken in the event of abandonment.~~

~~In the event of an unplanned permanent closure, the project owner shall notify the CPM, as well as other responsible agencies, by telephone, fax, or e-mail within 24 hours and shall take all necessary steps to implement the on-site contingency plan. The project owner shall keep the CPM informed of the status of all closure activities.~~

~~A closure plan, consistent with the requirements for a planned closure, shall be developed and submitted to the CPM within 90 days of the permanent closure or another period of time agreed to by the CPM.~~

~~POST CERTIFICATION CHANGES TO THE ENERGY COMMISSION DECISION: AMENDMENTS, OWNERSHIP CHANGES, STAFF APPROVED PROJECT MODIFICATIONS AND VERIFICATION CHANGES (COMPLIANCE-13)~~

~~The project owner must petition the Energy Commission pursuant to Title 20, California Code of Regulations, section 1769, in order to modify the project (including linear facilities) design, operation or performance requirements, and to transfer ownership or operational control of the facility.~~ **~~It is the responsibility of the project owner to contact the CPM to determine if a proposed project change should be considered a project modification pursuant to section 1769.~~** ~~Implementation of a project modification without first securing Energy Commission, or Energy Commission staff approval, may result in enforcement action that could result in civil penalties in accordance with section 25534 of the Public Resources Code.~~

~~A petition is required for **amendments** and for **Staff approved project modifications** as specified below. Both shall be filed as a “Petition to Amend.” Staff will determine if the change is significant or insignificant. For verification changes, a letter from the project owner is sufficient. In all cases, the petition or letter requesting a change should be submitted to the CPM, who will file it with the Energy Commission’s Dockets Unit in accordance with Title 20, California Code of Regulations, section 1209.~~

~~The criteria that determine which type of approval and the process that applies are explained below. They reflect the provisions of Section 1769 at the time this condition was drafted. If the Commission’s rules regarding amendments are amended, the rules in effect at the time an amendment is requested shall apply.~~

COMPLIANCE TABLE 1
SUMMARY of COMPLIANCE CONDITIONS OF CERTIFICATION

CONDITION NUMBER	SUBJECT	DESCRIPTION
COM-1	Unrestricted Access	The project owner shall grant Energy Commission staff and delegate agencies or consultants unrestricted access to the power plant site.
COM-2	Compliance Record	The project owner shall maintain project files on-site. Energy Commission staff and delegate agencies shall be given unrestricted access to the files.
COM-3	Compliance Verification Submittals	The project owner is responsible for the delivery and content of all verification submittals to the CPM, whether such condition was satisfied by work performed or the project owner or his agent.
COM-4	Pre-Construction Matrix and Tasks Prior to Start of Construction	Construction shall not commence until the all of the following activities/submittals have been completed: • Notify property owners • Submit pre-construction matrix identifying conditions to be fulfilled before the start of construction • Completed all pre-construction conditions • CPM has issued a letter to the project owner authorizing construction
COM-5	Compliance Matrix	The project owner shall submit a compliance matrix (in a spreadsheet format) with each monthly and Annual Compliance Report, which includes the status of all Compliance Conditions of Certification.
COM-6	Monthly Compliance Report/Key Events List	During construction, the project owner shall submit Monthly Compliance Reports (MCRs) which include specific information. The first MCR is due the month following the Energy Commission business meeting date on which the project was approved and shall include an initial list of dates for each of the events identified on the Key Events List.
COM-7	Annual Compliance Report	After construction ends and throughout the life of the project, the project owner shall submit Annual Compliance Reports instead of Monthly Compliance Reports.
COM-8	Confidential Information	Any information the project owner deems confidential shall be submitted to the Energy Commission's Executive Director with a request for confidentiality.
COM-9	Annual Energy Facility Compliance Fees	Payment of Annual Energy Facility Compliance Fee
COM-10	Amendments, Ownership Changes, Staff-Approved Project Modifications, and Verification Changes	The project owner must petition the Energy Commission to delete or change a Condition of Certification, modify the project design or operational requirements and/or transfer ownership or operational control of the facility.

COMPLIANCE TABLE 1
SUMMARY of COMPLIANCE CONDITIONS OF CERTIFICATION

CONDITION NUMBER	SUBJECT	DESCRIPTION
COM-11	Reporting of Complaints, Notices, and Citations	Prior to the start of construction, the project owner must provide all property owners within a one (1) mile radius a telephone number to contact project representatives with questions, complaints or concerns. Within ten (10) days of receipt, the project owner shall report to the CPM all notices, complaints, violations, and citations.
COM-12	Site Contingency Planning	No less than sixty (60) days prior to the start of commercial operation the project owner must submit an on-site contingency plan to ensure public and environmental health and safety are protected while responding to an unanticipated event or emergency.
COM-13	Incident Reporting Requirements	The project owner shall notify the CPM within one (1) hour of an incident and submit a detailed incident report within thirty (thirty) days, maintain records of incident report, and submit public health and safety documents with employee training provisions.
COM-14	Non-Operation	No later than two (2) weeks prior to a facility's planned non-operation, or no later than two (2) weeks after the start of unplanned non-operation, the project owner must notify the CPM, interested agencies and nearby property owners of this status. During non-operation, the project owner must provide written updates.
COM-15	Facility Closure Plans	One (1) year after initiating commercial operation, the project owner must submit a Provisional Closure Plan and Cost Estimate for permanent closure. Three (3) years prior to closing, the project owner must submit a Final Closure Plan

ATTACHMENT 1
COMPLAINT REPORT / RESOLUTION FORM

Complaint Log Number:__________________________ Docket Number:______________________________

Project Name:____

COMPLAINANT INFORMATION

Name:____ Phone Number:______________________________

Address:____

COMPLAINT

DATE COMPLAINT RECEIVED:_______________________ TIME COMPLAINT RECEIVED:__________________

COMPLAINT RECEIVED BY: ☐ TELEPHONE ☐ IN WRITING (COPY ATTACHED)

DATE OF FIRST OCCURRENCE:____

DESCRIPTION OF COMPLAINT (INCLUDING DATES, FREQUENCY, AND DURATION):______________________

____

____

FINDINGS OF INVESTIGATION BY PLANT PERSONNEL:____

____

____

DOES COMPLAINT RELATE TO VIOLATION OF A CEC REQUIREMENT? ☐ YES ☐ NO

DATE COMPLAINANT CONTACTED TO DISCUSS FINDINGS:____

DESCRIPTION OF CORRECTIVE MEASURES TAKEN OR OTHER COMPLAINT RESOLUTION:__________________

____

____

DOES COMPLAINANT AGREE WITH PROPOSED RESOLUTION? ☐ YES ☐ NO

IF NOT, EXPLAIN:____

____

CORRECTIVE ACTION

IF CORRECTIVE ACTION NECESSARY, DATE COMPLETED:____

DATE FIRST LETTER SENT TO COMPLAINANT (COPY ATTACHED):__________________________________

DATE FINAL LETTER SENT TO COMPLAINANT (COPY ATTACHED):__________________________________

OTHER RELEVANT INFORMATION:____

____

____

"This information is certified to be correct."

PLANT MANAGER SIGNATURE:______________________________ DATE:(ATTACH ADDITIONAL PAGES AND ALL SUPPORTING DOCUMENTATION, AS REQUIRED)

PALEN SOLAR ELECTRIC GENERATING SYSTEM (09-AFC-7C)
PRELIMINARY STAFF ASSESSMENT

Amendment to Palen Solar Power Project

PREPARATION TEAM

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Introduction .... Christine Stora

Project Description .... Christine Stora

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Biological Resources..........

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PALEN SOLAR ELECTRIC GENERATING SYSTEM AMENDMENT

Docket No. 09-AFC-07C
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(Revised 06/19/2013)

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Jennifer Nelson
Adviser to Presiding Member

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Adviser to Associate Member

Eileen Allen
Commissioners' Technical Adviser for Facility Siting

DECLARATION OF SERVICE

I, Christine Stora, declare that on _June 28_, 2013, I served and filed copies of the attached PSEGS PSA, dated June 28, 2013. This document is accompanied by the most recent Proof of Service, which I copied from the web page for this project at: http://www.energy.ca.gov/sitingcases/palen/compliance/.

The document has been sent to the other persons on the Service List above in the following manner:

(C*heck one*)

For service to all other parties and filing with the Docket Unit at the Energy Commission:

__X__ I e-mailed the document to all e-mail addresses on the Service List above and personally delivered it or deposited it in the U.S. mail with first class postage to those parties noted above as "hard copy required"; **OR**

___ Instead of e-mailing the document, I personally delivered it or deposited it in the U.S. mail with first class postage to all of the persons on the Service List for whom a mailing address is given.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct, and that I am over the age of 18 years.

Dated: 6/28, 2013

Christine Stora